ELEMENTARY
CORE Academy
UTAH STATE OFFICE OF EDUCATION & UTAH STATE UNIVERSITY

ELEMENTARY CORE ACADEMY • ELEMENTARY CORE ACADEMY • ELEMENTARY CORE ACADEMY

2ND GRADE

PARTICIPANT HANDBOOK
2004

UTAH STATE OFFICE OF EDUCATION

UtahState UNIVERSITY

ELEMENTARY CORE ACADEMY
6517 Old Main Hill
Logan, UT 84322-6517

435-797-0939
http://coreacademy.usu.edu

ISBN: 1-890563-86-2

Acknowledgements

These materials have been produced by and for the teachers of the State of Utah. Appreciation is expressed to the numerous individuals who provided input and effort into the creation of this curriculum. Delivery of the Elementary CORE Academy, including the development and delivery of content, coordination of sessions, distribution of materials, and participant interaction, has been a collaborative effort of many educational groups across Utah. The following organizations, Utah teachers, and science leaders contributed ideas and activities as part of this professional development project:

Organizations:

Utah State Office of Education (USOE)
Utah State University (USU)
State Science Education Coordination Committee (SSECC)
State Mathematics Education Coordination Committee (SMECC)
Special Education Services Unit (USOE)
WestEd Eisenhower Regional Consortium

Individuals:

Academy Coordination Committee: Max Longhurst, Brett Moulding, Nicole Paulson, Marv Tolman, Pat Beckman

Academy Director: Max Longhurst

Academy Coordinator: Megan Richards

Academy Facilitators and Contributors: Lissa Jensen, Shirley Mills, Sue Porter, Meri-Lyn Stark, Leeanne Walker

Academy Presenters: Brenda Dent, Melissa Garber, Kim Moreton, Barbara Roy, Geoffrey Smith, Linda Stott, LeeAnne Walker, Kris Wright, Amy Spencer, Suraj Syal, Diane Johnson, Connie Nink

Credits for editing, compiling, and formatting these materials are given to Kerry Bair, Jennifer Downs, Heidi Draper, James Evans, Andrae Ferguson, Eric Rowley, Weylin Richards, and Meagen Williams.

UTAH STATE OFFICE OF EDUCATION

250 East 500 South/P.O. Box 144200 Salt Lake City, Utah 84114-4200
Steven O. Laing, Ed.D. State Superintendent of Public Instruction
Voice: (801) 538-7500 Fax: (801) 538-7521 TDD: (801) 538-7876

Dear CORE Academy Teachers:

Involvement in the CORE Academy represents a significant investment by you, your school, and district in educational excellence for the students of Utah. The goal of the Academy is to provide a high quality opportunity for teachers to engage in meaningful professional growth.

The Academy will help you gain expertise in the collection and use of accurate data and analysis of each student's level of achievement, teach sound instructional methods specifically aligned to the state Core Curriculum, and provide an opportunity for collegial support.

I commend you for your dedication and willingness to engage in meaningful professional development. It is my belief that educators care deeply about their students and work hard to create successful experiences in the classroom. Despite some challenges facing our schools, dedicated and professional educators make profound differences each day.

Sincerely,

Patrick Ogden
Interim State Superintendent
of Public Instruction

Funding Sources

Appreciation is expressed for the tremendous educational input and monetary commitment of several organizations for the successful delivery of the Elementary CORE Academy. This year's Elementary CORE Academy was developed and funded through a variety of sources. The Utah State Office of Education (USOE), in collaboration with Utah State University (USU) and local school districts of Utah, have supported kindergarten through sixth grade teachers with professional development experiences that will enhance the educational experience for Utah children.

Major funding for the Academy comes from the following sources:

Federal/State Funds:

Utah State Office of Education
 Staff Development Funds
 Special Education Services Unit

ESEA Title II

Utah Math Science Partnership

WestED Eisenhower Regional Consortium

District Funds:

Various sources including Quality Teacher Block, Federal ESEA Title II, and District Professional Development Funds

School Funds:

Trust land, ESEA Title II, and other school funds
Utah State Office of Education Special Education Services

The state and district funds are allocations from the state legislature. ESEA is part of the "No Child Left Behind" funding that comes to Utah.

Additionally, numerous school districts, individual schools, and principals in Utah have sponsored teachers to attend the Academy. Other educational groups such as the Utah Division of Water Resources, National Energy Foundation, Utah Energy Office, and the Utah Mining Association have assisted in the development and delivery of resources in the Academy.

Most important is the thousands of teachers who take time from their summer to attend these professional development workshops. It is these teachers who make this program possible.

Goals of the Elementary CORE Academy

Overall

The purpose of the Elementary CORE Academy is to create high quality teacher instruction and improve student achievement through the delivery of professional development opportunities and experiences for teachers across Utah.

The Academy will provide elementary teachers in Utah with:

1. Models of exemplary and innovative instructional strategies, tools, and resources to meet newly adopted Core Curriculum standards, objectives, and indicators.
2. Practical models and diverse methods of meeting the learning needs of all children, with instruction implementation aligned to the Core Curriculum.
3. Meaningful opportunities for collaboration, self-reflection, and peer discussion specific to innovative and effective instructional techniques, materials, teaching strategies, and professional practices in order to improve classroom instruction.

Learning a limited set of facts will no longer prepare a student for real experiences encountered in today's world. It is imperative that educators have continued opportunities to obtain instructional skills and strategies that provide methods of meeting the needs of all students. Participants of the Academy experience will be better equipped to meet the challenges faced in today's classrooms.

Table of Contents

Chapter 1: Second Grade Core Curriculum

Chapter 2: Facilitated Activities

Chapter 3: Content Standard I and Math Standard V Activities

Chapter 4: Math Standards I and V Activities

Chapter 5: Content Standard II Activities

Chapter 6: Math Standards II and III Activities

Chapter 7: Content Standard III Activities

Chapter 8: Math Standards I and IV Activities

Chapter 9: Appendix

Second Grade
Core Curriculum

K-2 Core Curriculum

Introduction

Most students enter school confident in their own abilities; they are curious and eager to learn more. They make sense of the world by reasoning and problem solving. Young students are active, resourceful individuals who construct, modify, and integrate ideas by interacting with the physical world as well as with peers and adults. They learn by doing, collaborating, and sharing their ideas. Students' abilities to communicate through language, pictures, sound, movement, and other symbolic means develop rapidly during these years.

- **Young children learn by doing, collaborating, and sharing their ideas.**

Literacy requires an understanding of listening, speaking, reading, writing, and viewing in many forms including print and electronic images. Today, more than ever, students must have the ability to think critically while applying new information to existing knowledge. Therefore, school literacy programs need to involve students in learning to read and write in situations that foster critical thinking and the use of literacy for independent learning in all content areas.

Young students are building beliefs about what mathematics is, about what it means to know and do mathematics, and about themselves as mathematical learners. Mathematics instruction needs to include more than short-term learning of rote procedures. Students must use technology and other mathematical tools, such as manipulative materials, to develop conceptual understanding and solve problems as they do mathematics. Students, as mathematicians, learn best with hands-on, active experiences throughout the instruction of the mathematics curriculum.

Language Arts and Mathematics are the tools for doing work in other areas. These content areas need to be integrated into other curriculum areas to provide students with optimal learning. The curriculum becomes more relevant when content areas are connected rather than taught in strict isolation. For this reason, the content areas of the Fine Arts, Health Education, Physical Education, Science, and Social Studies have been combined to enable teachers to teach more efficiently and students to learn in a real-life context that enhances lifelong learning.

The Kindergarten through Second Grade Core describes what students should know and be able to do at the end of each of the kindergarten, first, and second grade levels. It has been developed, critiqued, and revised by a community of Utah teachers, university educators, State Office of Education specialists, and an advisory committee representing a wide variety of people from the community. The Core reflects the current philosophy of education that is expressed in national documents developed by the International Reading Association, National Council of the Teachers of Mathematics, National Standards for Arts Education, Information Power, National Association for Sport and Physical Education, American Association for the Advancement of Science, National Council for the Social Studies, International Society for Technology and Education, and Early Childhood Standards.

Organization of the K-2 Core:

- **Intended Learning Outcomes**
- **Standard**
- **Objective**
- **Indicator**

Organization of the K-2 Core

The Core is designed to help teachers organize and deliver instruction.

- Each grade level begins with a brief course description.
- The Kindergarten, First, and Second Grade INTENDED LEARNING OUTCOMES describe the goals for students to gain knowledge and understand their world. They are found at the beginning of each grade level, are an integral part of the Core, and should be included as part of instruction.
- The first Core area consists of the Language Arts curriculum.
- The second Core area consists of the Mathematics curriculum.
- The third Core area consists of the subject areas of the Fine Arts, Health Education, Physical Education, Science, and Social Studies.
- A STANDARD is a broad statement of what students are expected to understand. Several Objectives are listed under each Standard.
- An OBJECTIVE is a more focused description of what students need to know and be able to do at the completion of instruction. If students have mastered the Objectives associated with a given Standard, they have mastered that Standard at that grade level. Several Indicators are described for each Objective.
- An INDICATOR is a measurable or observable student action that enables one to assess whether a student has mastered a particular Objective. Indicators are not meant to be classroom activities, but they can help guide classroom instruction.

Guidelines Used in Developing the K-2 Core

The Core is:

Consistent With the Nature of Learning

The main intent in the early grades is for students to value learning and develop the skills to gain knowledge and understand their world. The Core is designed to produce an integrated set of Kindergarten, First, and Second Grade Intended Learning Outcomes for students, with specific goals in all content areas.

Coherent

The Core has been designed so that, wherever possible, the ideas taught within a particular grade level have a logical and natural connection with each other and with those of earlier grades. Efforts have also been made to select topics and skills that integrate well with one another appropriate to grade level. In addition, there is an upward articulation of concepts, skills, and content. This spiraling is intended to prepare students to understand and use more complex concepts and skills as they advance through the learning process.

- **By emphasizing depth rather than breadth, the Core seeks to empower students.**

Developmentally Appropriate

The Core takes into account the psychological and social readiness of students. It builds from concrete experiences to more abstract understandings. The Core focuses on providing experiences with concepts that students can explore and understand in depth to build the foundation for future learning experiences.

Reflective of Successful Teaching Practices

Learning through play, movement, and adventure is critical to the early development of the mind and body. The Core emphasizes student exploration. The Kindergarten, First, and Second Grade Intended Learning Outcomes are central in each standard. The Core is designed to encourage instruction with students working in cooperative groups. Instruction should recognize the importance of each Core area in the classroom, school, and community.

Comprehensive

The Kindergarten, First, and Second Grade Core does not cover all topics that have traditionally been in the Kindergarten, First, and Second Grade curriculum; however, it provides a basic foundation of knowledge and skills in all content areas. By emphasizing depth rather than breadth, the Core seeks to empower students rather than intimidate them with a collection of isolated and eminently forgettable facts. Teachers are free to add related concepts and skills, but they are expected to teach all the standards and objectives specified in the Core for their grade level.

Feasible

Teachers and others who are familiar with Utah students, classrooms, teachers, and schools have designed the Core. It can be taught with easily obtained resources and materials. A Teacher Handbook is also available for teachers and has sample lessons on each topic for each grade level. The Teacher Handbook is a document that will grow as teachers add exemplary lessons aligned with the new Core.

- **Student achievement of the standards and objectives in this Core is best assessed using a variety of assessment instruments.**

Useful and Relevant

This curriculum relates directly to student needs and interests. Relevance of content areas to other endeavors enables students to transfer skills gained from one area of instruction into their other school subjects and into their lives outside the classroom.

Reliant Upon Effective Assessment Practices

Student achievement of the standards and objectives in this Core is best assessed using a variety of assessment instruments. Performance tests are particularly appropriate to evaluate student mastery of thinking processes and problem-solving skills. A variety of classroom assessment approaches should be used by teachers in conjunction with the Criterion Referenced Tests (CRT) that are administered to first and second grade students in Language Arts and Mathematics, and with the pre- and post-tests administered in kindergarten. Observation of students engaged in instructional activities is highly recommended as a way to assess students' skills as well as attitudes toward learning. The nature of the questions posed by students provides important evidence of their understanding.

Engaging

In the early grades, children are forming attitudes and habits for learning. It is important that instruction maximizes students' potential and gives them understanding of the intertwined nature of learning. Effective elementary instruction engages students actively in enjoyable learning experiences. Instruction should be as thrilling an experience for a child as seeing a rainbow, growing a flower, or describing a toad. In a world of rapidly expanding knowledge and technology, all students must gain the skills they will need to understand and function responsibly and successfully in the world. The Core provides skills in a context that enables students to experience the joy of learning.

K-2 Intended Learning Outcomes

The main intent at the early grades is for students to value learning and develop the skills to gain knowledge and understand their world.

The Intended Learning Outcomes described below reflect the belief that kindergarten, first, and second grade education should address the intellectual, social, emotional, physical, and ethical development of children. While the Kindergarten, First, and Second Grade Core Curriculum focuses primarily on content and the intellectual development of children, it is important to create a classroom culture that fosters development of many aspects of a person. By nurturing development in these interrelated human domains, young people will be healthy and discover varied and exciting talents and dreams. They will be socially and civically competent and able to express themselves effectively.

- **Intended learning outcomes provide a direction for general classroom instruction, management, culture, environment, and inclusion.**

The outcomes identified below are to provide a direction for general classroom instruction, management, culture, environment, and inclusion. These outcomes should be interwoven throughout the Kindergarten, First, and Second Grade Core Curriculum, which offers more specific and measurable standards for instruction.

Beginning in kindergarten and by the end of second grade students will be able to:

1. **Demonstrate a positive learning attitude.**
   a. Display a sense of curiosity.
   b. Practice personal responsibility for learning.
   c. Demonstrate persistence in completing tasks.
   d. Apply prior knowledge and processes to construct new knowledge.
   e. Voluntarily use a variety of resources to investigate topics of interest.
2. **Develop social skills and ethical responsibility.**
   a. Respect similarities and differences in others.
   b. Treat others with kindness and fairness.
   c. Follow classroom and school rules.
   e. Include others in learning and play activities.
   f. Participate with others when making decisions and solving problems.
   g. Function positively as a member of a family, class, school, and community.

3. **Demonstrate responsible emotional and cognitive behaviors.**
    a. Recognize own values, talents, and skills.
    b. Express self in positive ways.
    c. Demonstrate aesthetic awareness.
    d. Demonstrate appropriate behavior.
    e. Express feelings appropriately.
    f. Meet and respect needs of self and others.
4. **Develop physical skills and personal hygiene.**
    a. Respect physical similarities and differences in self and others.
    b. Learn proper care of the body for health and fitness.
    c. Develop knowledge that enhances participation in physical activities.
    d. Display persistence in learning motor skills and developing fitness.
    e. Use physical activity for self-expression.
5. **Understand and use basic concepts and skills.**
    a. Develop phonological and phonemic awareness.
    b. Decode, read, and comprehend written text and symbols.
    c. Develop vocabulary.
    d. Develop reasoning and sequencing skills.
    e. Demonstrate problem-solving skills.
    f. Observe, sort, and classify objects.
    g. Make and interpret representations, graphs, and models.
    h. Recognize how content ideas interconnect.
    i. Make connections from content areas to application in real life.
6. **Communicate clearly in oral, artistic, written, and nonverbal form.**
    a. Share ideas using communication skills.
    b. Predict an event or outcome based on evidence.
    c. Use appropriate language to describe events, objects, people, ideas, and emotions.
    d. Listen attentively and respond to communication.
    e. Use mathematical concepts to communicate ideas.
    f. Use visual art, dance, drama, and music to communicate.

The Second Grade Core Curriculum

Second grade core concepts should be integrated across all curriculum areas. Reading, writing, and mathematical skills should be emphasized as integral to the instruction in all other areas. Personal relevance of content is always an important part of helping students to value learning and should be emphasized.

In second grade, students are immersed in a literature-rich environment, filled with classical and contemporary fiction and nonfiction selections, which relate to all areas of learning and interest. Students listen and speak effectively in classroom discussions. They continue to work on fluency and expression and use a combination of strategies for reading and comprehension.

Second graders extend their study of number and spatial sense to include three-digit numbers and three-dimensional figures. They make measurements and collect, organize, and display data. They use graphs to answer questions and make summary statements and predictions based on their experiences. While learning mathematics, students will be actively engaged in using concrete materials and appropriate technologies such as calculators and computers.

In second grade, students learn about their relationship to the classroom, school, family, and community. Students develop the skills of questioning, gathering information, constructing explanations, and drawing conclusions. They learn basic body control while developing motor skills and moving in a variety of settings. Students become aware of strength, endurance, and flexibility in different parts of their bodies. They express thoughts and ideas creatively, while challenging their imagination, fostering reflective thinking, and developing disciplined effort and problem-solving skills.

- **Reading, writing, and mathematical skills should be emphasized as integral to the instruction in all other areas.**

Second Grade Language Arts Core Curriculum

Standard I: ***Oral Language*—Students develop language for the purpose of effectively communicating through listening, speaking, viewing, and presenting.**

Standard I: ***Oral Language*—Students develop language for the purpose of effectively communicating through listening, speaking, viewing, and presenting.**

Objective 1: Develop language through listening and speaking. Identify specific purpose(s) for listening (e.g., to gain information, to be entertained).

a. Listen and demonstrate understanding by responding appropriately (e.g., follow multiple-step directions, restate, clarify, question, summarize).

b. Speak clearly and audibly with expression in communicating ideas.

c. Speak in complete sentences with appropriate subject-verb agreement.

Objective 2: Develop language through viewing media and presenting.

a. Identify specific purpose(s) for viewing media (i.e., to identify main idea and details, to gain information, distinguish between fiction/nonfiction).

b. Use a variety of formats (e.g., drama, sharing of books and personal writings, choral readings, informational reports, retelling experiences, and stories in sequence) in presenting with various forms of media (e.g., pictures, posters, charts, ads, newspapers).

Standard II: ***Concepts of Print*—Students develop an understanding of how printed language works.**

Objective 1: Demonstrate an understanding that print carries "the" message.

a. Recognize that print carries different messages.

b. Identify messages in common environmental print (e.g., signs, boxes, wrappers).

Objective 2: Demonstrate knowledge of elements of print within a text.

a. Discriminate between letters, words, and sentences in text.

b. Match oral words to printed words while reading.

c. Identify punctuation in text (i.e., periods, question marks, and exclamation points).

Standard II: ***Concepts of Print*—Students develop an understanding of how printed language works.**

Standard III:
***Phonological and Phonemic Awareness*—Students develop phonological and phonemic awareness.**

Standard III: ***Phonological and Phonemic Awareness*—Students develop phonological and phonemic awareness.**

Objective 1: Demonstrate phonological awareness.

a. Count the number of syllables in words.

b. Count the number of syllables in a first name.

Objective 2: Recognize like and unlike word parts (oddity tasks).

a. Identify words with same beginning consonant sounds (e.g., man, sat, sick) and ending consonant sounds (e.g., man, sat, ten) in a series of words.

b. Identify words with same medial sounds in a series of words (e.g., long vowel sound: take, late, feet; short vowel sound: top, cat, pan; middle consonant sound: kitten, missing, lesson).

Objective 3: Orally blend word parts (blending).

a. Blend syllables to make words (e.g., /ta/…/ble/, table).

b. Blend onset and rime to make words (e.g., /p/…/an/, pan).

c. Blend individual phonemes to make words (e.g., /s/ /a/ /t/, sat).

Objective 4: Orally segment words into word parts (segmenting).

a. Segment words into syllables (e.g., table, /ta/…/ble/).

b. Segment words into onset and rime (e.g., pan, /p/…/an/).

c. Segment words into individual phonemes (e.g., sat, /s/…/a/…/t/).

Objective 5: Orally manipulate phonemes in words and syllables (manipulation).

a. Substitute initial and final sound (e.g., replace first sound in mat to /s/, say sat; replace last sound in mat with /p/, say map).

b. Substitute vowel in words (e.g., replace middle sound in map to /o/, say mop).

c. Delete syllable in words (e.g., say baker without the /ba/, say ker).

d. Deletes initial and final sounds in words (e.g., say sun without the /s/, say un; say hit without the /t/, say hi).

e. Delete initial phoneme and final phoneme in blends (e.g., say step without the /s/, say tep; say best without the /t/, say bes).

Standard IV: ***Phonics and Spelling*—Students use phonics and other strategies to decode and spell unfamiliar words while reading and writing.**

Objective 1: Demonstrate an understanding of the relationship between letters and sounds.

a. Identify and pronounce all vowel diphthongs (e.g., oi, oy, aw, au) and consonant digraphs (e.g., ch, sh, th, wh) accurately in words.

b. Identify and pronounce sounds for short and long vowels, using patterns (e.g., cvc, cvvc, cvcv, cvc-silent e), and vowel digraphs (e.g., ea, ee, ie, oa, ai, ay, oo, ow) accurately in two-syllable words.

c. Identify and pronounce r-controlled vowel patterns in words (e.g., ar, or, er).

d. Identify and blend letter sounds to pronounce words.

Objective 2: Use knowledge of structural analysis to decode words.

a. Identify and read grade level contractions and compound words.

b. Identify sound patterns and apply knowledge to decode words (e.g., blends, digraphs, vowel patterns, r-controlled vowels).

c. Demonstrate an understanding of representing the same sound with different patterns by decoding these patterns accurately in isolation and in text (e.g., ee, ea, ei, e).

d. Use knowledge of root words and prefixes (e.g., re, un, mis) and suffixes (e.g., s, es, ed, ing, est, ly) to decode words.

e. Use letter and syllable patterns to pronounce multisyllabic words.

Objective 3: Spell words correctly.

a. Use knowledge of word families, patterns, and common letter combinations to spell new words.

b. Spell words with short and long vowel sounds, r-controlled words, words with consonant blends, consonant and vowel digraphs.

c. Spell an increasing number of grade level high-frequency and irregular words correctly (e.g., believe, answer).

d. Learn the spellings of irregular and difficult words (e.g., because, animals, before, answer, weight).

Standard IV: ***Phonics and Spelling*—Students use phonics and other strategies to decode and spell unfamiliar words while reading and writing.**

Objective 4: Use spelling strategies to achieve accuracy (e.g., prediction, visualization, and association).

a. Use knowledge about spelling to predict the spelling of new words.

b. Visualize words while writing.

c. Associate the spelling of new words with that of known words and word patterns.

d. Use spelling generalities to assist spelling of new words (e.g., one vowel between two consonants, silent “e” on the end of a word, two vowels together).

Standard V: ***Fluency*—Students develop reading fluency to read aloud grade level text effortlessly without hesitation.**

Objective 1: Read aloud grade level text with appropriate speed and accuracy.

a. Read grade level text at a rate of approximately 80 wpm.

b. Read grade level text with an accuracy rate of 95-100%.

Objective 2: Read aloud grade level text effortlessly with clarity.

a. Read grade level text in three- to four-word phrases using intonation, expression, and punctuation cues.

b. Read with automaticity 200 second grade high-frequency/sight words.

Standard V:
***Fluency*—Students develop reading fluency to read aloud grade level text effortlessly without hesitation.**

Standard VI: ***Vocabulary*****—Students learn and use grade level vocabulary to increase understanding and read fluently.**

Standard VI: ***Vocabulary*****—Students learn and use grade level vocabulary to increase understanding and read fluently.**

Objective 1: Learn new words through listening and reading widely.

a. Use new vocabulary learned by listening, reading, and discussing a variety of genres.

b. Learn the meaning of a variety of grade level words (e.g., words from literature, social studies, science, math).

Objective 2: Use multiple resources to learn new words by relating them to known words and/or concepts.

a. Use multiple resources to determine the meanings of unknown words (e.g., simple dictionaries, glossaries).

b. Relate unfamiliar words and concepts to prior knowledge to increase vocabulary (e.g., liquid: milk, water, punch).

Objective 3: Use structural analysis and context clues to determine meanings of words.

a. Identify meanings of words using prefixes and suffixes (e.g., do/undo, write/rewrite, happy/happiness, help/helper/helpful).

b. Use context to determine meanings of unknown key words (e.g., The store clerk glared at the children as they looked at the toys.).

c. Use context to determine meanings of synonyms, antonyms, homonyms (e.g., sun/son) and multiple-meaning words (e.g., ring).

Standard VII: ***Comprehension*****—Students understand, interpret, and analyze narrative and informational grade level text.**

Objective 1: Identify purposes of text.

a. Identify purpose for reading.

b. Identify author's purpose.

Objective 2: Apply strategies to comprehend text.

a. Relate prior knowledge to make connections to text (e.g., text to text, text to self, text to world).

b. Ask questions about text read aloud and independently.

c. Form mental pictures to aid understanding of text.

d. Make and confirm predictions while reading using title, picture clues, text, and/or prior knowledge.

e. Make inferences and draw conclusions from text.

f. Identify topic/main idea from text; note details.

g. Summarize important ideas/events; summarize supporting details in sequence.

h. Monitor and clarify understanding applying fix-up strategies while interacting with text.

i. Compile information from text.

Objective 3: Recognize and use features of narrative and informational text.

a. Identify characters, setting, sequence of events, problem/resolution.

b. Identify different genres: fairy tales, poems, realistic fiction, fantasy, fables, folk tales.

c. Identify information from pictures, captions, diagrams, charts, graphs, and table of contents.

d. Identify different structures in texts (e.g., compare/contrast, cause/effect).

e. Locate facts from a variety of informational texts (e.g. newspapers, magazines, books, other resources).

Standard VII: ***Comprehension*****— Students understand, interpret, and analyze narrative and informational grade level text.**

Standard VIII: *Writing*—**Students write daily to communicate effectively for a variety of purposes and audiences.**

Standard VIII: *Writing*—**Students write daily to communicate effectively for a variety of purposes and audiences.**

Objective 1: Prepare to write by gathering and organizing information and ideas (pre-writing).

a. Generate ideas for writing by reading, discussing literature and informational text, and reflecting on personal experiences.

b. Select topics from generated ideas.

c. Identify audience, purpose, and form for writing.

d. Use simple graphic organizers to organize information.

Objective 2: Compose a written draft.

a. Draft ideas on paper in an organized manner utilizing words and sentences (e.g., beginning, middle, end; main idea; details).

b. Use voice in writing (e.g., express feelings, opinions).

c. Select appropriate words to convey meaning.

Objective 3: Revise by elaborating and clarifying a written draft.

a. Revise draft to add details, strengthen word choice, and reorder content.

b. Enhance fluency by using complete sentences.

c. Revise writing, considering the suggestions of others.

Objective 4: Edit written draft for conventions.

a. Edit writing for capitals in names, first word of a sentence, and the pronoun "I", correct punctuation of sentence endings, greetings and closings of letters, dates, and contractions.

b. Edit for spelling of grade level-appropriate words.

c. Edit for standard grammar (e.g., subject-verb agreement).

d. Edit for appropriate formatting features (e.g., margins, indentations, titles).

Objective 5: Use fluent and legible handwriting to communicate.

a. Write demonstrating mastery of all upper- and lower-case manuscript letters and numerals using proper form, proportions, and spacing.

b. Increase fluency in forming manuscript letters and numerals.

c. Produce legible documents with manuscript handwriting.

Objective 6: Write in different modes and genres.

a. Produce personal writing (e.g., journals, friendly notes and letters, personal experiences, family stories, literature responses).

b. Produce traditional and imaginative stories, narrative and formula poetry as an individual/shared writing activity.

c. Produce informational text (e.g., ABC books, how-to books, observations).

d. Produce writing to persuade (e.g., express opinions).

e. Produce functional texts (e.g., lists, labels, signs).

f. Share writing with others using illustrations, graphs, and/or charts to add meaning.

g. Publish 4-6 individual products.

Second Grade Mathematics Core Curriculum

Standard I: Students will acquire number sense and perform operations with whole numbers.

Standard I: **Students will acquire number sense and perform operations with whole numbers.**

Objective 1: Represent whole numbers in a variety of ways.

a. Relate number words to the numerals that represent the quantities 0-100.

b. Represent whole numbers up to 1,000 in groups of hundreds, tens, and ones using base ten models, and write the numeral representing the set.

c. Read and write a three-digit numeral, relating it to a set of objects and a pictorial representation.

d. Write a numeral to 999 in expanded form (e.g., 539 is 5 hundreds, 3 tens, 9 ones or 500+30+9).

e. Identify the place and the value of a given digit in a three-digit numeral (e.g., the two in 281 means 2 hundreds or 200).

f. Demonstrate multiple ways to represent numbers using symbolic representations (e.g., thirty is the same as two groups of 15, the number of pennies in three dimes, or 58-28).

Objective 2: Identify simple relationships among whole numbers.

a. Identify the number that is one more, one less, ten more, or ten less than any whole number up to 100.

b. Write number sentences using the terms “greater than,” “less than,” or “equal to,” to compare numbers.

c. Order four whole numbers less than 100 from least to greatest and from greatest to least.

d. Use ordinal numbers 1st through 10th.

Objective 3: Model and illustrate meanings of the operations of addition and subtraction and describe how they relate.

a. Demonstrate the joining and separating of sets with eighteen or fewer objects and record the results with pictures or symbols.

b. Model three meanings of subtraction: separating of sets (“take away”), comparison of sets (“how many more/fewer”), and missing addends using objects, pictorial representations, and symbols.

c. Separate a given set of objects into two, three, five, or ten groups of equal size.

d. Model addition and subtraction of two-digit whole numbers in a variety of ways.

e. Select an addition or subtraction sentence to solve a problem involving joining or separating of sets with eighteen or fewer objects.

f. Recognize that addition number sentences have related subtraction sentences (e.g., 8-5=3, 3+5=8).

Objective 4: Use fractions to identify parts of the whole.

a. Separate geometric shapes and sets of objects into halves, thirds, and fourths using a variety of models and illustrations.

b. Specify a region of a geometric shape (e.g., as "___ out of ___ equal parts") when given four or fewer equal parts.

c. Represent the unit fractions 1/2, 1/3, and 1/4 with objects, pictures, and symbols.

Objective 5: Solve whole number problems using addition and subtraction in vertical and horizontal notation.

a. Use a variety of methods and tools to facilitate computation (e.g., estimation, mental math strategies, paper and pencil, calculator).

b. Compute accurately with basic number combinations for addition and subtraction facts to eighteen.

c. Add three whole numbers with sums to eighteen.

d. Find the sum of two-digit whole numbers and describe the process used.

Standard II: **Students will identify and use patterns and relations to represent mathematical situations.**

Standard II: Students will identify and use patterns and relations to represent mathematical situations.

Objective 1: Recognize and represent patterns having multiple attributes.

a. Sort, classify, and label objects by three or more attributes.

b. Identify and label repeating and growing patterns using objects, pictures, and symbolic notation (e.g., ABAABBAAABBB . . .).

c. Identify repeating and growing patterns in the environment.

d. Construct models and skip count by twos, threes, fives, and tens and relate to repeated addition.

Objective 2: Recognize and represent relations using mathematical symbols.

a. Recognize that "$\neq$" indicates a relationship in which the quantities on each side are not of equal value.

b. Recognize that symbols such as $\square$, $\triangle$, or $\diamond$ in an addition or subtraction equation represent a value that will make the statement true (e.g., $\square$ +3=6, 5+7=$\triangle$, 7=9-$\diamond$).

c. Demonstrate that changing the order of addends does not change the sum (e.g., 3+2+7=12, 7+3+2=12) and that changing the grouping of three or more addends does not change the sum (e.g., (2+3)+7=12, 2+(3+7)=12).

Standard III: Students will describe, identify, and create geometric shapes and describe spatial relationships.

Objective 1: Describe, identify, and create geometric shapes.

a. Identify, name, draw, sort, and compare circles, triangles, and parallelograms.

b. Identify and name spheres, cones, and cylinders.

c. Find and identify familiar geometric shapes in the students' environment.

d. Determine whether a circle, triangle, square, or rectangle has a line of symmetry.

Objective 2: Describe spatial relationships.

a. Create and use verbal or written instructions to move within the environment.

b. Find and name locations using coordinates (A, 1).

c. Identify shapes in various orientations (e.g., △ and ▽).

Standard III:
Students will describe, identify, and create geometric shapes and describe spatial relationships.

Standard IV:
Students will understand and use measurement tools and techniques.

Standard IV: Students will understand and use measurement tools and techniques.

Objective 1: Identify measurable attributes of objects and units of measurement.

a. Sequence a series of events of a day in order by time (e.g., breakfast at 7:00, school begins at 9:00).
b. Identify the name and value of a penny, nickel, dime, quarter, and dollar.
c. Estimate length, capacity, and weight using customary units.

Objective 2: Use appropriate techniques and tools to determine measurements.

a. Compare and order objects, using nonstandard units, according to their length, weight, or capacity.
b. Measure length using inches and feet, weight using pounds, and capacity using cups.
c. Determine the value of a set of up to five coins that total $1.00 or less (e.g., two quarters and one dime equals 60¢; three dimes, one nickel, and one penny equals 36¢).
d. Read, tell, and write time to the hour and half-hour.
e. Use a calendar to determine the day of the week and date.
f. Determine the perimeter of a square, triangle, and rectangle by measuring with nonstandard units.

Standard V: Students will collect and draw conclusions from data and understand basic concepts of probability.

Objective 1: Collect, organize, and display simple data.

a. Gather data by vote or survey.

b. Sort, classify, and organize data in a variety of ways.

c. Use a variety of methods to organize, display, and label information, including keys, using pictographs, tallies, bar graphs, and organized tables.

d. Report information from a data display.

Objective 2: Determine the likelihood of an event.

a. Predict events that will be the same in one day or one week.

b. Predict the outcome when there are only two possible outcomes (e.g., tossing a coin).

Standard V:
Students will collect and draw conclusions from data and understand basic concepts of probability.

Second Grade Fine Arts, Health, Physical Education, Science and Social Studies Core Curriculim

Standard I:
Students will develop a sense of self.

Standard I: Students will develop a sense of self.

Objective 1: Describe and adopt behaviors for health and safety.

a. Explain the importance of balance in a diet.

b. Distinguish communicable from noncommunicable diseases (e.g., chicken pox, common cold, flu; asthma, cancer, diabetes).

c. Relate behaviors that can help prevent disease (e.g., hand washing, good nutrition, fitness, universal precautions).

d. Identify the harmful effects of tobacco on self and others (e.g., death, heart and lung disease, shortness of breath).

e. Adopt basic safety habits (e.g., wear a seatbelt, practice bicycle safety, find adult help in an emergency).

Objective 2: Develop and apply skills in fine and gross motor movement.

a. Participate daily in sustained periods of physical activity that requires exertion (e.g., one to five* minutes of walking, jogging, jump roping).

b. Perform fundamental locomotor and nonlocomotor skills in movement sequences and game applications (e.g., walk-hop-skip, run-stretch-skate, run-hop-lay up).

c. Perform manipulative skills exhibiting a majority of correct technique components (e.g., soccer kick: eyes on ball, step with foot opposite to kicking foot, contact ball with inside of foot, follow through).

d. Identify components of physical fitness (i.e., strength, endurance, flexibility) and corresponding activities.

e. Create and perform unique dance movements and sequences that expand physical skills while demonstrating personal and spatial awareness.

Objective 3: Develop and use skills to communicate ideas, information, and feelings.

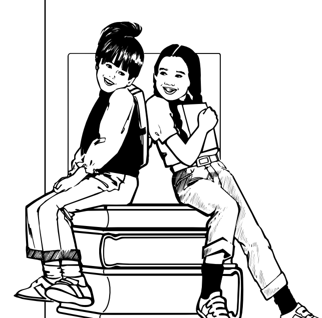
a. Express personal experiences and imagination through dance, storytelling, music, and visual art.

b. Create, with improving accuracy, works of art depicting depth (e.g., close objects large, distant objects small) using secondary and tertiary colors.

c. Develop ability to sing in tune with relaxed strength and clarity.

d. Develop consistency in rhythmic accuracy of body percussion and instrument playing.

* Some students may not be able to sustain activity for one minute due to various medical concerns.



Standard II:
Students will develop a sense of self in relation to families and community.

Standard II: Students will develop a sense of self in relation to families and community.

Objective 1: Describe behaviors that influence relationships with family and friends.

a. Describe characteristics of healthy relationships (e.g., caring, responsibility, trust, respect).

b. Identify benefits of cooperating and sharing.

c. Explain how families and communities change over time.

d. Recognize how choices and consequences affect self, peers, and family.

e. Identify behaviors that might create conflict situations and ways to resolve them.

Objective 2: Examine important aspects of the community and culture that strengthen relationships.

a. Explain why families, schools, and communities have rules.

b. Compare rural, suburban, and urban communities.

c. Relate goods and services to resources within the community.

d. Participate in activities that promote public good (e.g., respect cultural and ethnic differences, identify community needs) and recite the Pledge of Allegiance.

e. Recognize the positive and negative impact of media.

Objective 3: Express relationships in a variety of ways.

a. Describe traditions, music, dances, artwork, poems, rhymes, and stories that distinguish cultures.

b. Develop an acting ability to relate to characters' thoughts and feelings (e.g., needs, hopes, frustrations, fears) in stories and plays.

c. Create and perform/exhibit dances, visual art, music, and dramatic stories from a variety of cultures expressing the relationship between people and their culture.

Standard III: Students will develop an understanding of their environment.

Objective 1: Investigate relationships between plants and animals and how living things change during their lives.

a. Observe and describe relationships between plants and animals.

b. Describe the life cycle of local plants and animals using diagrams and pictures.

c. Create pictures and stories about real animals and compare them to make-believe stories about animals.

Objective 2: Observe and describe weather.

a. Observe and describe patterns of change in weather.

b. Measure, record, graph, and report changes in local weather.

c. Describe how weather affects people and animals.

d. Draw pictures and create dances and sounds that represent weather features (e.g., clouds, storms, snowfall).

Objective 3: Investigate the properties and uses of rocks.

a. Describe rocks in terms of the parts that make up the rocks.

b. Sort rocks based upon color, hardness, texture, layering, and particle size.

c. Identify how the properties of rocks determine how people use them.

d. Create artworks using rocks and rock products.

Objective 4: Demonstrate how symbols and models are used to represent features of the environment.

a. Identify and use information on a map or globe (i.e., map key or legend, compass rose, physical features, continents, oceans).

b. Use an atlas and globe to locate information.

c. Locate continents and oceans on a map or globe (i.e., North America, Antarctica, Australia, Africa, Pacific Ocean, Atlantic Ocean).

Standard III:
Students will develop an understanding of their environment.

K-6 Elementary Mathematics Core Curriculum in Table Format

Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade
Standard I: **Students will understand simple number concepts and relationships.**	**Standard I:** **Students will acquire number sense and perform simple operations with whole numbers.**	**Standard I:** **Students will acquire number sense and perform operations with whole numbers.**	**Standard I:** **Students will acquire number sense and perform operations with whole numbers and simple fractions.**	**Standard I:** **Students will acquire number sense and perform operations with whole numbers, simple fractions, and decimals.**	**Standard I:** **Students will acquire number sense and perform operations with whole numbers, simple fractions, and decimals.**	**Standard I:** **Students will acquire number sense and perform operations with rational numbers.**
Objective 1: **Identify and use whole numbers.** a. Relate a *numeral* to the number of objects in a set (e.g., □ □ □ = 3). b. Construct models of numbers to 10 with physical objects or manipulatives. c. Make pictorial representations of numbers to 10 (e.g., draw four circles, draw six squares). d. Recognize and write numerals from 0 to 10. e. Manipulate objects to demonstrate and describe multiple ways of representing a number (e.g., 5 can be 3 and 2 more, 5 can also be 2 and 2 and 1).	**Objective 1:** **Represent whole numbers in a variety of ways.** a. Relate number words to the *numerals* that represent the quantities 0 to 10. b. Sort objects into groups of tens and ones and write the numeral representing the set. c. Represent *whole numbers* up to 100 in groups of tens and ones using objects. d. Write a numeral when given the number of tens and ones. e. Write a numeral to 99 in *expanded form* (e.g., 39 is 3 tens and 9 ones or 30+9). f. Use zero to represent the number of elements in the empty set or as a placeholder in a two-digit numeral.	**Objective 1:** **Represent whole numbers in a variety of ways.** a. Relate number words to the *numerals* that represent the quantities 0-100. b. Represent *whole numbers* up to 1,000 in groups of hundreds, tens, and ones using base ten models, and write the numeral representing the set. c. Read and write a three-digit numeral, relating it to a set of objects and a pictorial representation. d. Write a numeral to 999 in *expanded form* (e.g., 539 is 5 hundreds, 3 tens, 9 ones or 500+30+9). e. Identify the place and the value of a given digit in a three-digit numeral (e.g., the two in 281 means 2 hundreds or 200). f. Demonstrate multiple ways to represent numbers using symbolic representations (e.g., thirty is the same as two groups of 15, the number of pennies in three dimes, or 58-28).	**Objective 1:** **Represent whole numbers in a variety of ways.** a. Model, read, and write *whole numbers* up to 10,000 using base ten models, pictures, and symbols. b. Write a *numeral* when given the number of thousands, hundreds, tens, and ones. c. Write a number up to 9,999 in expanded form (e.g., 6,539 is 6 thousands, 5 hundreds, 3 tens, 9 ones or 6000+500+30+9). d. Identify the place and the value of a given digit in a four-digit numeral. e. Demonstrate multiple ways to represent numbers using models and symbolic representations (e.g., fifty is the same as two groups of 25, the number of pennies in five dimes, or 75-25).	**Objective 1:** **Represent whole numbers and decimals in a variety of ways.** a. Model, read, and write numerals from tenths to 100,000. b. Write a *whole number* up to 99,999 in *expanded form* (e.g., 76,539 is 7 ten-thousands, 6 one-thousands, 5 hundreds, 3 tens, 9 ones or 70,000+6,000+500+30 +9). c. Identify the place and the value of a given digit in a five-digit numeral, including decimals to tenths. d. Demonstrate multiple ways to represent numbers by using models and symbolic representations (e.g., 36 is the same as the square of six, three dozen, or 9x4). e. Identify *square numbers* using models.	**Objective 1:** **Represent whole numbers and decimals in a variety of ways.** a. Model, read, and write numerals from hundredths to one millions. b. Write a *whole number* up to 999,999 in *expanded form* (e.g., 876,539 = 8 hundred-thousands, 7 ten-thousands, 6 thousands, 5 hundreds, 3 tens, 9 ones or 8x100,000 + 7x10,000 + 6x1,000 + 5x100 + 3x10 + 9). c. Demonstrate multiple ways to represent whole numbers by using models and symbolic representations (e.g., $108=2x50+8; 108=10^2 + 8$). d. Classify whole numbers from 2 to 20 as *prime* or *composite* and 0 and 1 as neither prime nor composite, using models. e. Represent repeated factors using *exponents* up to three (e.g., $8=2x2x2=2^3$).	**Objective 1:** **Represent whole numbers and decimals in a variety of ways.** a. Change *whole numbers* with *exponents* to *standard form* (e.g., 2^4 = 2^4=16) and recognize that $10^0 = 1$. b. Read and write *numerals* from thousandths to one billion. c. Write a whole number to 999,999 in *expanded form* using *exponents* (e.g., $876{,}539 = 8 \times 10^5 + 7 \times 10^4 + 6 \times 10^3 + 5 \times 10^2 + 3 \times 10^1 + 9 \times 10^0$). d. Express numbers in *scientific notation* using positive powers of ten. e. Classify whole numbers to 100 as *prime*, *composite*, or neither. f. Determine the *prime factorization* for a whole number up to 50.

Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade
Objective 2: **Identify simple relationships among whole numbers.** a. Develop strategies for *one-to-one* correspondence and keeping track of quantities. b. Compare two sets of objects to determine whether they have the same, fewer, or more elements. c. Order sets of objects from 1 to 9. d. Estimate quantities less than 10.	**Objective 2:** **Identify simple relationships among whole numbers.** a. Identify the number that is one more or one less than any *whole number* from 1 to 99. b. Use the vocabulary "greater than," "less than," and "equal to" when comparing sets of objects or numbers. c. Order sets of objects and numbers from 0 to 20. d. Use ordinal numbers 1st through 5th (i.e., 1st, 2nd, 3rd, 4th, 5th).	**Objective 2:** **Identify simple relationships among whole numbers.** a. Identify the number that is one more, one less, ten more, or ten less than any *whole number* up to 100. b. Write number sentences using the terms "greater than," "less than," or "equal to," to compare numbers. c. Order four whole numbers less than 100 from least to greatest and from greatest to least. d. Use *ordinal numbers* 1st through 10th.	**Objective 2:** **Identify relationships among whole numbers.** a. Use a variety of strategies to determine whether a number is even or odd. b. Identify the number that is ten more, ten less, 100 more, or 100 less than any *whole number* up to 1,000. c. Compare the relative size of numbers (e.g., 31 is large compared to 4, about half as big as 60, close to 27). d. Compare whole numbers up to four digits using the symbols <, >, and =. e. Order and compare whole numbers on a number line.	**Objective 2:** **Identify relationships among whole numbers and decimals.** a. Identify the number that is 100 more, 100 less, 1,000 more, or 1,000 less than any *whole number* up to 10,000. b. Compare the relative size of numbers (e.g., 100 is small compared to a million, but large compared to 5). c. Compare whole numbers up to five digits using the symbols <, >, and =. d. Identify a whole number that is between two given whole numbers. e. Order and compare whole numbers and decimals to tenths on a number line.	**Objective 2:** **Identify relationships among whole numbers, fractions, decimals, and percents.** a. Order and compare *whole numbers*, fractions (including mixed numbers), and decimals using a variety of methods and symbols. b. Rewrite mixed numbers and improper fractions from one form to the other. c. Find the least common denominator for two fractions. d. Represent commonly used fractions as decimals and percents in various ways (e.g., objects, pictures, calculators).	**Objective 2:** **Identify relationships among whole numbers, fractions (rational numbers), decimals, and percents.** a. Find the *greatest common factor* and *least common multiple* for two numbers using a variety of methods (e.g., list of multiples, prime factorization). b. Order and compare *rational numbers*, including mixed numbers, using a variety of methods and symbols. c. Locate positive rational numbers on a number line. d. Convert common fractions, decimals, and percents from one form to another (e.g., 3/4= 0.75 = 75%).

Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade
Objective 3: **Model and illustrate meanings of the operations of addition and subtraction and describe how they relate.** a. Demonstrate the joining and separating of sets of objects to solve problems. b. Describe the joining or separating of sets with informal language when using models. c. Record pictorially the results from the joining or separating of sets.	Objective 3: **Model and illustrate meanings of the operations of addition and subtraction and describe how they relate.** a. Demonstrate the joining and separating of sets with twelve or fewer objects and record the results with pictures or symbols. b. Model two meanings of subtraction: separating of sets ("take away") and comparison of sets ("how many more/fewer") using objects, pictorial representations, and symbols. c. Use correct vocabulary and symbols to describe addition (i.e., add, "and," plus, +, sum), subtraction (i.e., subtract, minus, -, take away, how many more/fewer), and equals (i.e., =, same as). d. Use zero in addition and subtraction sentences.	Objective 3: **Model and illustrate meanings of the operations of addition and subtraction and describe how they relate.** a. Demonstrate the joining and separating of sets with eighteen or fewer objects and record the results with pictures or symbols. b. Model three meanings of subtraction: separating of sets ("take away"), comparison of sets ("how many more/fewer"), and missing addends using objects, pictorial representations, and symbols. c. Separate a given set of objects into two, three, five, or ten groups of equal size. d. Model addition and subtraction of two-digit whole numbers in a variety of ways. e. Select an addition or subtraction sentence to solve a problem involving joining or separating of sets with eighteen or fewer objects. f. Recognize that addition number sentences have related subtraction sentences (e.g., 8-5=3, 3+5=8).	Objective 3: **Model and illustrate meanings of the operations of addition, subtraction, multiplication, and division and describe how they relate.** a. Model addition and subtraction of two- and three-digit *whole numbers* in a variety of ways. b. Model multiplication of a one-digit *factor* by a one-digit factor using various methods (e.g., repeated addition, rectangular *arrays*, manipulatives, pictures) and connect the representation to an *algorithm*. c. Model division as sharing equally and as repeated subtraction using various methods (e.g., rectangular arrays, manipulatives, number lines, pictorial representations). d. Demonstrate, using objects, that multiplication and division are inverse operations (e.g., 3x4=12; thus, 12÷4=3 and 12÷3=4). e. Select and write an addition, subtraction, or multiplication sentence to solve a problem related to the students' environment, and write a story problem that relates to a given equation. f. Demonstrate the effects of place value when multiplying whole numbers by 10.	Objective 3: **Model and illustrate meanings of the four operations and describe how they relate.** a. Use models to represent multiplication of a one- or two-digit *factor* by a two-digit factor (up to 30) using a variety of methods (e.g., rectangular *arrays*, manipulatives, pictures) and connect the representation to an *algorithm*. b. Recognize that division by zero is not possible (e.g., 6÷0 is undefined). c. Select and write a multiplication or division sentence to solve a problem related to the students' environment and write a story problem that relates to a given equation. d. Represent division of a two-digit *dividend* by a one-digit *divisor*, including whole number remainders, using various methods (e.g., rectangular arrays, manipulatives, pictures) and connect the representation to an algorithm. e. Demonstrate that multiplication and division are inverse operations (e.g., 3x4=12; thus, 12÷4=3 and 12÷3=4). f. Describe the effect of place value when multiplying whole numbers by 10 and 100.	Objective 3: **Model and illustrate meanings of operations and describe how they relate.** a. Identify the *dividend*, *divisor*, and *quotient* regardless of the division symbol used. b. Determine whether a whole number is divisible by 2, 3, 5, 9, and/or 10, using the *rules of divisibility*. c. Represent remainders as *whole numbers*, decimals, or fractions and describe the meaning of remainders as they apply to problems from the students' environment (e.g., If there are 53 people, how many vans are needed if each van holds 8 people?). d. Model addition, subtraction, and multiplication of fractions and decimals in a variety of ways (e.g., using objects and a number line). e Select or write the number sentences that can be used to solve a two-step problem. f. Model different strategies for whole number multiplication (e.g., partial product, lattice) and division (e.g., partial quotient). g. Describe the effect on place value when multiplying and dividing whole numbers and decimals by 10, 100, and 1,000.	Objective 3: **Model and illustrate meanings of operations and describe how they relate.** a. Represent division of a multi-digit *dividend* by two-digit *divisors*, including decimals, using models, pictures, and symbols. b. Model addition, subtraction, multiplication, and division of fractions and decimals in a variety of ways (e.g., objects, a number line). c. *Apply rules of divisibility*. d. Select or write a number sentence that can be used to solve a multi-step problem and write a word problem when given a two-step expression or equation.

Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade
	Objective 4: Use fractions to identify parts of the whole. a. Share sets of up to ten objects between two students and identify each part as half. b. Divide geometric shapes into equal parts, identifying halves and fourths.	**Objective 4: Use fractions to identify parts of the whole.** a. Separate geometric shapes and sets of objects into halves, thirds, and fourths using a variety of models and illustrations. b. Specify a region of a geometric shape (e.g., as "___ out of ___ equal parts" when given four or fewer equal parts. c. Represent the unit fractions 1/2, 1/3, and 1/4 with objects, pictures, and symbols.	**Objective 4: Use fractions to communicate parts of the whole.** a. Identify the denominator of a fraction as the number of equal parts in the whole region or set. b. Identify the numerator of a fraction as the number of equal parts being considered. c. Divide *regions* and sets of objects into equal parts using a variety of models and illustrations. d. Name and write a fraction to represent a portion of a unit whole for halves, thirds, fourths, sixths, and eighths. e. Determine which of two fractions is greater using models or illustrations.	**Objective 4: Use fractions to communicate parts of the whole.** a. Divide regions and sets of objects into equal parts using a variety of models and illustrations. b. Name and write a fraction to represent a portion of a unit whole for halves, thirds, fourths, fifths, sixths, eighths, and tenths. c. Relate fractions to decimals that represent tenths. d. Determine which of two fractions is greater using models or illustrations. e. Find equivalent fractions for one-half, one-third, and one-fourth using manipulatives and pictorial representations.	**Objective 4: Use fractions to communicate parts of the whole.** a. Divide regions, sets of objects, and line segments into equal parts using a variety of models and illustrations. b. Name and write a fraction to represent a portion of a unit whole for halves, thirds, fourths, fifths, sixths, eighths, tenths, and twelfths. c. Represent the simplest form of a fraction in various ways (e.g., objects, pictorial representations, symbols). d. Represent mixed numbers and improper fractions in various ways (e.g., rulers, objects, number lines, symbols). e. Rename *whole numbers* as fractions with different denominators (e.g., 5=5/1, 3=6/2, 1=7/7). f. Model and calculate equivalent forms of a fraction and describe the process used.	**Objective 4: Use fractions and percents to communicate parts of the whole.** a. Divide regions, sets of objects, and *line segments* into equal parts using a variety of models and illustrations. b. Name and write a fraction to represent a portion of a unit whole for halves, thirds, fourths, fifths, sixths, eighths, tenths, twelfths, and sixteenths. c. Write a fraction or ratio in simplest form. d. Name equivalent forms for fractions (halves, thirds, fourths, fifths, tenths), ratios, percents, and decimals, including repeating or terminating decimals. e. Relate percents less than 1% or greater than 100% to equivalent fractions, decimals, *whole numbers*, and mixed numbers.

Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade
	Objective 5: Solve whole number problems using addition and subtraction in horizontal and vertical notation. a. Compute addition and subtraction facts to twelve. b. Add three whole numbers with sums to twelve.	**Objective 5: Solve whole number problems using addition and subtraction in vertical and horizontal notation.** a. Use a variety of methods and tools to facilitate computation (e.g., estimation, mental math strategies, paper and pencil, calculator). b. Compute accurately with basic number combinations for addition and subtraction facts to eighteen. c. Add three *whole numbers* with *sums* to eighteen. d. Find the sum of two-digit whole numbers and describe the process used.	**Objective 5: Solve whole number problems using addition, subtraction, multiplication, and division in vertical and horizontal notation.** a. Use a variety of methods and tools to facilitate computation (e.g., estimation, mental math strategies, paper and pencil, calculator). b. Find the sum of any two *addends* with three or fewer digits, including monetary amounts, and describe the process used. c. Find the *difference* of two-digit *whole numbers* and describe the process used. d. Find the *product* for multiplication facts through ten times ten and describe the process used.	**Objective 5: Solve whole number problems using addition, subtraction, multiplication, and division in vertical and horizontal notation.** a. Determine when it is appropriate to use estimation, mental math strategies, paper and pencil, or a calculator. b. Find the sum and difference of four-digit numbers, including monetary amounts, and describe the process used. c. Multiply two- and three-digit *factors* by a one-digit factor and describe the process used. d. Divide a two-digit *whole number dividend* by a one-digit *divisor*, with a *remainder* of zero and describe the process used.	**Objective 5: Solve problems using the four operations with whole numbers, decimals, and fractions.** a. Determine when it is appropriate to use estimation, mental math strategies, paper and pencil, or a calculator. b. Use estimation strategies to determine whether results obtained using a calculator are reasonable. c. Multiply up to a three-digit *whole number* by a one- or two-digit whole number. d. Divide up to a three-digit whole number *dividend* by a one-digit *divisor*. e. Add and subtract decimals with digits to the hundredths place (e.g., 35.42+7.2; 75.2–13.45). f. Add, subtract, and multiply fractions. g. Simplify *expressions*, without *exponents*, using the *order of operations*.	**Objective 5: Solve problems using the four operations with whole numbers, decimals, and fractions.** a. Determine when it is appropriate to use estimation, mental math strategies, paper and pencil, or a calculator. b. Use estimation strategies to determine whether results obtained using a calculator are reasonable. c. Multiply up to a three-digit *factor* by a one- or two-digit factor including decimals. d. Divide up to a three-digit *dividend* by a one- or two-digit *divisor* including decimals. e. Add and subtract decimals to the thousandths place (e.g., 34.567+3.45; 65.3-5.987). f. Add, subtract, multiply, and divide fractions and mixed numbers. g. Solve problems using ratios and proportions. h. Simplify *expressions*, with *exponents*, using the *order of operations*.

Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade
					Objective 6: **Model and illustrate integers.** a. Identify, read, and locate *integers* on a number line. b. Describe situations where integers are used in the students' environment.	**Objective 6:** **Model, illustrate, and perform the operations of addition and subtraction of integers.** a. Recognize that the sum of an *integer* and its opposite is zero. b. Model addition and subtraction of integers using manipulatives and a number line. c. Add and subtract integers.
Standard II: **Students will identify and use patterns to represent mathematical situations.**	**Standard II:** **Students will identify and use patterns and relations to represent mathematical situations.**	**Standard II:** **Students will identify and use patterns and relations to represent mathematical situations.**	**Standard II:** **Students will use patterns and relations to represent mathematical situations.**	**Standard II:** **Students will use patterns and relations to represent mathematical situations.**	**Standard II:** **Students will use patterns and relations to represent and analyze mathematical situations using algebraic symbols.**	**Standard II:** **Students will use patterns, relations, and functions to represent and analyze mathematical situations using algebraic symbols.**
Objective 1: **Identify and sort objects according to common attributes.** a. Sort objects into groups by color, shape, size, number, or other *attributes*. b. Identify which attribute was used to sort objects into a group. c. Find multiple ways to sort and classify a group of objects.	**Objective 1:** **Recognize and represent patterns with one or two attributes.** a. Sort and classify objects by one or two *attributes*. b. Identify, create, and label simple patterns using manipulatives, pictures, and symbolic notation (e.g., ABAB. . ., □ ○ △ □ ○ △ . . .). c. Identify patterns in the environment. d. Identify horizontal and vertical patterns on hundreds charts. e. Use patterns to establish skip counting by twos to 20 and by fives and tens to 100. f. Count backward from 10 to 0 and identify the pattern.	**Objective 1:** **Recognize and represent patterns having multiple attributes.** a. Sort, classify, and label objects by three or more *attributes*. b. Identify and label repeating and *growing patterns* using objects, pictures, and symbolic notation (e.g., ABAABBAAABBB...). c. Identify repeating and growing patterns in the environment. d. Construct models and skip count by twos, threes, fives, and tens and relate to repeated addition.	**Objective 1:** **Recognize and create patterns with given attributes.** a. Create and extend *repeating* and *growing* patterns using objects, numbers, and tables. b. Record results of patterns created using manipulatives, pictures, and numeric representations and describe how they are extended.	**Objective 1:** **Recognize, describe, and use patterns and identify the attributes.** a. Represent and analyze repeating and growing patterns using objects, pictures, numbers, and tables. b. Recognize and extend multiples and other number patterns using a variety of methods.	**Objective 1:** **Recognize, analyze, and use patterns and describe their attributes.** a. Analyze and make predictions about patterns involving *whole numbers*, decimals, and fractions using a variety of tools including organized lists, tables, objects, and variables. b. Extend patterns and describe a rule for predicting the next element.	**Objective 1:** **Recognize, analyze, and use multiple representations of patterns and functions and describe their attributes.** a. Analyze patterns on graphs and tables and write a generalization to predict how the patterns will continue. b. Create tables and graphs to represent given patterns and algebraic *expressions*. c. Draw a graph from a table of values or to represent an equation. d. Write an algebraic expression from a graph or a table of values.

Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade
Objective 2: **Identify and use patterns to describe numbers or objects.** a. Use patterns to count orally from 1 to 20 and backward from 10 to 0. b. Identify simple patterns in the environment. c. Predict what comes next in an established pattern and justify thinking. d. Duplicate, extend, and create simple patterns using objects and pictorial representations.	**Objective 2:** **Recognize and represent relations using mathematical symbols.** a. Recognize that "=" indicates a relationship in which the quantities on each side of an equation are equal. b. Recognize that symbols such as □, △, or ◇ in an addition or subtraction equation represent a missing value that will make the statement true (e.g., □ + 3 = 6, 5 +7 = △, 4 = 5 – ◇). c. Demonstrate that changing the order of *addends* does not change the *sum* (e.g., 3+2=5 and 2+3=5).	**Objective 2:** **Recognize and represent relations using mathematical symbols.** a. Recognize that "≠" indicates a relationship in which the quantities on each side are not of equal value. b. Recognize that symbols such as □, △, or ◇ in an addition or subtraction equation represent a value that will make the statement true (e.g., □ +3=6, 5+7=△, 7=9-◇). c. Demonstrate that changing the order of *addends* does not change the *sum* (e.g., 3+2+7=12, 7+3+2=12) and that changing the grouping of three or more addends does not change the sum (e.g., (2+3)+7=12, 2+(3+7)=12).	**Objective 2:** **Recognize and represent mathematical situations using patterns and symbols.** a. Recognize that symbols such as □, △, or ◇ in an addition, subtraction, or multiplication equation, represent a value that will make the statement true (e.g., 5+7=△, □-3=6, ◇=2x4). b. Solve equations involving equivalent expressions (e.g., 6+4 = □+7). c. Use the >, <, and = symbols to compare two *expressions* involving addition and subtraction (e.g., 4+6 □ 3+2; 3+5 ◇ 16-9). d. Demonstrate that grouping three or more *addends* does not change the *sum* (e.g., 3+(2+7)=12, (7+3)+2=12) and changing the order of *factors* does not change the *product* (e.g., 3x7=21, 7x3=21). e. Use a variety of manipulatives to model the *identity property of addition* (e.g., 3+0=3), the *identity property of multiplication* (e.g., 7x1=7), and the *zero property of multiplication* (e.g., 6x0=0).	**Objective 2:** **Recognize, represent, and solve mathematical situations using patterns and symbols.** a. Solve equations involving equivalent expressions (e.g., 6x2= □x3 or 6x□=9+9). b. Use the <, >, = symbols to compare two expressions involving addition, subtraction, multiplication, and division (e.g., 5x4◇9÷3). c. Recognize that a given variable maintains the same value throughout an equation or expression (e.g., □+□=8; □=4). d. Demonstrate that changing the order of *factors* does not change the *product* (e.g., 2x3=6, 3x2=6) and that the grouping of three or more factors does not change the product (e.g., (2x3)x1=6; 2x(3x1)=6). e. Demonstrate the distribution of multiplication over addition using a rectangular *array* (e.g., 8x14=8 rows of 10 plus 8 rows of 4).	**Objective 2:** **Represent, solve, and analyze mathematical situations using algebraic symbols.** a. Recognize a variety of symbols for multiplication and division including x, •, and * as symbols for multiplication and ÷, ⌐, and a fraction bar (/ or -) as division symbols. b. Recognize that a variable (◇, n, x) represents an unknown quantity. c. Solve one-step equations involving *whole numbers* and a single variable (e.g., n÷7=3). d. Recognize that the answer to a multiplication problem involving a factor of zero is equal to zero (e.g., 0x45=0). e. Use expressions or one-step equations to represent real-world situations. f. Use the *associative*, *commutative*, and *distributive properties* to compute with whole numbers.	**Objective 2:** **Represent, solve, and analyze mathematical situations using algebraic symbols.** a. Recognize that a number in front of a variable indicates multiplication (e.g., 3y means 3 times the quantity y). b. Solve two-step equations involving *whole numbers* and a single variable (e.g., 3x+4=19). c. Recognize that "≈" indicates a relationship in which the quantities on each side are approximately of equal value (e.g., π ≈3.14). d. Recognize that an *exponent* can be represented in the following ways: 4^3 or 4^3. e. Evaluate *expressions* and formulas, substituting given values for the variables (e.g., 2x+4; x=2; therefore, 2(2)+4=8). f. Recognize that if the *product* is zero, then one or more *factors* equal zero (i.e., if ab=0 then either a=0 or b=0 or a and b=0).

Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade
Standard III: **Students will identify and create simple geometric shapes and describe spatial relationships.**	**Standard III:** **Students will describe, identify, and create and simple geometric shapes and describe spatial relationships.**	**Standard III:** **Students will describe, identify, and create geometric shapes and describe spatial relationships.**	**Standard III:** **Students will use spatial reasoning to describe, identify, and create geometric shapes.**	**Standard III:** **Students will use spatial reasoning to recognize, describe, and identify geometric shapes.**	**Standard III:** **Students will use spatial reasoning to recognize, describe, and identify geometric shapes and principles.**	**Standard III:** **Students will use spatial and logical reasoning to recognize, describe, and identify geometric shapes and principles.**
Objective 1: **Identify and create simple geometric shapes.** a. Identify circles, triangles, rectangles, and squares. b. Combine shapes to create *two-dimensional* objects. c. Draw circles, triangles, rectangles, and squares. d. Recognize circles, triangles, rectangles, and squares in the students' environment.	**Objective 1:** **Describe, identify, and create simple geometric shapes.** a. Identify, name, draw, create, and sort circles, triangles, rectangles, and squares. b. Identify circles, triangles, rectangles, and squares in the students' environment. c. Recognize that combining simple geometric shapes can create more complex geometric shapes.	**Objective 1:** **Describe, identify, and create geometric shapes.** a. Identify, name, draw, sort, and compare circles, triangles, and *parallelograms*. b. Identify and name spheres, cones, and cylinders. c. Find and identify familiar geometric shapes in the students' environment. d. Determine whether a circle, triangle, square, or rectangle has a *line of symmetry*.	**Objective 1:** **Describe, identify, and create geometric shapes.** a. Identify and draw *points*, *lines*, *line segments*, and *endpoints*. b. Identify and draw *lines of symmetry* on triangles, squares, circles, and rectangles. c. Determine whether an angle is *right*, *obtuse*, or *acute* by comparing the angle to the corner of a rectangle. d. Classify polygons (e.g., *quadrilaterals*, pentagons, hexagons, octagons) by the number of sides and corners. e. Identify, make, and describe cubes (e.g., a cube has 6 square *faces*, 8 *vertices*, and 12 *edges*).	**Objective 1:** **Describe, identify, and analyze characteristics and properties of geometric shapes.** a. Identify and draw *parallel lines* and *intersecting lines*. b. Identify and draw lines of symmetry on a variety of *polygons*. c. Identify and describe *quadrilaterals* (i.e., rectangles, squares, *rhombuses*, *trapezoids*, kites). d. Identify *right*, *obtuse*, and *acute* angles. e. Compare two polygons to determine whether they are *congruent* or *similar*. f. Identify and describe *cylinders* and *rectangular prisms*.	**Objective 1:** **Describe, identify, and analyze characteristics and properties of geometric shapes.** a. Identify and draw *perpendicular* lines. b. Draw, label, and describe rays and describe an angle as two rays sharing a common endpoint. c. Label an angle as acute, *obtuse*, *right*, or *straight*. d. Identify and describe *equilateral*, *isosceles*, *scalene*, *right*, *acute*, and *obtuse* triangles. e. Identify the *vertex* of an angle or the *vertices* of a polygon. f. Compare *corresponding angles* of two triangles and determine whether the triangles are *similar*. g. Identify and describe *pyramids* and *prisms*.	**Objective 1:** **Identify and analyze characteristics and properties of geometric shapes.** a. Identify the *midpoint* of a *line segment*. b. Identify concave and *convex polygons*. c. Identify the center, *radius*, *diameter*, and *circumference* of a circle. d. Identify the number of *faces*, *edges*, and *vertices* of *pyramids* and *prisms*.

Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade
Objective 2: **Describe simple spatial relationships.** a. Visualize how to fit a shape into a design. b. Use and demonstrate words to describe position with objects (i.e., on, over, under, above, below, top, bottom, up, down, in front of, behind, next to, beside). c. Use and demonstrate words to describe distance with objects (i.e., far, near).	Objective 2: **Describe simple spatial relationships.** a. Use and demonstrate words to describe position (i.e., between, before, after, middle, left, right). b. Use and demonstrate words to describe distance (i.e., closer, farther).	Objective 2: **Describe spatial relationships.** a. Create and use verbal or written instructions to move within the environment. b. Find and name locations using coordinates (A, 1). c. Identify shapes in various orientations (e.g., △ and ▽).	Objective 2: **Describe spatial relationships.** a. Give directions to reach a location. b. Use coordinates (A, 1) or regions to locate positions on a map. c. Demonstrate and use horizontal and vertical lines.	Objective 2: **Specify locations and describe spatial relationships using grids and maps.** a. Locate positions on a map of Utah using coordinates or regions. b. Give the *coordinates* or *regions* of a position on a map of Utah.	Objective 2: **Specify locations and describe spatial relationships using coordinate geometry.** a. Locate points defined by ordered pairs in the first *quadrant*. b. Write an ordered pair for a point in the first quadrant. c. Specify possible paths between locations on a *coordinate grid* and compare distances of the various paths.	Objective 2: **Specify locations and describe spatial relationships using coordinate geometry.** a. Graph points defined by ordered pairs in all four quadrants. b. Write the ordered pair for a point in any quadrant.
			Objective 3: **Visualize and identify geometric shapes after applying transformations.** a. Demonstrate the effect of a slide (translation) or flip (reflection) on a figure, using manipulatives. b. Determine whether two polygons are *congruent* by sliding, flipping, or turning to physically fit one object on top of the other. c. Identify *two-dimensional* shapes (*nets*) that will fold to make a cube. d. Create a *polygon* that results from combining other polygons.	Objective 3: **Visualize and identify geometric shapes after applying transformations.** a. Identify a *slide* (*translation*) or *flip* (*reflection*) on a figure using manipulatives. b. Relate *cubes*, *cylinders*, *cones*, and *rectangular prisms* to the *two-dimensional* shapes (*nets*) from which they were created.	Objective 3: **Visualize and identify geometric shapes after applying transformations.** a. Identify a *slide* (*translation*) or *flip* (*reflection*) on a figure across a line. b. Demonstrate the effect of a *turn* (*rotation*) on a figure using manipulatives. c. Relate *pyramids* and *prisms* to the *two-dimensional* shapes (*nets*) from which they were created.	Objective 3: **Visualize and identify geometric shapes after applying transformations.** a. *Turn* (*rotate*) a shape around a point and identify the location of the new vertices. b. *Slide* (*translate*) a polygon either horizontally or vertically on a coordinate grid and identify the location of the new vertices. c. *Flip* (*reflect*) a shape across either the x- or y-axis and identify the location of the new vertices.

Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade
Standard IV: **Students will understand and use simple measurement tools and techniques.**	Standard IV: **Students will understand and use simple measurement tools and techniques.**	Standard IV: **Students will understand and use measurement tools and techniques.**	Standard IV: **Students will understand and use measurement tools and techniques.**	Standard IV: **Students will understand and use measurement tools and techniques.**	Standard IV: **Students will understand and apply measurement tools and techniques.**	Standard IV: **Students will understand and apply measurement tools and techniques.**
Objective 1: Identify measurable attributes of objects and units of measurement. a. Identify clocks and calendars as tools that measure time. b. Identify a day, week, and month on a calendar. c. Identify pennies, nickels, dimes, and quarters as units of money.	**Objective 1: Identify measurable attributes of objects and units of measurement.** a. Identify the appropriate tools for measuring length, weight, capacity, temperature, and time. b. Identify the values of a penny, nickel, dime, and quarter. c. Estimate the length of an object by comparing to a nonstandard unit (e.g., How many new pencils wide is your desk?).	**Objective 1: Identify measurable attributes of objects and units of measurement.** a. Sequence a series of events of a day in order by time (e.g., breakfast at 7:00, school begins at 9:00). b. Identify the name and value of a penny, nickel, dime, quarter, and dollar. c. Estimate length, *capacity*, and weight using customary units.	**Objective 1: Identify and describe measurable attributes of objects and units of measurement.** a. Recognize the two systems of measurement: *metric* and *customary*. b. Describe the relationship between metric units of length (i.e., centimeter, meter). c. Describe the relationship among customary units of length (i.e., inch, foot, yard) and the relationship between customary units of *capacity* (i.e., cup, quart). d. Estimate length, capacity, and weight using metric and customary units.	**Objective 1: Identify and describe measurable attributes of objects and units of measurement.** a. Describe the relationship among *metric* units of length (i.e., millimeter, centimeter, meter), between metric units of capacity (i.e., milliliter, liter), and between metric units of weight (i.e., gram, kilogram). b. Identify a mile as a measure of distance and its relationship to other *customary* units of length. c. Describe the relationship among customary units of *capacity* (i.e., cup, pint, quart, gallon). d. Estimate length, capacity, and weight using metric and customary units.	**Objective 1: Identify and describe measurable attributes of objects and units of measurement.** a. Describe the relationship among *metric* units of length (i.e., millimeter, centimeter, meter, kilometer). b. Describe the relationship among *customary* units of weight (i.e., ounce, pound). c. Identify the correct units of measurement for *volume*, *area*, and *perimeter* in both metric and customary systems. d. Estimate length, volume, weight, and area using metric and customary units. e. Convert units of measurement within the metric system and convert units of measurement within the customary system.	**Objective 1: Identify and describe measurable attributes of objects and units of measurement.** a. Compare a meter to a yard, a liter to a quart, and a kilometer to a mile. b. Identify *pi* as the ratio of the *circumference* to *diameter* of a circle. c. Explain how the size of the unit used in measuring affects the precision. d. Estimate length, volume, weight, and area using *metric* and customary units.

Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade
Objective 2: Use appropriate techniques and tools to determine measurements. a. Compare two objects (e.g., shorter/longer, heavier/lighter, larger/smaller, more/less). b. Find the length of an object using nonstandard units (e.g., pencils, paper clips). c. Name the days of the week in order. d. Sort pennies, nickels, dimes, and quarters.	**Objective 2: Use appropriate techniques and tools to determine measurements.** a. Compare objects, using nonstandard units, according to their length, weight, or volume (e.g., pencils/length, books/weight, boxes/volume). b. Read and tell time to the nearest hour. c. Name the days of the week, months of the year, and seasons in order. d. Determine the value of a set of the same coins that total 25¢ or less (e.g., a set of 14 pennies equals 14¢, a set of 5 nickels equals 25¢, a set of 2 dimes equals 20¢).	**Objective 2: Use appropriate techniques and tools to determine measurements.** a. Compare and order objects, using nonstandard units, according to their length, weight, or capacity. b. Measure length using inches and feet, weight using pounds, and *capacity* using cups. c. Determine the value of a set of up to five coins that total $1.00 or less (e.g., two quarters and one dime equals 60¢; three dimes, one nickel, and one penny equals 36¢). d. Read, tell, and write time to the hour and half-hour. e. Use a calendar to determine the day of the week and date. f. Determine the *perimeter* of a square, triangle, and rectangle by measuring with nonstandard units.	**Objective 2: Use appropriate techniques and tools to determine measurements.** a. Measure the length of objects to the nearest centimeter, meter, half-inch, foot, and yard. b. Measure *capacity* using cups and quarts, and measure weight using pounds. c. Determine the value of a combination of coins and bills that total $5.00 or less and write the monetary amounts using the dollar sign and decimal notation. d. Identify the number of hours in a day, the number of days in a year, and the number of weeks in a year. e. Read, tell, and write time to the quarter-hour. f. Identify any given day of the month (e.g., the third Wednesday of the month is the 18th). g. Read and record the temperature to the nearest ten degrees using a Fahrenheit thermometer. h. Estimate and measure the *perimeter* and area of rectangles by measuring with nonstandard units.	**Objective 2: Determine measurements using appropriate tools and formulas.** a. Measure the length of objects to the nearest centimeter, meter, quarter-inch, foot, and yard. b. Measure *capacity* using milliliters, liters, cups, pints, quarts, and gallons and measure weight using grams, kilograms, and pounds. c. Read, tell, and write time to the nearest minute, identifying a.m. and p.m. d. Read and record the temperature to the nearest degree, in Fahrenheit, using a thermometer. e. Determine the value of a combination of coins and bills that total $20.00 or less. f. Count back change for a single-item purchase and determine the amount of change to be received from a multiple-item purchase. g. Determine possible *perimeters*, in whole units, for a rectangle with a fixed *area* and determine possible areas when given a rectangle with a fixed perimeter.	**Objective 2: Determine measurements using appropriate tools and formulas.** a. Measure length to the nearest 1/8 of an inch and to the nearest centimeter. b. Measure *volume* and weight using *metric* and *customary* units. c. Measure angles using a protractor. d. Calculate *elapsed time* within a.m. or p.m. time periods. e. Read and record the temperature to the nearest degree (above and below zero) when using a thermometer with a Celsius or Fahrenheit scale. f. Calculate the *perimeter* of rectangles and triangles. g. Calculate the *area* of squares and rectangles using a formula.	**Objective 2: Determine measurements using appropriate tools and formulas.** a. Measure length to the nearest one-sixteenth of an inch and to the nearest millimeter. b. Estimate and measure an angle to the nearest degree. c. Calculate the *circumference* of a circle using a given formula. d. Calculate *elapsed time* across a.m. and p.m. time periods. e. Calculate the *areas* of triangles, rectangles, and *parallelograms* using given formulas. f. Calculate the *surface area* and *volume* of right, rectangular prisms using given formulas.

Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade
Standard V: **Students will collect and draw conclusions from data and understand basic concepts of probability.**	Standard V: **Students will collect and draw conclusions from data and understand basic concepts of probability.**	Standard V: **Students will collect and draw conclusions from data and understand basic concepts of probability.**	Standard V: **Students will collect and organize data to make predictions and identify basic concepts of probability.**	Standard V: **Students will collect and organize data to make predictions and use basic concepts of probability.**	Standard V: **Students will collect, analyze, and draw conclusions from data and apply basic concepts of probability.**	Standard V: **Students will collect, analyze, and draw conclusions from data and apply basic concepts of probability.**
Objective 1: **Collect, organize, and display simple data.** a. Collect, organize, and record data using objects and pictures. b. Represent data in a variety of ways (e.g., graphs made from people, *pictographs*, bar graphs) and interpret the data (e.g., more people like red than blue).	Objective 1: **Collect, organize, and display simple data.** a. Collect physical objects to use as data. b. Collect, represent, and interpret data using tables, tally marks, *pictographs*, and bar graphs.	Objective 1: **Collect, organize, and display simple data.** a. Gather data by vote or survey. b. Sort, classify, and organize data in a variety of ways. c. Use a variety of methods to organize, display, and label information, including keys, using *pictographs*, tallies, bar graphs, and organized tables. d. Report information from a data display.	Objective 1: **Collect, organize, and display data to make predictions.** a. Collect, read, represent, and interpret data using tables, graphs, and charts, including keys (e.g., pictographs, bar graphs). b. Make predictions based on a data display.	Objective 1: **Collect, organize, and display data to make predictions and answer questions.** a. Identify a question that can be answered by collecting data. b. Collect, read, and interpret data from tables, graphs, charts, surveys, and observations. c. Represent data using tables, line plots, line graphs, and bar graphs. d. Identify and distinguish between *clusters* and *outliers* of a data set.	Objective 1: **Formulate and answer questions using statistical methods to compare data.** a. Formulate a question that can be answered by collecting data. b. Collect, compare, and display data using an appropriate format (i.e., *line plots*, bar graphs, pictographs, circle graphs, line graphs). c. Identify minimum and *maximum* values for a set of data. d. Identify or calculate the *mean*, *mode*, and *range*. e. Propose and justify inferences based on data.	Objective 1: **Design investigations to reach conclusions using statistical methods to make inferences based on data.** a. Design investigations to answer questions by collecting and organizing data in a variety of ways (e.g., bar graphs, line graphs, frequency tables, stem and leaf plots). b. Collect, compare, and display data using an appropriate format (i.e., bar graphs, line graphs, *line plots*, circle graphs, scatter plots). c. Compare two similar sets of data on the same graph and compare two graphs representing the same set of data. d. Recognize that changing the scale influences the appearance of a display of data. e. Develop and evaluate inferences and predictions based on data.

Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade
Objective 2: **Determine the likelihood of events.** a. Describe events encountered in books read as possible or not possible. b. Describe events as likely or unlikely (e.g., It is likely to snow today. It is unlikely an elephant will be in school).	**Objective 2:** **Determine the likelihood of an event.** a. Compare events to decide which are more likely, less likely, and equally likely. b. Relate past events to future events (e.g., The sun set about 6:00 last night, so it will set about the same time tonight).	**Objective 2:** **Determine the likelihood of an event.** a. Predict events that will be the same in one day or one week. b. Predict the outcome when there are only two possible outcomes (e.g., tossing a coin).	**Objective 2:** **Identify basic concepts of probability.** a. Describe the results of events using the terms "certain," "equally likely," and "impossible." b. Predict outcomes of simple activities (e.g., a bag contains three red marbles and five blue marbles. If one marble is selected, is it more likely to be red or blue?).	**Objective 2:** **Use basic concepts of probability.** a. Describe the results of investigations involving random outcomes as simple ratios (e.g., 4 out of 9, 4/9). b. Predict outcomes of simple experiments, including with and without replacement, and test the predictions.	**Objective 2:** **Apply basic concepts of probability.** a. Describe the results of investigations involving random outcomes using a variety of notations (e.g., 4 out of 9, 4/9, 4:9). b. Recognize that outcomes of experiments and samples are fractions between 0 and 1. c. Predict the probability of an outcome in a simple experiment.	**Objective 2:** **Apply basic concepts of probability.** a. Write the results of a probability experiment as a fraction, ratio, or percent between zero and one. b. Compare experimental results with anticipated results (e.g., experimental: 7 out of 10 tails; whereas, anticipated 5 out of 10 tails). c. Compare individual, small group, and large group results for a probability experiment.

Facilitated Activities

Getting to Know You Glyph

1. Make your personal glyph by answering the questions and following the instructions.

   A. How did you get here today?
   If you drove by yourself, take a black square.
   If you shared a ride, take a white square.

   B. How many years have you participated in the Elementary CORE Academy?
   If this is your first year, take 1 trapezoid.
   For 2 years participation, take 2 trapezoids.
   For 3 years participation, take 3 trapezoids.

   C. In my spare time I like to do:
   active things (jogging, hiking, gardening, etc.), take 2 hexagons.
   passive things (reading, scrapbooking, etc.), take 1 hexagon.

   D. I am most skilled at teaching:
   literacy, take 1 rhombus.
   content core, take 2 rhombuses.
   math, take 3 rhombuses.

   E. I prefer working:
   by myself, take 1 square.
   with a partner, take 2 squares.
   in a group, take 3 squares.

   F. I have taught 2nd grade for:
   1-5 years, take 1 triangle.
   6-10 years, take 2 triangles.
   11-15 years, take 3 triangles.
   16-20 years, take 4 triangles.
   more than 20 years, take 5 triangles.

2. Arrange your shapes into a design on the square and glue it.

   A. In groups of 6-10 people, get a large sheet of paper and make a bar graph with your glyphs. Remember to label both the vertical and horizontal axes of your graph and give your graph a title!

   B. Write 3-5 summary statements about your group from the data you collected on your graph. These will be used to introduce your group!

   C. Have FUN!

- **This idea can be used at the first of the year to get acquainted with your class by asking questions that you want to know about your students.**

Strategies for Basic-Facts Instruction

Andrew C. Isaacs and William M. Carroll

In a class of beginning second graders, children explained with these typical replies how they solved the number fact 8 + 7: I know 7 + 7 is 14, and 1 more is 15; 8 + 2 makes 10. But 7 has 5 more, so the answer is 15; and I just knew the answer was 15. Teaching basic number facts like 8 + 7 has been a goal of elementary mathematics instruction for more than 100 years and continues to be important today.

Although most teachers agree that students' fact mastery is important, many are unclear about how to seek it in ways that are consistent with the NCTM's Standards (1989, 1991, 1995). They even disagree about what knowing the basic facts means and when, or even if, students should achieve mastery. Is it appropriate to expect first graders to memorize addition facts, or will this task interfere with their mathematical thinking? What classroom practices can build both understanding and quick recall? Can fact mastery be achieved through problem-solving activities, or is practice necessary? If current reforms in mathematics education are to succeed, questions about the basic facts need answers.

Why Should Children Learn the Facts?

Most people recognize that children should learn the basic facts because knowing them is useful, both in school and in life out of school. Estimation and mental computation require the use of basic facts. How can students use 80 x 40 to estimate 84 x 41 if they do not know 8 x 4? Students who know their facts do better in school mathematics. Parents, teachers, and the public expect schools to teach the basic facts.

Fortunately, no conflict need exist between fact mastery and school mathematics reform. Many goals of reform—helping students make connections between school mathematics and the real world, helping students develop conceptual understanding as well as procedural skills, helping students learn to explain their thinking and to understand others' explanations—can be achieved through a program that also leads to fact mastery. Properly approached, the basic facts offer

SOURCE: Teaching Children Mathematics 5 no9 508-15 My '99

excellent opportunities for teaching children to think mathematically.

How Should the Facts Be Taught?

The traditional rote approach to the basic facts, with frequent drill and timed tests, has serious disadvantages. Premature demands for quick performance can induce anxiety and undermine understanding. Rigid schedules for mastery do not accommodate individual differences and have unfortunate outcomes for some children. The rote approach encourages students to believe that mathematics is more memorizing than thinking.

Today, however, the outlines of a better approach are clear. This approach begins with children's natural thinking. The essence of many current reforms in primary-grade mathematics, including the approach to the basic facts described here, is to recognize and build on the wealth of informal mathematical knowledge that children bring to school. Traditionally, much of this knowledge has been ignored or suppressed.

Early work with basic facts should help children refine and extend their natural strategies for solving simple problems. As children increase their proficiency at various strategies, they begin to remember the simplest facts. Knowing the simpler facts makes possible more efficient strategies for harder facts. Gradually, students master more and more efficient strategies and commit more and more facts to memory. At the end of the process, students can accurately and automatically produce all the basic number combinations. Many of these combinations are recalled from memory, but a few may also be found through quickly executed strategies or suitable rules. Fact strategies and recall are used by both children and adults. We know a research mathematician, for example, who solves 8 x 7 by doubling 7 three times—14, 28, 56—but he does the doubling so quickly and effortlessly that it is automatic.

In this section of the article, we describe this strategies approach for the addition and subtraction facts; many of the same ideas also apply to the multiplication and division facts. First we describe how children's informal knowledge, especially their knowledge of counting and of part-whole relationships, can be used in beginning fact work. Then we describe how children use facts that they know to derive facts that they do not know. Finally, we discuss the role of practice and sketch a possible sequence for addition- and subtraction-facts instruction.

Counting to Solve Problems

Perhaps the best way to extend primary-grade children's informal understanding of addition and

- **No conflict need exist between fact mastery and mathematics reform.**

- **To encourage more efficient methods, ask children to share strategies.**

subtraction is by asking them to solve simple problems—without telling them how those problems are to be solved. These problems can come from real life, classroom situations, textbooks, the teacher, or the children's imaginations: An adult movie ticket is $7 and a child's ticket is $4. How much for one adult and one child? Miriam wants a toy horse that costs $15. She has $8. How much more does she need?

As students encounter the problems, they should be encouraged to devise their own solution procedures by looking for patterns, thinking logically, and using manipulatives. The adult approach—reducing such problems to addition or subtraction number sentences and retrieving the answers from memory—is not a natural strategy for young children. Instead, primary-grade children tend to use direct modeling, counting, and derived-fact strategies (Bergeron and Herscovics 1990).

Direct-modeling techniques are generally the first to appear for a given type of problem. The child counts out objects to represent the quantities in a problem, performs actions with the objects that parallel the problem situation, and counts some set to find the answer. To solve the preceding movie-ticket problem, for example, a child might count out seven chips for the cost of the adult's ticket and four chips for the child's ticket. Then by counting all the chips, the child can find the total cost. Direct modeling is used by young students to solve simple addition and subtraction problems and even some surprisingly difficult multiplication and division problems (Carpenter et al. 1993).

Direct modeling can be rather inefficient, however, especially for problems with larger numbers. Eventually, direct-modeling strategies are supplanted by oral or mental counting strategies. A large number of such strategies for addition have been identified (Resnick 1983; Carpenter and Moser 1984; Baroody and Ginsburg 1986; Siegler and Jenkins 1989). Two common strategies are counting all and counting on from the larger addend.

A significant feature of most counting strategies is that the child must keep track of how many numbers have been said. To solve 3 + 4 by counting all, the child first counts three numbers (1, 2, 3) and then four more numbers (4, 5, 6, 7). This double counting can be tricky; using fingers or objects can help. Similar counting strategies exist for subtraction, such as counting up from the smaller number to the larger and counting back from the larger number.

How best to help children advance to more efficient strategies is an open question. Certainly laying out a strict sequence of strategies and expecting all children to adhere to it would be ill-advised. Not only do different children progress at different rates, but the same child may use different strategies on different problems or even on the same problem in different contexts. However, if teachers hesitate too much to demonstrate better methods, students' progress may be impeded.

One approach to encourage more efficient methods is to ask children to share their strategies. This method helps them improve their communication skills and learn from one another. Figure 1, for example, shows how two first graders used a hundreds chart to find 5 + 9. In a typical class, children will use and describe various approaches, so most children will encounter new but understandable techniques. The teacher may also propose and model strategies, taking care that certain strategies do not become official while other strategies are discouraged. The teacher should not be disappointed when a child does not adopt more efficient strategies right away—development may be advancing below the surface at the rate best suited to the child.

Class discussion of strategies should be supplemented with exercises designed to facilitate more sophisticated strategies. For example, the advance from counting all to counting on depends in part on skill in counting ahead the correct number of counts from another number. By practicing counting outside any problem context, children can develop competencies that support more sophisticated problem-solving strategies. A variety of such exercises should be included: counting forward and backward by 1's, starting at various numbers; skip counting, especially by 2's, 5's, and 10's; and counting forward and backward a given number of numbers: Start at 8 and count forward 3 or Start at 11 and count back 2, and so on.

Parts and wholes

Another central understanding that young children bring to school is that a quantity can be broken into parts that taken together equal the original quantity. They also understand that if they have some and get more, then they end up with more; and if they have some and lose some, then they end up with less (Resnick, Lesgold, and Bill 1990). Developing these basic parts and whole ideas further is essential to understanding addition and subtraction.

Ten-frames, like those in figure 2, are good for developing part-whole understandings involving the landmark numbers 5 and 10 (Thompson and Van de Walle 1984; Thornton and Smith 1988; Van de Walle 1994). These understandings are especially useful in addition- and subtraction-fact work. For example, the ten-frame for 8 in figure 2 shows that 8 is 3 more than 5 and also 2 less than 10. The ten-frame for 4 shows that 4 is 1 less than 5 and 6 less than 10. Once students learn facts involving 5 and 10, especially the pairs of numbers that sum to 10, they can use their knowledge to solve other basic-fact problems.

Derived facts

Although most young children do not have automatic command of the basic facts, most adults do. In between is a stage in which some facts are known and others are not. During this stage, many children use the facts that they know to derive the facts that they do not know. Class discussion of such derived-fact strategies helps students learn from their peers and also legitimizes the use of strategies, thus encouraging the invention of further strategies (Steinberg 1985). Class discussion should examine the relative advantages of different strategies for various problems (Thornton and Smith 1988). Encouraging the discussion of multiple solutions enhances strategy and fact knowledge and helps students develop methods for mental and multidigit computation. Instruction to facilitate specific strategies can also be worthwhile.

The doubles facts are often useful for deriving unknown facts. For example, a child might solve 3 + 4 by noting that 3 + 3 = 6, so 3 + 4 must be 1 more than 6. Facts like 8 + 6 can be solved either by sharing (8 + 6 = 7 + 7 = 14) or by using a double and adding 2 more (8 + 6 = 6 + 6 + 2 = 12 + 2 = 14). Since doubles-based strategies are common, care should be taken that children learn the doubles facts early. Many games can be modified so that they involve doubles. For example, games with two dice can be played with one die doubled instead. A chart with examples of addition doubles, such as 6 eggs + 6 eggs = 12 eggs, can be kept as a class project and explored for patterns, for example, all the sums are even. Brief oral drills are also appropriate as children are consolidating their knowledge of these facts.

Many other common strategies involve 10. For example, a child using 10 might solve 9 + 7 in several steps: 9 + 1 = 10 and 10 + 6 = 16, so 9 + (1 + 6) = 16. To support such strategies, early attention should be given to complements of 10, such as 6 + 4, 7 + 3, and so on. The ten-frame activities described previously are ideal.

Children also use derived-fact strategies for subtraction. Some subtraction strategies are refinements in counting, such as using 10 as a bridge in counting up or down. For example, to solve 13 - 6, count up 4 from 6 to 10, and then up 3 more from 10 to 13, for a total counted of 4 + 3 = 7. Other strategies involve using known addition facts to derive unknown subtraction facts: 15 - 8 = 7, since 7 + 8 = 15.

Practice

The place of practice in school mathematics is much disputed. We think that a reasonable position was described by William Brownell more than fifty years ago. Brownell and his student Charlotte Chazal found that under certain conditions, practice can be harmful. Premature demands for speed, for example, caused many children simply to become quicker at immature approaches. Delaying drill was found to result in better understanding and ultimately in less need for drill (Brownell and Chazal 1935). Over the years, unfortunately, some educators have misunderstood this and similar research and have concluded that all practice is bad. We believe that the right conclusion is that premature practice can be detrimental but that properly managed practice is essential in the development of expertise—whether the subject is piano, tennis, or the basic facts (Brownell 1956; Chase and Chi 1981; Siegler 1988; Anderson, Reder, and Simon 1996). Brief, engaging, and purposeful practice distributed over time is usually most effective. Problem solving is one important source for such practice, but games, computers, or even old-fashioned technology like flash cards and choral drills can also be useful.

An instructional sequence

The preceding ideas can be used to sketch a possible instructional sequence for the addition and subtraction facts. Note that in this sequence, the facts are grouped by strategy rather than by sum. A double like 6 + 6, for example, may be easier than a problem like 4 + 3 and, accordingly, appears earlier in this sequence.

1. Basic concepts of addition; direct modeling and counting all for addition
2. The 0 and 1 addition facts; counting on; adding 2
3. Doubles (6 + 6, 8 + 8, etc.)
4. Complements of 10 (9 + 1, 8 + 2, etc.)
5. Basic concepts of subtraction; direct modeling for subtraction
6. Easy subtraction facts (- 0, - 1, and - 2 facts); counting back to subtract
7. Harder addition facts; derived-fact strategies for addition (near doubles, over-10 facts)
8. Counting up to subtract
9. Harder subtraction facts; derived-fact strategies for subtraction (using addition facts, over-10 facts)

How Can Fact Knowledge Be Assessed?

The assessment of children's fact knowledge should be balanced, based on multiple indicators, and aligned with

- **What is meant by fact proficiency differs by age.**

instruction. Assessment should help the teacher evaluate not only answers but also how students are getting those answers and whether students understand the underlying mathematical concepts and connections. For example, a student might appear to know the basic facts during problem-solving activities but actually be relying on counting. Another student might be quite proficient on isolated facts but have a weak grasp of the concepts of the operations. A combination of assessment techniques can clarify each student's strengths and weaknesses and can help the teacher plan instruction.

What is meant by fact proficiency differs by age. For example, the first grader in figure 3 used finger counting, doubles, and recall in answering various facts. These responses show a good range of mathematical understanding and indicate that the student is reasonably proficient in the basic addition facts. By third or fourth grade, however, we would expect all addition facts to be answered quickly by recall or automatic strategies.

Samples of students' work

Collecting samples of student work is a good way to gather evidence about students' knowledge and application of facts. These performance-based samples should come from activities in which students use facts. For example, figure 4 shows a number-collection box in which a second grader recorded different ways of making a target number, in this example, 9. Such exercises help children develop their understanding of addition and subtraction and also afford opportunities for assessing fact knowledge.

Although performance-based samples offer evidence of conceptual understanding and applications, information about students' level of proficiency is often limited. Typically, for example, work samples do not reveal whether the student used counting, derived-fact strategies, or recall. The information is also limited to the particular numbers involved in the sample. Without additional information, a teacher might find it difficult to plan meaningful instruction.

Observations, class discussion, and interviews

Observing students engaged in games and problem-solving activities can yield rich information about their fact knowledge. For example, as students play a game, a teacher may notice whether they are using counting strategies, derived-fact strategies, or known facts. More important, the teacher can get a better idea of the range of students' knowledge with individual facts. Brief observational notes can help with planning individual and whole-class instruction: Tomás is still counting on, even for the easy facts; Juanita knows most of the double facts, and she also uses these facts to solve some of the near doubles. Useful information can also be obtained during class discussions as individuals explain their solutions to story problems or other problem-solving activities.

Short individual interviews are probably the best way to get a full picture of a student's progress with basic facts. Although these interviews are time-consuming, with a little planning a teacher can manage a five-minute interview twice a year with each student, perhaps spacing the interviews over a month. More frequent interviews with students who are having difficulties can help pinpoint problems.

Inventory tests

Although clearly an overreliance on timed tests is more harmful than beneficial (Burns 1995), this fact has sometimes been misinterpreted as meaning that they should never be used. On the contrary, if we wish to assess fact proficiency, time is important. Timed tests also serve the important purpose of communicating to students and parents that basic-fact proficiency is an explicit goal of the mathematics program. However, daily, or even weekly or monthly, timed tests are unnecessary.

An inventory test on all the addition and subtraction facts might be done at the beginning of second and third grades. These tests establish a baseline for measuring progress and provide information that can be useful in planning instruction. End-of-the-year tests, and perhaps mid-year tests, can be used to document progress. Similar inventories for multiplication and division facts might be given in fourth and fifth grades. We recommend against any timed tests during first grade, or any frequent use in the primary grades, because they work against a strategies approach to the facts. That is, in a timed situation, students will be less likely to explore the more sophisticated strategies necessary to make progress.

Small-scale diagnostic tests

Although positive inventory-test results are reassuring, they yield limited information. It may be, for example, that a student is proficient at some facts but uses counting for other facts. For this reason, it is helpful to test smaller sets of facts with short diagnostic tests linked to specific strategies. For example, after students work on the doubles, a quick test of the doubles facts can indicate whether students are ready to move on. As students move toward proficiency, short tests of mixed fact strategies—doubles, near doubles, and complements of 10—can also be useful for diagnostic purposes. A three-second rule is often used as a benchmark of automaticity (Van de Walle 1994), although some teachers prefer two seconds (Thornton 1990). Note that these criteria allow enough time for students to use efficient strategies or rules for some facts.

If we expect students to move from counting strategies toward facility with facts, then an occasional low-stress test or practice is consistent with our goals and the message that we want students to receive. The crucial point is to emphasize individual progress. In kindergarten and first grade, counting strategies are appropriate for solving the basic addition facts, but we should have concerns about students who are still counting all in the middle of second grade or who have not mastered even the easiest addition facts. Not diagnosing these students' difficulties and planning appropriate instruction for them does them a disservice. A balanced approach to assessment—work samples, some observations, some test information, and some interview information—gives the teacher, the student, and the parent a more complete portrait of the child's fact knowledge, how it is connected to other mathematical knowledge, and what progress is being made.

Conclusion

A strategies-based approach to the basic facts has several advantages. First of all, it works: children do learn their facts. Rathmell (1978) found that teaching children thinking strategies facilitates their learning and retention of basic facts. More recent studies have confirmed this effect again and again. These findings should not be surprising: a strategies approach helps students organize the facts in a meaningful network so that they are more easily remembered and accessed. Further, although many facts become automatic, adults also use strategies and rules for certain facts. Many strategies, such as properties of the multiples of 9, both support facts and supply links to other mathematical concepts, such as divisibility. Many researchers have recommended strategies-based approaches for learning the basic facts, including Thornton (1978, 1990), Cook and Dossey (1982), Myren (1996), and Chambers (1996).

A strategies-based approach also builds students' understanding and confidence. De-emphasizing rote memorization encourages students to use their common sense in mathematics, thus supporting concept development. International research confirms that early fact automaticity and problem solving are not discrepant goals (Fuson, Stigler, and Bartsch 1988; Stigler, Lee, and Stevenson 1990). The cost in instructional time is also low: delayed practice often means less practice. Children's success at learning their facts also reassures parents about their children's mathematics program.

Certain pitfalls must be avoided in a strategies-based approach. One danger is that children might learn strategies by rote, so that mindless memorization is replaced by equally mindless strategies (Cobb 1985). Another possibility is that class discussion might degenerate into the tedious recitation of every imaginable method, with little critical appraisal of the various approaches. Encouraging multiple ways to solve fact problems may also lead students to conclude that memorizing the facts is not important. We believe, however, that in most situations a thoughtful and sensitive teacher can avoid these hazards.

Our purpose has been to address important questions about the basic facts, for fear that neglecting them will undermine reforms now under way. We worry that our efforts to correct for a narrow focus on lower-level skills will lead to an overcorrection. We recall Brownell's warning at the beginning of the New Math era: In objecting to the emphasis on drill prevalent not so long ago, we may have failed to point out that practice for proficiency in skills has its place too (1956). We must remember that successful education involves both basic skills and higher-order processes.

References

Anderson, John R., Lynne M. Reder, and Herbert A. Simon. "Situated Learning and Education." *Educational Researcher* 25 (May 1996): 5-11.

Baroody, Arthur J., and Herbert P. Ginsburg. "The Relationship between Initial Meaning and Mechanical Knowledge of Arithmetic." *Conceptual and Procedural Knowledge: The Case of Mathematics*, edited by James Hiebert. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1986.

Bergeron, Jacques C., and Nicolas Herscovics. "Psychological Aspects of Learning Early Arithmetic." *In Mathematics and Cognition: A Research Synthesis by the International Group for the Psychology of Mathematics Education*, edited by Pearla Nesher and Jeremy Kilpatrick. Cambridge: Cambridge University Press, 1990.

Brownell, William A. "Meaning and Skill—Maintaining the Balance." *Arithmetic Teacher* 3 (October 1956): 129-36. Reprinted in *Arithmetic Teacher* 34 (April 1987): 18-25.

Brownell, William A., and Charlotte B. Chazal. "The Effects of Premature Drill in Third-Grade Arithmetic." *Journal of Educational Research* 29 (September 1935): 17-28.

Burns, Marilyn. "In My Opinion: Timed Tests." *Teaching Children Mathematics* 1 (March 1995): 408-9.

- **Andy Isaacs, aisaacs@uchicago.edu, works for the University of Chicago School Mathematics Project (UCSMP). His interests include elementary teacher education and writing and implementing reform mathematics curricula.**
- **Bill Carroll, will@cicero.spc.uchicago.edu, teaches at Saint Ignatius Preparatory School in Chicago, Illinois. From 1991 to 1997, he directed the evaluation of UCSMP's Everyday Mathematics curriculum.**

Carpenter, Thomas P., and James M. Moser. “The Acquisition of Addition and Subtraction Concepts in Grades One through Three.” *Journal for Research in Mathematics Education* 15 (May 1984): 179-202.

Carpenter, Thomas P., Ellen Ansell, Megan L. Franke, Elizabeth Fennema, and Linda Weisbeck. “Models of Problem Solving: A Study of Kindergarten Children’s Problem-Solving Processes.” *Journal for Research in Mathematics Education* 24 (November 1993): 428-41.

Chambers, Donald L. Direct “Modeling and Invented Procedures: Building on Children’s Informal Strategies.” *Teaching Children Mathematics* 3 (October 1996): 92-95.

Chase, William G., and Michelene T. H. Chi. “Cognitive Skill: Implications for Spatial Skill in Large-Scale Environments.” *In Cognition, Social Behavior, and the Environment*, edited by John H. Harvey. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1981.

Cobb, Paul. “Critique: A Reaction to Three Early Number Papers.” *Journal for Research in Mathematics Education* 16 (March 1985): 141-45.

Cook, Cathy J., and John A. Dossey. “Basic Fact Thinking Strategies for Multiplication—Revisited.” *Journal for Research in Mathematics Education* 13 (May 1982): 163-71.

Fuson, Karen C., James W. Stigler, and Karen Bartsch. “Grade Placement of Addition and Subtraction Topics in Japan, Mainland China, the Soviet Union, Taiwan, and the United States.” *Journal for Research in Mathematics Education* 19 (November 1988): 449-56.

Myren, Christina L. “Encouraging Young Children to Solve Problems Independently.” *Teaching Children Mathematics* 3 (October 1996): 72-76.

National Council of Teachers of Mathematics (NCTM). *Curriculum and Evaluation Standards for School Mathematics*. Reston, Va.: NCTM, 1989.

National Council of Teachers of Mathematics (NCTM). *Professional Standards for Teaching Mathematics*. Reston, Va.: NCTM, 1991.

National Council of Teachers of Mathematics (NCTM). *Assessment Standards for School Mathematics*. Reston, Va.: NCTM, 1995.

Rathmell, Edward C. "Using Thinking Strategies to Teach the Basic Facts." *In Developing Computational Skills, 1978 Yearbook of the National Council of Teachers of Mathematics*, edited by Marilyn N. Suydam and Robert E. Reys, 13-38. Reston, Va.: NCTM, 1978.

Resnick, Lauren B. A "Developmental Theory of Number Understanding." *In The Development of Mathematical Thinking*, edited by Herbert P. Ginsburg. New York: Academic Press, 1983.

Resnick, Lauren B., Sharon Lesgold, and Victoria Bill. "From Protoquantities to Number Sense." Paper presented at the Psychology of Mathematics Education Conference, Mexico City, 1990.

Siegler, Robert S. "Individual Differences in Strategy Choices: Good Students, Not-So-Good Students, and Perfectionists." *Child Development* 59 (August 1988): 833-51.

Siegler, Robert S., and Eric Jenkins. *How Children Discover New Strategies*. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1989.

Steinberg, Ruth M. Instruction on "Derived Facts Strategies in Addition and Subtraction." *Journal for Research in Mathematics Education* 16 (November 1985): 337-55.

Stigler, James W., Shin-Ying Lee, and Harold W. Stevenson. *Mathematical Knowledge: Mathematical Knowledge of Chinese, Japanese, and American Elementary School Children*. Reston, Va.: National Council of Teachers of Mathematics, 1990.

Thompson, Charles S., and John Van de Walle. "Let's Do It: Modeling Subtraction Situations." *Arithmetic Teacher* 32 (October 1984): 8-12.

Thornton, Carol A. "Emphasizing Thinking Strategies in Basic Fact Instruction." *Journal for Research in Mathematics Education* 9 (May 1978): 214-27.

Thornton, Carol A. "Strategies for the Basic Facts." *In Mathematics for the Young Child*, edited by Joseph N. Payne, 133-51. Reston, Va.: National Council of Teachers of Mathematics, 1990.

Thornton, Carol A., and Paula J. Smith. A"ction Research: Strategies for Learning Subtraction Facts." *Arithmetic Teacher* 35 (April 1988): 8-12.

Van de Walle, John. *Elementary School Mathematics: Teaching Developmentally*. White Plains, N.Y.: Longman, 1994.

Figure 1

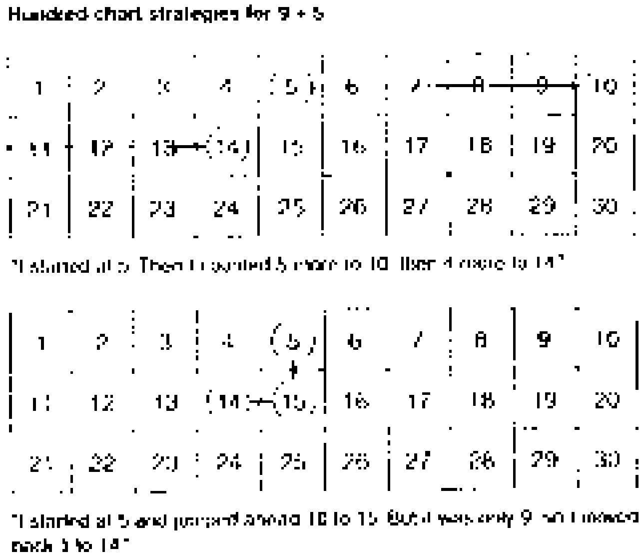


Figure 2

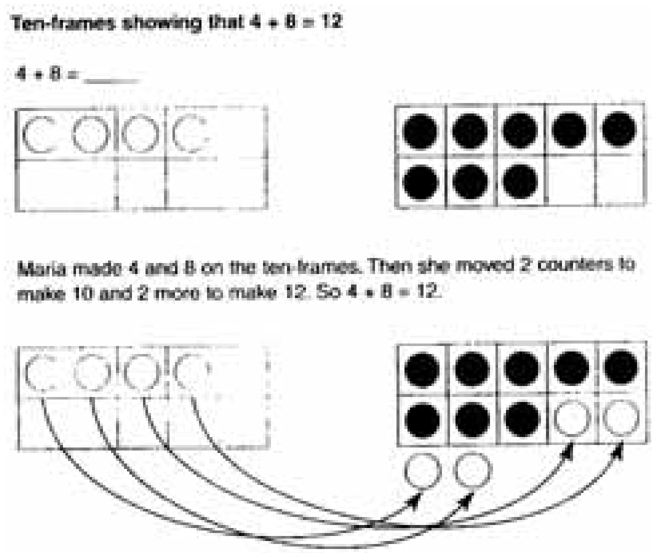


Figure 3

A REASONABLY PROFICIENT FIRST-GRADE STUDENT

Student: [Student reads] Three plus five equals .... Hm. [Pause] Three. [Student then counts on fingers, putting up five fingers at one time.] Four, five six, seven, eight. Eight.

Teacher: How did you figure that out?

Student: I did it on my fingers. [Child is shown card with 5 + 5 on it.]

Student: [Rapidly] Five plus five equals ten.

Teacher: How did you get that?

Student: I figured it out in my mind.

Teacher: You always knew it? [Student indicates yes.] Okay, what’s six plus six?

Student: [Fairly rapidly] Thirteen.

Teacher: How did you get that?

Student: Because I counted five and then added two more: five plus five and two more.

Teacher: And you got what, thirteen?

Student: Yeah. [Child reads next problem] Seven plus nine equals.... [Pause. Then child begins to count on fingers. First, child apparently begins to count all—to seven on one hand. Then starts over, saying seven and starting over on fingers, putting up nine fingers one at a time.] Eight, nine, ten, ..., sixteen. Sixteen.

Teacher: Sixteen. Okay, so here’s another one. If seven plus nine is sixteen, what’s nine plus seven?

Student: [Two seconds, then child responds with enthusiasm.] Sixteen!

Teacher: How do you know that?

Student: It doesn’t matter which one’s first. But they’re always, ... they’re just always like, ... no matter what is first, they’re always the same number.

Teacher: Here’s another one. Four plus ten.

Student: [Quickly] Four plus ten is fourteen.

Teacher: How did you get that?

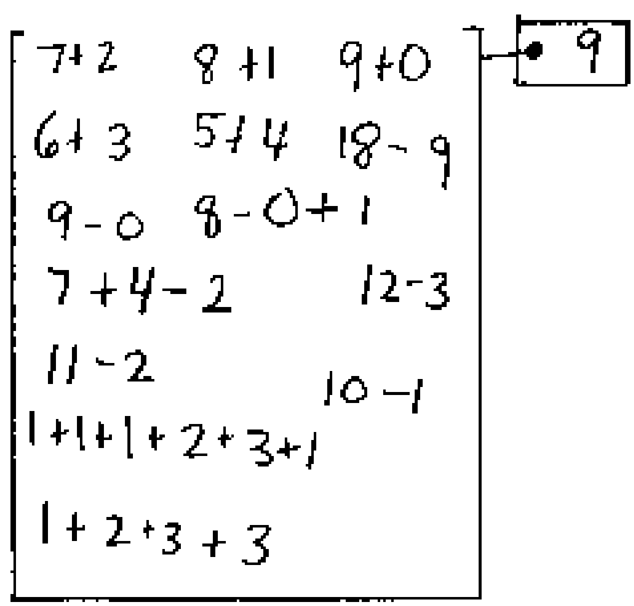
Student: Well, I just figured it out.

Teacher: On your fingers.

Student: No. I thought.

Figure 4

“Number-collection box” for 9



Skunk

Instructional Procedures

1. Teacher rolls the dice and everyone keeps track of the total of the numbers rolled.
2. Players may continue to play as long as they want. Or, they may quit at any time. If a player chooses to quit, s/he keeps all the points accumulated to that point and records the total under one of the letters.
3. If a seven is rolled, players still playing lose ALL the points for that turn and must record a 0 under one of the letters. Play then goes to the next letter.
4. The player with the most points at the end of five turns wins the game.

You will need:

- **1 pair of overhead dice**
- **1 sheet of paper per person with S K U N K written on it**
- **1 pair of dice per group**

Piggy—A Variation of Skunk

You will need:

- **2-4 players**
- **1 pair of dice**

Instructional Procedures

1. Players take turns rolling the dice and keeping a total of the numbers rolled.
2. Players may continue to roll as long as they want. They may quit at any time. If a player chooses to quit, s/he keeps all the points accumulated to that point and records the total. Play then goes to the next player.
3. If a player rolls a seven, s/he loses all points for that turn. Play then goes to the next player.
4. The first player to get 100 or more points is the winner.

Game may be played one of two ways:

1. Both players play off the numbers that are rolled.
2. The person rolling the dice accumulates points.

Partner—Fact Practice

Instructional Procedures

1. Divide students into partners.
2. Partners face each other with hands behind their backs.
3. On the count of three, each player extends any number of fingers on one or both hands.
4. The first person to accurately add up the total number of fingers extended on all hands says the answer.
5. Repeat.

(Teaches the influence of peer pressure. When you know what you are going to do, it makes it easier to respond when someone asks you to do something.)

High Sums

You will need:

- **2 players**
- **Deck of cards with 4 of each numeral 0-9**

Instructional Procedures

1. Deal each player an equal number of cards in a stack, face down.
2. At the exact same time, both players turn their top two cards face up and find the sum of the two cards.
3. The player with the greater sum keeps all four cards OR if a player cannot figure out the sum of the two cards, that player forfeits his/her cards to the other player.
4. If the sums are equal, the challenge begins. Each player puts three more cards on top of the cards that created the challenge. The first card is placed face down. The second and third cards are placed face up and added together.
5. Players compare the sums of the last two cards. The player who has the sum with the greater value keeps all ten cards.
6. When all the cards have been played, one of the players selects just one card from the deck. If the number on the card is even, the player with the most cards wins. If the number on the card is odd, the player with the lesser number of cards wins!

Addition Compare

Instructional Procedures

1. Each player prepares a playing space:

   $$\square + \square \quad < \quad \square + \square$$

2. Four cards are drawn at random, one at a time. After each draw, the players write the digit in any one of the empty boxes on his/her playing space. The goal is to make the statement true for the sum of the numbers.
3. After four cards have been drawn, each player who has a true statement scores one point.
4. Whoever scores ten points first, is the winner.

Variation: The game may be played by just comparing two or three digit numbers without adding them. The game board would just have two or three boxes with an inequality sign between them. Can be played with less than or greater than.

You will need:

- **2 players**
- **2 sets of 10 cards numbered with the digits 0-9**
- **Paper for each player**

Dice Sums

Instructional Procedures

On the bottom of a piece of paper, draw a number line beginning with the number two and ending with the number 12. Roll two dice. Mark an X above the sum that is rolled—making a line plot with your data. Keep rolling the dice until one sum is rolled 12 times. Have the students predict which sum will finish first on a class chart. Record the sum that finishes first on the class chart. How close was their prediction?

Possible Extensions/Adaptations/Integration

- After the students have played the game for awhile, let them change their prediction and tell why they wanted to change. This will give you some indication how much they understand about probability.
- Have the students try to figure out why one number comes up more often than the others with a pair of dice.
- Use decahedron dice. This will help your students practice all the facts 0-9!
- Explore the probability of the new combinations of numbers.

The Birthday Guess

Instructions

Show each *Birthday Guess Sheet* (p. 2-24) to the participating student and ask if the date of his/her birthday is on the sheet. S/he may respond "YES" or "NO." If the response is "YES," add the number in the upper left hand corner. You will add the numbers in the upper left hand corner of any sheet for which the response is "YES." This will give you the date of the student's birthday.

Birthday Guess Sheet

A

1	17
3	19
5	21
7	23
9	25
11	27
13	29
15	31

B

2	18
3	19
6	22
7	23
10	26
11	27
14	30
15	31

C

4	20
5	21
6	22
7	23
12	28
13	29
14	30
15	31

D

8	24
9	25
10	26
11	27
12	28
13	29
14	30
15	31

E

16	24
17	25
18	26
19	27
20	28
21	29
22	30
23	31

Categories Chart

	Animals	Weather Words	Rock Descriptions	Things on a Map/Globe
M				
S				
R				
T				
P				

It's About Choices

RAFT

1. The teacher assigns a RAFT task to each student based on interest and/or learning profile.
2. Students work alone to complete their task.
3. Students review one another's work and make suggestions for improvement.
4. When changes are made, the teacher checks each student's work for accuracy and quality.
5. When students are ready, the teacher forms groups of students, making sure each RAFT role is represented in each group.
6. After completing the RAFT, students meet in teacher-assigned table groups of 6.
7. Each group has a leader or guide.
8. Students share their RAFT work.
9. Using accompanying rubric, students evaluate their work.

Rubric

4 = I did it all

3 = I did most of it, but not all of it

2 = I didn't do most of it, but I did some

1 = I didn't do any of it

_____ I learned that I needed to act in my role.

_____ I understood who my audience was going to be.

_____ I made a product in the correct format.

_____ I used the topic I was assigned.

_____ I did my personal best.

RAFT Chart

Role	Audience	Format	Topic
Sun	puddle	letter	“How Dry I Am”
Cloud	snow	song or poem	“It’s Freezing In Here”
Wind	thermometer	chart	“You Blow Me Away”
Thermometer	2nd grade students	graph	“Life is Full of Ups and Downs”
Rain	plants	ad	“Raindrops Keep Falling on my Head”
Snow	animals	2 riddles	“Bundle Up”
Storm	rainbow	picture	“You’d Be Lost Without Me”

Role	Audience	Format	Topic

Tic-Tac-Toe

Create a game for others to play to learn about the life cycle of an insect.	**Teach** a lesson about the life cycle of an oak tree to our class.	**Compare** two groups of animals like mammals and birds. Tell ways they are the same and ways they are different.
Draw or trace pictures of an animal's life cycle on transparencies. Tell the class about your pictures.	**Graph** the kinds of animals you have learned about to show how many or how few of each kind.	**Demonstrate** how the class could learn about a plant's life cycle.
Survey everyone in the class to find the type of animal they like best.	**Design** a diorama or display of the environment where a specific animal would live.	**Choose** a make-believe story about an animal and write about the same type of real animal and its real life.

Tic-Tac-Toe

Create	**Teach**	**Compare**
Draw	**Graph**	**Demonstrate**
Survey	**Design**	**Choose**

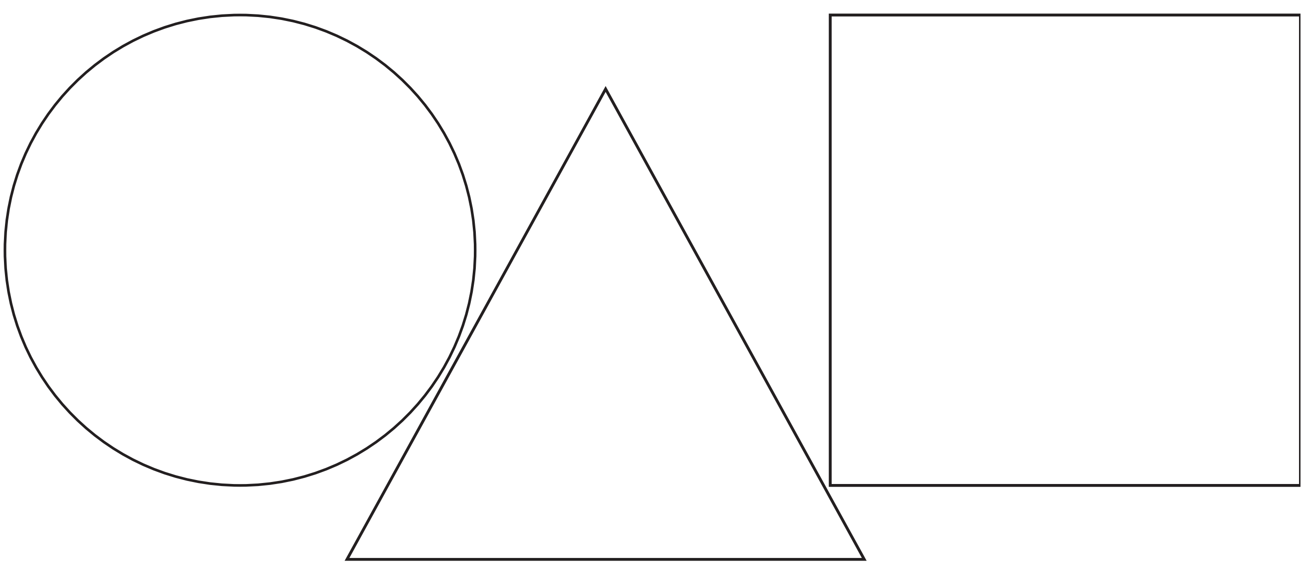
Tic-Tac-Toe

Name ____________________________________

My Choices

- Look at the *My Choices Shapes* page (p. 2-37). Pick one circle activity, one triangle activity and one square activity.
- Cut and glue the jobs you plan to do on the blank shapes they match at the bottom of this page.
- Ask the teacher to help you find a partner for your square activity.

Glue choices here.



My Choices Shapes

Draw a map of the classroom. Include a compass rose. Tell about your map.

Use a world map or globe to locate the continents. Write a list of continent names.

Work with a classmate to complete a map of Utah that shows some mountains, lakes, rivers, and 3–4 big cities.

Create a map key or legend for the classroom. Include as many features from the classroom as you can. Include a map. Label the map.

Use a world map or globe to locate 4 oceans. Write the ocean names and tell a continent to the west or east.

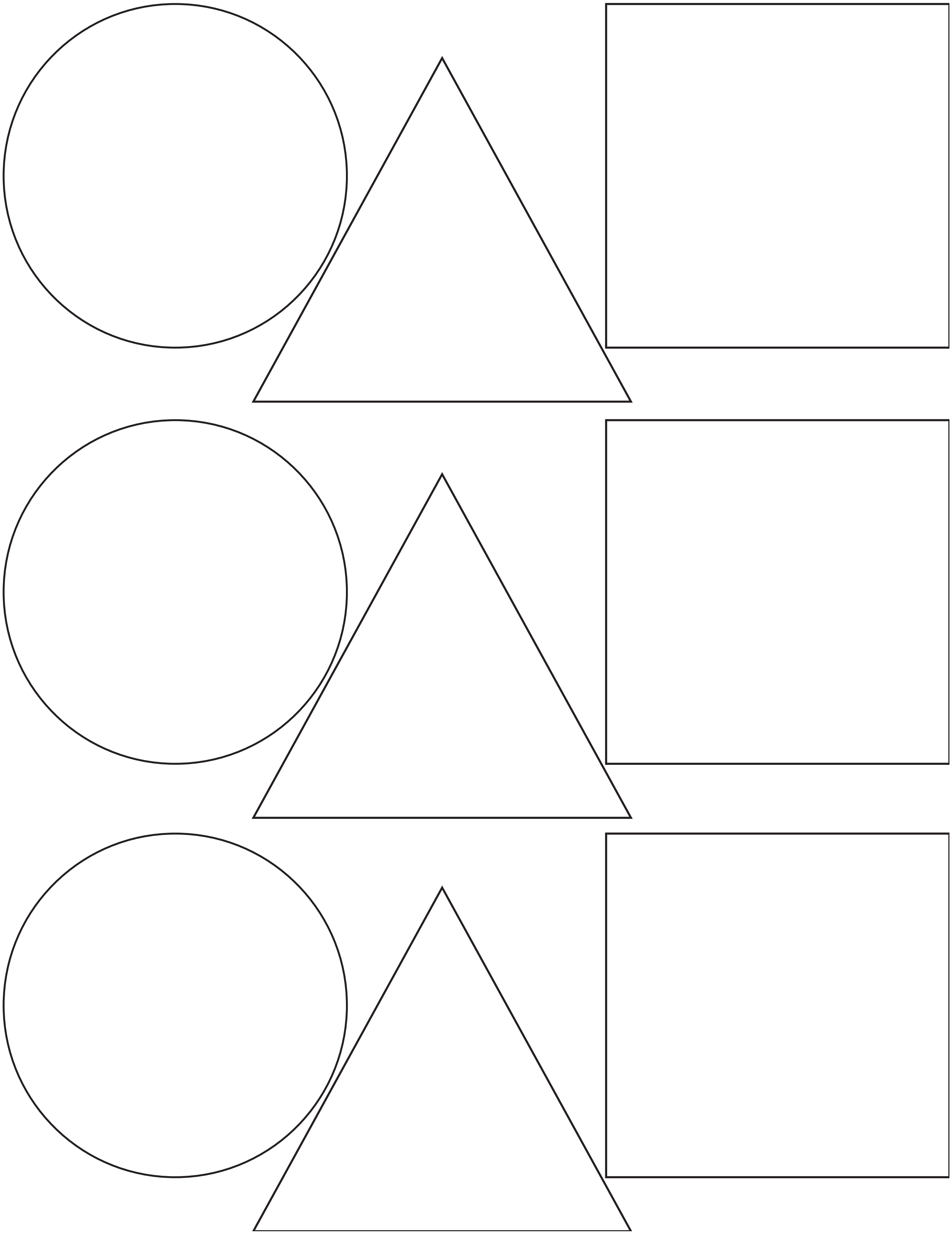
Work with a classmate to complete a map of the U.S. A. that shows 3 mountain ranges, 6 lakes, 3 rivers, and 10 capitol cities.

Write the directions to your classroom from the entrance of the school. Draw a map of the school. Label the map.

Learn and sing "Earth Song" about the 7 continents and 4 oceans. Add a verse.

Work with a classmate to complete a world map. Include all oceans and continents. Add 10 countries and 5 more map details of your choice.

My Choices Shapes



Name________________________________

What Do You Want to Learn About Rocks?

Parents: Please assist your child in completing this survey.

These are some topics we will be studying in our unit on Rocks. We want to know what you want to learn about. Number your choices from 1 to 5. Make sure that 1 is your favorite and 5 is your least favorite.

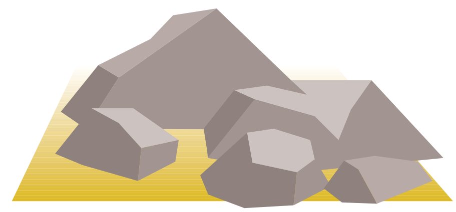
______ seeing rock collections

______ uses for rocks

______ creating things with rocks

______ rock formations

______ rock stories



What can you tell us about rocks?
(Parents write as your child dictates an answer, please use child's exact words.)

1. What are rocks made from?

2. Tell something that looks different in different rocks.

3. What can you do with rocks?

4. Where do rocks come from?

5. How can you use a rock to make artwork?

Rock Science Rubric for: ___________________________

3 Student understands and can explain or demonstrate skill or concept completely.
2 Student somewhat understands and explains or demonstrates skill or concept.
1 Student does not understand or demonstrate skill or concept.

Name is on papers		Locates information about rocks in a book	
Locates a rock outside and brings to class.		Uses materials appropriately	
Develops 3 or more groups in which to sort rocks		Creates artwork on rock	
Identifies 5 or more things around the school made from/with rock		Arranges rocks in a variety of groupings and can explain differences	
Predicts locations to find rocks		Explains possible reasons that rocks may change	
Explains why some rocks are used in certain ways		Experiments with models representing rock groups	
Illustrates & explains rock sample.		Shares materials with group	
Specifies 5 or more uses for rocks		Discusses science activities with group or class	

The Integrated Curriculum in Elementary Classrooms: A Research Base

Curriculum developed through the integrated approach reflects the real world and engages the learner's body, mind, feelings, senses, and intuition in learning experiences. Grounded in developmental brain research and information processing theories, the integrated approach develops skills needed to function in an information-rich world (Shoemaker, 1989).

In sum, research on the integrated approach to curriculum development suggests positive effects on student achievement, ability to make connections across disciplines, and attitudes toward learning. Following is an overview of some research findings.

Achievement Gains

- Students demonstrated increased understanding of science concepts (Romance & Vitale, 2001).
- Achievement gains were observed in the areas of conceptual learning and text comprehension (Guthrie et al., 1999).
- Students showed gains in their ability to use higher-order thinking strategies including: comprehending informational texts, searching multiple texts, representing knowledge, transferring concepts, and interpreting narrative (Guthrie et al., 1996).
- Students showed gains in ability to write about realistic situations embedded in the integrated approach to curriculum development (Hillary, 1996).

Connections

- Students made increased connections across disciplines (Boidy & Moran, 1994; Roth et al., 1992).
- Students demonstrated the ability to transfer learning across subjects and to apply learning to real life (Boidy & Moran, 1994).

Attitudes

- The classroom climate was more positive and students and teachers demonstrated increased enjoyment of learning (Fuller, 2001).
- Students demonstrated more positive attitudes and self-confidence toward both science and reading (Romance & Vitale, 2001).
- Increase in higher-order thinking strategies correlated with increase in intrinsic motivation for literacy experiences (Guthrie et al., 1996).

Several articles describe integrated curriculum projects and some references (research and non-research) are listed below. The last two articles listed describe school-wide or district-wide reform projects where the integrated curriculum was implemented.

Cooper, J., & Dever, M. T. (2001). Socio-dramatic play as a vehicle for curriculum integration in first grade. *Young Children 56*(3), 58-63.

Dever, M. T., Barta, J. J., & Falconer, R. (1999). Project Boxes: A curriculum development innovation for achieving developmentally appropriate practice in the primary grades. *The NALS Journal, 23*(1), 16-20.

Dever, M. T., & Hobbs, D. E. (1998). The learning spiral: Taking the lead from how children learn. *Childhood Education, 75*(1), 7-11.

Hoewisch, A. (2001). Creating well-rounded curricula with *Flat Stanley*: A school-university project. *The Reading Teacher, 55*(2), 154-168.

Grisham, D. L. (1995). Integrating the curriculum: The case of an award-winning elementary school. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA, April 17-22.

Santa, C. M. (1995). Improving the literacy program: A journey toward integrated curriculum. *Literacy improvement series for elementary educators*. Northwest Regional educational Lab., Portland, OR.

References

Boidy, T., & Moran, M. (1994). Improving students' transfer of learning among subject areas through the use of an integrated curriculum and alternative assessment. Dissertation, St. Xavier University.

Fuller, J. L. (2001). An integrated hands-on inquiry based cooperative learning approach: The impact of the PALMS approach on student growth. Paper presented at the Annual Meeting of the American Educational Research Association, Seattle, WA. April 10-14.

Guthrie, J. T., Anderson, E., Alao. S., & Rinehart, J. (1999). Influences of concept-oriented reading instruction on strategy use and conceptual learning from text. *Elementary School Journal, 99*(4), 344-366.

Guthrie, J. T., Meter, P.V., McCann, A .D., Wigfield, A., Bennett, L., Poundstone, C. C., Rice, M. E., Faibisch, F. M., Hunt, B., Mitchell, A. M. (1996). Growth of literacy engagement: Changes in motivation and strategies during concept-oriented reading instruction. Reading Research Report No. 3. *The National Reading Research Center*, University of Georgia and University of Maryland.

Hillary, K. (1996). Improving third and fourth grade student writing through the use of integrated curriculum. Dissertation, Nova Southeastern University.

Romance, N. R. & Vitale, M. R. (2001). Research Report: Implementing an in-depth expanded science model in elementary schools: Multi-year findings, research issues, and policy implications. *International Journal of Science Education, 23*(4), 373-404.

Roth, K. J., Peasley, K., Hazelwood, C. (1992). Integration from the student perspective: Constructing meaning in science. The Center for the Learning and Teaching of elementary Subjects. Michigan State University. ED 354 097.

Shoemaker, B. J. E. (1989). Integrative Education: A curriculum for the twenty-first century. *OSSC Bulletin, 33*(2). ED 311 602.

Implementation Plan

3 ideas I plan to implement in my classroom as soon as possible:

1. ______________________________

2. ______________________________

3. ______________________________

2 ideas I am considering implementing in my classroom:

1. ______________________________

2. ______________________________

1 idea that I really want to learn more about:

1. ______________________________

Helpful Hints for Supporting All Learners

The following information is provided as a resource for teachers as they work with the diverse learners they encounter in their classrooms. Most ideas presented are for use in any content area and at any grade level, including the K-2 Content, Math, and Science Core curricula that are the focus of the 2004 Elementary CORE Academy.

Common barriers to learning and ways to overcome those barriers are presented, as well as the basic fundamentals of differentiating instruction. Also included is a checklist for highlighting appropriate student-specific adaptations and modifications designed to help struggling students, including the gifted.

There is also a chart that describes weaknesses in cognitive processes that could explain why a student struggles with particular reading or other academic skills. This information should be provided through formalized assessment.

For more information, please contact curriculum or special education specialists at the Utah State Office of Education or the specialists at the Utah Personnel Development Center.

- **Barriers Students Face**
- **Engaging All Learners**
- **Adaptation/ Modification Checklist**
- **Why Students Struggle in the Classroom**

Barriers Students Face

1. Barriers exist that encumber the path to academic achievement for students.
2. The way to get around the barriers is by employing effective instructional practices that utilize differentiation strategies.
3. Two elements of a learning setting can be points of differentiation.
   a. Person—learner
      These characteristics are out of the control of the teacher, but can be positively influenced by differentiation.
      - *Learning Preference* (style or strength)
      - *Learning Ability* (enhanced or impaired)

   b. Process—instruction
      These practices during the instructional cycle are within the control of the teacher and can positively influence student achievement.
      - *Input* (instructional delivery)
      - *Output* (demonstration of learning)

Common Barriers

PERSON—Student	What to do about it	PROCESS—Instruction	What to do about it
Limited language skills	Pre-teach critical or potentially troublesome vocabulary. Provide visual or kinesthetic cues.	**Unclear directions and expectations**	Reduce instructional clutter. Provide simple clear directions. Teach and maintain consistent routines.
Trouble maintaining attention	Provide short, intense learning sessions, vary tasks, break down complex tasks.	**Over-reliance on worksheets/bookwork**	Provide explicit instruction, examples, and relevant practice. Provide adequate guided practice.
Inadequate mastery of prerequisite skills	Provide experience or background knowledge Do not assume anything.	**Inadequate Guided Practice during lesson sequence**	Continue with guided practice until 90% of your students are performing skill at 80%-90% or better.
Inefficient processing skills	Allow think time, provide physical cue to respond, rehearse responses, use simple vocabulary, check for understanding, give one direction at a time, wait time.	**Use of abstract examples**	Use clear, easily recognizable examples during initial phases of instruction. Use visual, auditory, and kinesthetic representations. Relate to real-life.
Impaired academic learning ability	Make tasks less complex, reduce amount of content to be leaned, relate to real-life experience of student.	**Only one option for students to demonstrate learning**	Provide more than one way for students to show what they know. Same criteria, demonstration is different.
Advanced academic learning ability	Make tasks more complex. Increase amount of content to be learned.	**Inappropriate use of homework**	Homework is review, not new learning. Do not use as busy work. Provide feedback.

Engaging All Learners

Hints for Differentiating Instruction

1. **INPUT—instruction**

   Visual Learners—use pictures, videos, diagrams, maps, guided notes, flow charts, demonstration, flash cards, study cards

   Auditory Learners—use lecture, telling, discussion, audio tracks, read aloud, debate, listen to news reports

   Kinesthetic Learners—use underlining, manipulatives, tracing, highlighting, dramatize, pantomime, mimic actions, field trips, information walks, actions, sign language.

2. **OUTPUT—demonstration of learning**

   Visual Learners—allow collages, drawings, diagrams, symbols, posters, cartoons, photos, maps, flow-charts, video

   Auditory Learners—allow storytelling, debates, speech, song/rap, interview, newspaper article, discussion, essays, journaling

   Kinesthetic Learners—allow painting, dancing, molding, model building, role play, pantomimes, games, creations, raps

Hints for Extending Instruction: for Academically Advanced Students

1. **INPUT—instruction**

   More Content—more elements to master, more independent study, supplementary materials, use less obvious examples, give more abstract examples and ideas, less practice on material given

   More Complex Task—more responses, more complex directions, more examples, more opportunities to generalize, less teacher direction

2. **OUTPUT—demonstration of learning**

   More Content—more concepts to demonstrate, require broad generalization, group work, complex assignments, generation instead of recognition, proficiency on more skills

   More Complex Task—require more responses, increase number of examples demonstrated, student must reorganize information, student develops more strategies for remembering—shares with others, teaches others

Hints for Accommodating Instruction: for Academically Struggling Students (Spec. Ed, 504, ELL, other)

Changes HOW student accesses or demonstrates learning.

NO change in HOW MUCH learning is expected.

1. **INPUT—instruction**

   Math—provide photocopy of assignment to write on, break down complex tasks, allow calculator use, use fact charts, give prompts for remembering steps, "think" out loud when instructing, increase amount of guided practice, teach strategies, identify and teach critical elements, peer partners, relate to real-life, guided notes

   Science—provide text reader, graphic organizers, teach prerequisite vocabulary, read written directions aloud, provide guided notes, explanations, clear examples and non examples, identify and teach critical elements, cloze procedure note taking, experiential activities, chunk instructional periods, multi-sensory approach, break-down complex tasks, relate to real-life, teach memory strategies

2. **OUTPUT—demonstration of learning**

   Math—allow extra time, partial assignments, use calculator, give prompts for formula steps, use a "do/redo/turn-in" option, do not mix examples and non-examples without clear warning, photocopy of assignment to write answers on, a copy of book for home, mix current lesson with basic skill review problems, check for understanding, homework partner, accept work done in class

   Science—allow verbal responses, posters, models, reduce choices on matching, give more time, short answer instead of essay, type instead of write, proofreader, do not penalize for spelling errors, demonstrations, provide a task analysis or completion checklist, review needed materials or steps, reduce writing load on assignments, allow a "do/re-do" option

Hints for Modifying Instruction for students with disabilities (Spec. Ed-must have an IEP)

Changes in WHAT/HOW MUCH a student is expected to learn.

1. **INPUT—instruction**

   Less Content—instruct on one or two basic skills/ideas, parallel curriculum on same topic, use simple real-life examples, simplify guided notes, provide concept summaries with easy to understand words, provide more practice with less material, use more examples with less material, reduce content clutter in lessons

   Less Complex Task—use words with literal meanings, break tasks down then teach each part to mastery, provide more prompts during guided practice, highlight basic information, keep tasks to one to three steps, provide guidance for remembering/associating information, provide easy diagrams or templates

2. OUTPUT—demonstration of learning

Less Content—fewer elements to master, one or two concepts to demonstrate, reduce assignment length, relate assignment to functional/real-life skills, assign easiest job during group work, have students recognize instead of generate information, require proficiency on only one or two skills

Less Complex Task—break down task, require only one or two responses, limit choices on matching, provide high level of prompting, outline necessary steps, allow strategies for remembering, give fewer practice exercises, reduce number of test items, give a modified test, highlight basic information, allow student to point to or say instead of write out, give extra time

Adaptation/Modification Checklist

Student: ______________________________ Teacher: ________________________

Testing Adaptations:
- ❑ Change essay questions to multiple choice.
- ❑ Reduce multiple choice to ______ choices.
- ❑ Avoid True or False questions.
- ❑ Avoid essay questions.
- ❑ Provide a word bank.
- ❑ Accept short answers.
- ❑ Give open book/notes tests.
- ❑ Allow student to record or dictate answers.
- ❑ Reduce spelling list for spelling tests.
- ❑ Extend time frame or shorten length of test.
- ❑ Avoid Scantron answer sheets.
- ❑ Read test to student.
- ❑ Provide study guide prior to test.
- ❑ Type tests and/or use large print.
- ❑ Test smaller units of material.
- ❑ Highlight key directions.
- ❑ Give test in an alternate site.
- ❑ Allow student to use calculator.
- ❑ Allow a test retake.
- ❑ Other: ______________________.

Presentation of Subject Matter:
- ❑ Teach to the student's learning style: ____________________
- ❑ Read text aloud.
- ❑ Provide small group instruction.
- ❑ Provide an accurate copy of notes or key points written on the board or overhead.
- ❑ Model lesson being taught.
- ❑ Utilize manipulatives.
- ❑ Highlight critical information.
- ❑ Pre-teach the vocabulary.
- ❑ Do not call on the student to read aloud in class.
- ❑ Check student's understanding during the lesson.
- ❑ Provide study guides.
- ❑ Assign a study buddy.
- ❑ Allow time for student to process directions/information.
- ❑ Other: ____________________.

Assignment Accommodations:
- ❑ Give directions in writing and verbally.
- ❑ Avoid penalizing for spelling errors, except on spelling tests/assignments.
- ❑ Show an example of what the completed assignment should look like.
- ❑ Reduce assignment.
- ❑ Read written work to student.
- ❑ Provide alternate assignment/strategy when demands of assignment conflict with student capabilities.
- ❑ Allow student to word process assignment.
- ❑ Avoid penalizing for poor penmanship.
- ❑ Allow student to use manuscript.
- ❑ Communicate homework expectations with parents.
- ❑ Check for student's understanding of the task.
- ❑ Chunk tasks.
- ❑ Allow a scribe or note taker.
- ❑ Other: ______________________.

Materials:
- ❑ Taped textbooks or other class material.
- ❑ Highlighted textbooks.
- ❑ Special equipment: calculator, computer, word processor/spell checker, other ______
- ❑ Large print books.
- ❑ Special paper (wide-lined, graph, etc.)
- ❑ Two sets of books; second one for home.
- ❑ Assignment sheet or planner.
- ❑ Behavior monitoring sheet.
- ❑ Other: ______________________

Grading:
- ❑ Use pass/fail grading system.
- ❑ Use a modified scale.
- ❑ Give credit for partial completion.
- ❑ Consider effort in assigning grade.
- ❑ Give credit for participation.
- ❑ Give copies of midterms to parents.
- ❑ Notify special education teacher when grades drop below a C-.
- ❑ Other: ______________________

Miscellaneous:
- ❑ Avoid timed activities.
- ❑ Implement preferential seating.
- ❑ Provide cues for staying on task.
- ❑ Provide a quiet place to work.
- ❑ Allow short breaks during assignments.
- ❑ Seat student next to a good role model.
- ❑ Provide daily check-in time with teacher.
- ❑ Consider Assistive Technology and Services.
- ❑ Other: ______________________.

Why Do Some Students Struggle in Your Classroom?

In explaining deficits in learning, there are weaknesses in cognitive processes that should be ruled in or ruled out through formalized assessment.

Cognitive Processes:	What it looks like in the classroom:
Auditory Processing—Perception, analysis, and synthesis of auditory stimuli.	❑ Confuses words and phrases that sound alike (e.g., "blue" with "blow" or "ball" with "bell"). ❑ Finds it hard to pick out an auditory figure from its background and it may seem that they are not listening or paying attention. ❑ Processes sound slowly and cannot keep up with the flow of conversation, inside or outside the classroom. ❑ Difficulty with phonics (decoding), spelling, and reading fluency.
Visual Perception—Recognizing the position and shape of what is seen (The "Mind's Eye").	❑ Reverses/rotates letters, jumps over words, reads the same line twice, or skip lines. ❑ Difficulty distinguishing a significant form from its background.
Short-Term Memory—Ability to hold information in immediate awareness and use it within a few seconds.	❑ Difficulty learning from lecture, listening and following directions. ❑ Cannot remember information long enough to process for comprehension and retrieval.
Long-Term Retrieval—Ability to store information and retrieve it later over extended time periods.	❑ "I know it but I can't think of it" phenomena. ❑ Demonstrate mastery of information one day and unable to recall it on test day (poor test performance/inconsistent grades).
Comprehension-Knowledge—Breadth and depth of acquired cultural knowledge and experience.	❑ Low vocabulary and reading comprehension. ❑ Difficulty in listening comprehension and in answering factual questions.
Processing Speed—Fluent performance of cognitive tasks automatically when under pressure to maintain attention.	❑ Can't process symbols fast enough to enhance decoding or comprehension. ❑ Does poorly on timed tasks.
Visual-Spatial Thinking—Perception, analysis, synthesis, and manipulation of visual stimuli.	❑ Weakness: rapid sound/symbol associations, copying tasks, and recognizing whole words.
Fluid Reasoning—Involves inductive and deductive reasoning, identifying relations, and drawing inferences.	❑ Difficulty in transfer and generalization. ❑ Poor flexibility in thinking. ❑ Low abstract problem solving.
Attention/Concentration—Ability to filter and prioritize external/internal stimuli to attend.	❑ Poor task/work completion. ❑ Assignments are partially completed, often items are skipped. ❑ Seems disorganized during instruction and practice.
Working Memory—Ability to temporarily store and perform a cognitive operation on a set of information.	❑ Problems with sequencing. ❑ Not flexible in use of strategies to solve problem/task. ❑ Attempts task but only understands a part of it. ❑ Seems unmotivated.
Cognitive Academic Language Proficiency—Proficiency in academic situations and those aspects of language that emerge from formal schooling.	❑ Understands more than can express. ❑ Difficulty in receptive and expressive language. ❑ Language "different" rather than language "disability". ❑ Poor vocabulary knowledge.

Mather, Nancy, Wendling, Barbara J., & Woodcock, Richard W. Essentials of WJ III Tests of Achievement Assessment. John Wiley & Sons, Inc. New York, 2001, pp. 111-112

Put Reading First: The Research Building Blocks of Reading Instruction, Second Edition, June 2003 [On-Line, PDF] http://www.nifl.gov/partnershipforreading/publications/k-3.html, page 2

Reading Fluency, Mather, N., & Goldstein, S. (2001). [On-Line] http://www.ldonline.org/ld_indepth/reading/reading_fluency.html

Silver, Larry B., M.D. A Look at Learning Disabilities in Children and Youth, [On-Line] http://www.ldonline.org/ld_indepth/reading/reading-2.html

Content Standard I and Math Standard V Activities

Food Pyramid

Content Standard I:
Students will develop a sense of self.

Objective 1:
Describe and adopt behaviors for health and safety.

Intended Learning Outcomes:
1. Demonstrate a positive learning attitude.
4. Develop physical skills and personal hygiene.
6. Communicate clearly in oral, artistic, written, and nonverbal form.

Content Connections:
Math V-1

Content Standard I

Objective 1

Connections

Background Information

Students should know why it is important to eat a variety of foods.

Invitation to Learn

Did you know pirates lost their teeth, but it wasn't because they didn't brush their teeth? It is because they didn't eat foods that contained Vitamin C. Did you know that there are foods you should eat everyday, just like pirates, because eating the right amount of a lot of different foods gives you the vitamins and minerals that will help you grow.

Instructional Procedures

Part 1

Have each child draw a picture of his/her favorite thing to eat on the 2” x 2” squares of paper (e.g., something that grows in the ground, comes from a tree or bush, meat, dairy, or is made from wheat, oats or corn, etc.).

1. Collect and graph data according to the food group the picture belongs in.
2. Explain that our food is divided into groups.
3. Some foods can fit in more than one category.
4. Discuss the differences of each food and the similarities.
5. Each group of food is important for our bodies.
   - *Milk Group*—strong bones and teeth
   - *Meat Group*—strong muscles, builds blood vessels, skin and hair

Materials

For each student:

- ❏ Play-Doh® or salt clay in red, yellow, orange, white, green, and brown
- ❏ Paper plate, paper cup or other container
- ❏ 2” x 2” square of white paper or Post-it® note
- ❏ *Food Pyramid Chart*
- ❏ *Food Cards*
- ❏ Crayons, pens, markers, or other writing utensils
- ❏ Tape
- ❏ Plastic wrap

- *Vegetable Group*—muscles work, heart beat, see in the dark, make red blood cells, and helps you grow
- *Fruit Group*—heal cuts and bruises
- *Grain Group*—energy

6. Label *Food Pyramid Chart* (p. 3-7) and draw pictures of what they would like to each from each group to satisfy their recommended daily servings (Milk: 3; Meat: 2; Vegetable: 3; Fruit: 2; Grain: 6). These represent the minimum number of servings recommended each day for children from 6-8 years of age. Some children may need more servings depending on their size, activity level and growth.[1]

Part 2

1. Divide students into small groups of four to five.
2. One child selects a *Food Card* (p. 3-8), looks at the word and then without talking or motioning, molds that food using Play-Doh® or salt clay. Whoever guesses what is being made takes the next turn. Everyone should have an opportunity to be the sculptor.

Part 3

1. Give each child a small ball of each color of clay (about the size of a quarter).
2. Explain they are going to make miniature food servings from the foods they listed on their charts.
3. Instruct them to look at their *Food Pyramid Charts* and sculpt each food they have drawn and place it on their paper plate. Each food item should be smaller than 1 inch. (Do not to eat the clay!)
4. Show them how to make foods with a variety of colors (e.g., egg with white and yellow clay, a slice of watermelon, corn on the cob, etc.).
5. Demonstrate how combination foods can fit into more than one category (e.g., a hamburger would have 2 servings from the grain group, 1 serving from the meat group, 1 serving from the vegetable group, 1 serving from the cheese group—depending on the size).
6. They should check off each food item on their list after they create it.
7. When they are finished, they will have a model of what they would need to eat during one day to help their bodies grow healthy and strong.

8. Cover the plates with plastic wrap or place in a large plastic bag for each child to take home, or give them a container to put their food in. Paper cups will work to get them home without being crushed.

Part 4

1. It is good to eat a variety of foods. Different vegetables, for example, have different vitamins and minerals. A good variety helps our bodies to receive all the necessary nutrients it needs to grow healthy and strong.
2. Not only do we need to eat smart, but exercise and rest is an important part of being healthy.
3. Discuss activities to do instead of sitting. Generate a list on the board.
4. Have students copy down some of their favorite activities that they can do at home or type up all the responses, copy and send home with each child.
5. Getting enough sleep is critical for our bodies, too.
6. Children who are 7-8 years old require about ten hours of sleep each night.

Possible Extensions/Adaptations/Integration

- Draw the student's favorite food from all five groups and tape them on the wall to see which group people like to eat from the most.
- Write a letter to a pirate telling them how important it is that they eat right. (Pirates lost their teeth because they didn't get enough Vitamin C.)
- Record how long you sleep each night for one week. Write down the time you turn off your light and the time you wake up in the morning. Graph and evaluate your results to see if you are getting enough rest.

Assessment Suggestions

- Give each child a *Food Pyramid Chart* and cut outs of different foods. Have them glue each piece in the correct category to fulfill their necessary daily requirements.
- Tell why our bodies need nutrients from each group and how they keep us healthy.

Additional Resources

Books

Food Rules, by Bill Haduch; ISBN 0-14-131147-9

The Berenstain Bears and Too Much Junk Food, by Stan and Jan Berenstain; ISBN 0-394-87217-7

D.W. the Picky Eater, by Marc Brown; ISBN 0-316-10957-6 (hardcover), ISBN 0-316-11048-5 (paperback)

Eating the Alphabet: Fruits and Vegetables from A to Z, by Lois Ehlert; ISBN 0-15-224435-2

Organization

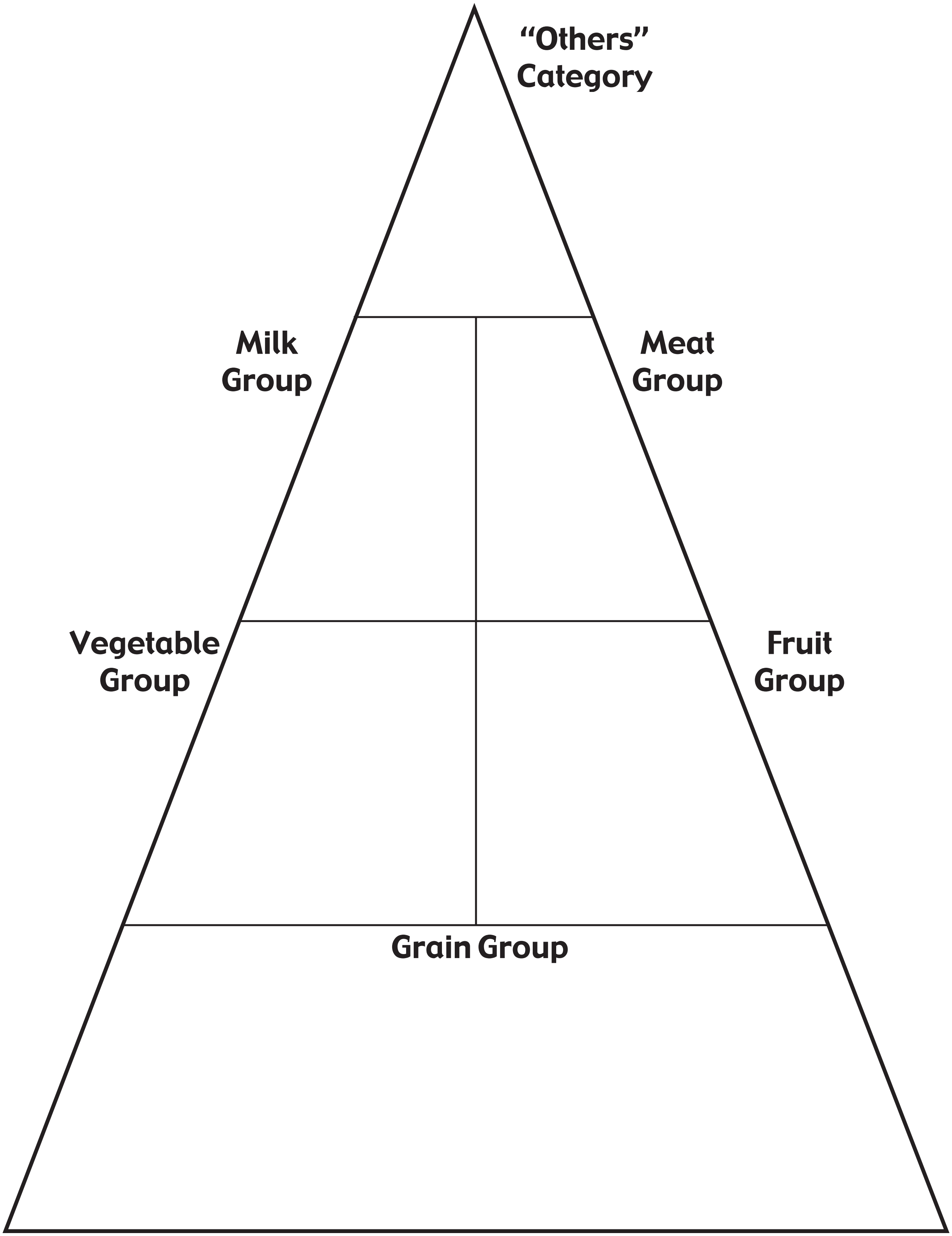
National Dairy Council, Rosemont, IL 60018-5616

Family Connections

- Children can help plan a meal for their family that contains something from each food group.
- Record what they eat in a day's time using the *Food Group Chart* (p. 3-17) and see what group they need to cut back on or what group they need to eat from more often.
- Share the information they have learned with their families and help them make wise choices about the foods they are eating.
- Generate a list of family activities to engage in instead of watching television or playing video games.

[1]National Dairy Council, Pyramid Café 1998

Food Pyramid



Food Group Chart

Food Groups	Breakfast	Lunch	Dinner
Grains 6 servings			
Fruits 2 servings			
Vegetables 3 servings			
Dairy 3 servings			
Meat 2 servings			
Others			

Food Cards

Apple	Pineapple	Cherry
Banana	Grapes	Lemon
Pear	Orange	Watermelon

Pudding	**Carrots**	**Corn on the Cob**
Yogurt	**Celery**	**Broccoli**
Swiss Cheese	**Chocolate Milk**	**Potato**

Lettuce	Bread	Pancake
Peas	Rice	Spaghetti
Beans	Tomato	Hamburger Bun

Taco Shell	Pizza	Soup
Cereal	Hamburger	Mashed Potatoes and Gravy
Waffle	Muffin	Peanut Butter and Jam Sandwich

Hot Dog	Ham	Ice Cream
Fried Chicken	Peanut Butter	Milk
Hamnburger	Fish	Bacon

Balanced Diet

Content Standard I

Objective 1

Connections

Content Standard I:
Students will develop a sense of self.

Objective 1:
Describe and adopt behaviors for health and safety.

Intended Learning Outcomes:
1. Demonstrate a positive learning attitude.
4. Develop physical skills and personal hygiene.
6. Communicate clearly in oral, artistic, written, and nonverbal form.

Content Connections:
Math IV-2, V-1, I-4

Background Information

Students should have a basic understanding of the five food groups and how a balanced diet will keep them healthy.

They should:

- Be familiar with the food pyramid.
- Understand the different food groups.
- Be able to list foods from each category and graph them.
- Categorize their favorite simple food.
- Categorize their favorite complex food (e.g., pizza: crust from the grain group, tomato sauce/toppings from the vegetable group, toppings from the meat group, cheese from dairy group, toppings from the fruit group, etc.).

Remember:

- One serving of meat is the size of a deck of playing cards.
- One fruit serving is the size of a tennis ball.
- A slice of bread or a computer mouse-size scoop of rice or noodles is a serving size from the grain group.
- Vegetable servings are 1/2 cup cooked vegetables or 1 cup raw.
- A serving from the milk group is 1 cup of milk or 2 slices of cheese.

Invitation to Learn

Do you know what is in the food you eat? Do you know what you are really eating? We always hear people talk about a balanced diet, but what does that mean?

Instructional Procedures

Review the five food groups with the children and show them a *Food Pyramid Chart* (p. 3-7).

1. Ask children to name some of their favorite foods. Write the names of the food on Post-it® notes and place them in the correct food group, or generate a list of food groups on the board with their choices listed under the correct food category.
2. Graph each food group to determine which group they eat from the most or the least.
3. Explain how each food group gives our bodies different nutrients that are essential for our growth and development. Emphasize that too much from a group, or not enough, isn't healthy. That is why we call it a balanced diet.
4. Discuss the similarities and differences of each food.
5. Lead discussion into the fact that foods are made of more than one ingredient.
6. Foods that are made of more than one ingredient are okay to eat, but too much can lead to an unhealthy diet.
7. Give each child a copy of a nutritional label. (Make an overhead transparency, if possible, for teacher use.)
8. Look at food labels from a variety of foods.
9. Discuss the meaning of a serving for a child.
10. Identify how many servings are in a package.
11. Vitamin A, C, calcium, protein, and iron are important for our bodies to grow properly. Mention that not receiving all of the nutrients we need can lead to diseases such as scurvy (lack of Vitamin C) and osteoporosis (not enough calcium).
12. Identify fat grams, sodium, and sugars on the labels.
13. Select a label and explain you are going to show them how much sugar, salt and fat are in this product. To demonstrate, measure the amount of salt (sodium) in one test tube or container, the sugar in another, and the fat in a third using the water gel that has been mixed with water to form a spongy consistency. (You could already have this measured and in the bottles before the lesson.)
14. Emphasize that the amount listed under the sugar, salt and fat is for EACH SERVING, not each package. Some of these measurements may be doubled.

Materials

- ❏ Water gel
- ❏ Test tubes or other clear container
- ❏ Water
- ❏ Salt, sugar
- ❏ Nutritional labels from a variety of foods
- ❏ Teaspoon and funnel
- ❏ *Food Pyramid Chart*
- ❏ *Food Group Chart*
- ❏ Post-it® note pad

15. Record and graph sugar, salt, and fat in the foods. It is important to pay attention to what is on labels. You don't have to avoid these foods, but be informed and learn to make good choices about what you eat.
16. Move the discussion toward foods we really like to eat (e.g., chocolate, popcorn, candy, doughnuts, chicken nuggets, pizza, etc.). These foods have many added ingredients that are not good for our bodies if we eat too much of them.
17. Talk about how all of these are necessary for our bodies, but in moderation.

Possible Extensions/Adaptations/Integration

- Graph the amount of sugar, salt, or fat in different foods from labels students have brought from home.
- Write letters to different companies with either compliments or concerns about their products.
- Write a reader's theater teaching how to eat a balanced diet and share with other classes.
- Record what they eat in one day on the *Food Group Chart*. Have them cut out these foods from colored paper and use them to create a self-portrait (e.g., carrots for legs, egg for the head, spaghetti for hair, potato for the body, apple slices for the ears, etc.). Proving *you are what you eat*.

Assessment Suggestions

- Give each child a food pyramid chart and cut-outs of different foods. Have him/her glue each piece in the correct category.
- Give each child a few samples of nutrition labels and have him/her choose the most healthy and least healthy food based on sugar, fat, and sodium content.

Additional Resources

Food Rules, by Bill Haduch; ISBN 0-14-131147-9

The Berenstain Bears and Too Much Junk Food, by Stan and Jan Berenstain; ISBN 0-394-87217-7

D.W. the Picky Eater, by Marc Brown; ISBN 0-316-10957-6 (hardcover), ISBN 0-316-11048-5 (paperback)

Eating the Alphabet: Fruits and Vegetables from A to Z, by Lois Ehlert; ISBN 0-15-224435-2

Family Connections

- Children can help plan a meal for their family that contains something from each food group.
- While shopping with their parents or guardians, students look at and compare nutrition labels of the same product, but different brand names.
- Students share the information they have learned with their families and help them make wise choices about the foods they are eating.

Effects of Tobacco

Content Standard I

Objective 1

Connections

Content Standard I:
Students will develop a sense of self.

Objective 1:
Describe and adopt behaviors for health and safety.

Intended Learning Outcomes:
4. Develop physical skills and personal hygiene.
6. Communicate clearly in oral, artistic, written, and nonverbal form.

Content Connections:
Math V-1

Background Information

Students should have a basic understanding that tobacco is harmful to those who smoke and those who breathe in second hand smoke.

Invitation to Learn

What we learn today will help keep you healthy, strong and physically fit for the rest of your life, if you make wise and informed decisions.

Instructional Procedures

We are going to talk about what smoking does to our bodies. Do you know someone who smokes? People who smoke aren't bad people, but smoking is not healthy for our bodies.

1. Partially blow up a plastic bag, let the air out, and blow it up again. This shows how our lungs work. They inflate, deflate, inflate and deflate. Most of the time we breathe normally, like when we are sitting at our desks, or on the bus. But sometimes we need to breathe hard, after running for example.
2. Our bodies breathe in oxygen and out carbon dioxide. We need oxygen to keep ourselves alive and healthy.
3. When we breathe other things into our lungs, they can be harmful and create problems breathing.
4. We are going to make a "lung."
5. Give each child a bag with 1/8–1/4 tsp. of water gel (sodium polyacrylate) in it.
6. Give each child a paper cup containing red water.

Materials

- ❏ High quality Ziploc® bags
- ❏ Water gel
- ❏ Paper cups or other containers for water
- ❏ Red food coloring
- ❏ Black powdered tempera paint
- ❏ Water
- ❏ Plastic bag
- ❏ Soda straws

7. Have students pour the water into the Ziploc® bag, zip it closed tightly, and mix the powder and water together. A soft gelatin will form. If it is runny, add a tiny bit of powder; if it is globby, add a little bit of water.
8. When everyone has their powder mixed, show students the air bubbles trapped in the gel.
9. Pretend this bag looks like our lungs. Our lungs are soft and have air pockets so the oxygen we breathe can be transported to other parts of our bodies through our blood cells.
10. When we put other things into our lungs, they can be harmful and create problems breathing.
11. Give each child a cup containing 1/4 tsp. of black tempera paint and water gel mixed together. Have them open their bags and dump in this mixture.
12. Gel will turn black and thick. (If it is runny, add more gel.)
13. When smoke enters our lungs it has other things mixed with it. Smoke is actually small particles. A cigarette contains parts of a tobacco plant that is mixed with other chemicals. As people smoke, these particles enter their lungs and become trapped. After time their lungs become black and stiff. This causes the lungs to not inflate as easily. Because of this, people who smoke can't get enough air to breathe. This next activity will show you what it might feel like.
14. Pass out soda straws—the smaller the diameter, the better.
15. Stand up and run in place for one minute.
16. After one minute of running in place, have the students put their straws in their mouths, hold their noses, and breathe through the straw as long as they can. Instruct them to remove the straw and breathe normally when they feel they can't get enough air.
17. Count how many breaths they could take before removing the straw, record and graph.
18. Reiterate how smoking prevents a person's lungs from getting all the oxygen it needs.
19. Explain how these particles can cause other problems. It can lead to heart disease, emphysema, lung disease, cancer, and death.
20. If we want to live a busy and active life, it is important we do all we can to keep our bodies as healthy as possible.
21. If you send the gel home with the children, place a strip of masking tape or other strong tape across the opening. Instruct

them to not open it on the bus or at home, or have them throw it away before leaving class.

22. REMEMBER—People who smoke are not bad people! But, smoking is bad for people.

Possible Extensions/Adaptations/Integration

- Design and produce a brochure that lists some of the effects of smoking.
- Design and produce flyers advertising the harmful effects of smoking and post throughout the school for Red Ribbon Week.
- Collect smoking ads from magazines and recognize how the advertiser is attempting to make smoking look glamorous.

Assessment Suggestions

- Have a "Heart Attack." Give each child a paper heart or have them cut one out of construction paper. Each child writes something that can be done to keep our bodies healthy on a heart and then hang the hearts together.
- Give each child an accordion book cut in the shape of a heart, diamond, or other shape. Write one thing that can be done to keep our bodies healthy on the book.

Additional Resources

Web sites

http://www.lungusa.org/learn/lung_images.html

http://www.hc-sc.gc.ca/hecs-sesc/tobacco/facts/blueribbon/secondHand.html

http://www.cdc.gov/tobacco/research_data/youth/stspta5.htm

http://www.cdc.gov/tobacco/data.htm

http://www.youngwomenshealth.org/smokeinfo.html

Family Connections

- Have children discuss what they have learned with their parents or guardians.
- Share their heart books with their parents.
- Have children write letters to businesses that are smoke-free thanking them for keeping a clean environment.

Math Standards I and V Activities

Our Half-Birthday Party!

Math Standard I:
Students will acquire number sense and perform operations with whole numbers.

Objective 4:
Use fractions to identify parts of the whole.

Intended Learning Outcomes:
1. Demonstrate a positive learning attitude.
5. Understand and use basic concepts and skills.
6. Communicate clearly in oral, artistic, written, and nonverbal form.

Content Connections:
Math III-1; Language Arts IV-3

Math Standard I

Objective 4

Connections

Background Information

Students should have a basic understanding that a whole object is made up of parts. Students will learn about fractions (especially 1/2) by participating in a Half-Birthday Party. They will do activities that teach fractions are part of a whole. The Half-Birthday Party is centered around the fraction 1/2 and should be used as an introduction to fractions. Other activities using fractions may be used to illustrate different fractions.

Invitation to Learn

Let's have a "half" birthday party and do some activities to learn about fractions. Share the *Half-Birthday Story*.

Instructional Procedures

Half-Birthday Party

1. Pin the "half-nose" on the "half-clown."
2. Students start with a whole circle nose and cut it into two parts, representing two parts make a whole. You could use a square and have students cut it into thirds or fourths as an extension.

Materials
- ❏ *Half-Birthday Party Invitation*
- ❏ Clown and nose with blindfold

Fraction Plates

This activity provides an opportunity to represent unit fractions of 1/2, 1/3, and 1/4 with visual objects, preparing students for the symbols.

Materials
- ❏ Fraction plates

Bean Fractions

Materials
- ❏ *Bean Fractions*
- ❏ Beans (paint one side a different color)

This activity is a hands-on approach to helping students identify the parts needed to represent a whole object of 1/2, 1/3, and 1/4 (see *Bean Fractions* p. 4-9).

Pizza Fractions

Materials
- ❏ *Pizza Fractions*
- ❏ Dice

This game can be played with two people or as a class divided into two teams.

1. Team 1 rolls the fraction dice and picks up a piece of pizza representing that fraction.
2. Team 2 then rolls the dice, repeating the steps.
3. A point is given to the team who places the last fraction piece, making a whole pizza.
4. If a 1 is rolled on the fraction dice, a whole pizza is "made" and the team receives one point.

   Optional: Once a pizza is made, remove the pizza and re-use the pieces, making the pizza over again.

Fraction Memory Game

Materials
- ❏ *Fraction Memory Game Pictures*
- ❏ *Fraction Memory Game Symbols*

Using posterboard-size *Fraction Memory Game Pictures* (p. 4-12) and *Fraction Memory Game Symbols* (p. 4-13), play the *Fraction Memory Game* with class. Small sets may be used for small groups . This activity helps students recognize regions of geometric shapes. It helps them learn to match fraction pictures to corresponding fraction symbols.

Possible Extensions/Adaptations/Integration

- *Spelling List:* Create fractions using vowels and consonants.

Assessment Suggestions

- *Observational:* During birthday party, observe students doing activities such as cutting circles or shapes into appropriate sections. Students can also be observed selecting a match for the *Fraction Memory Game*, discussing the fraction of colored beans with a friend, and selecting pieces of pizza for *Pizza Fractions*.

Additional Resources

Books

Jump, Kangaroo, Jump!, by Stuart J. Murphy; ISBN 0-06-446721-X

Fabulous Fractions, by Lynette Long; ISBN 0471369810

Eating Fractions, by Bruce McMillan; ISBN 0-590-43771-2

Baker Bill, by Calvin Irons; ISBN 0-7327-1419-2

Give Me Half!, by Stuart J. Murphy; ISBN 0-06-446701-5

Web site

http://www.matti.usu.edu (National Library of Virtual Manipulatives)

Family Connections

- *Real-Life Fractions:* Invite families to help students find and share examples of "real life fractions" (i.e., 6 out of 12 eggs equals 1/2 dozen; the green light on a stop light represents 1/3).
- *Family Fraction Fun:* Student draws a picture of his/her family, including each member. Families help student find several fractions using different family attributes (i.e., 2/4 of our family have brown eyes, 3/4 of our family are girls, etc.).

Our Incredible Half-Birthday Party!

Susan was very organized. She kept a small calendar on her desk at school. She would put an "X" across each day before leaving school. She was so organized, that she even asked our teacher if she could come to school on Saturday and Sunday just to mark off the day. I thought she was crazy!

Sometimes it bothered me that she always wanted to be so organized. However, one day, I become very grateful that Susan kept track of every detail of every day.

Susan raised her hand one day and exclaimed, "We have a birthday to celebrate this week!" We all looked around the class – we couldn't think of anyone that was having a birthday. She said again, "We have a birthday to celebrate . . . the 1/2 birthday of our class!"

Our teacher was impressed. "You're right! This week means we are 1/2 of the way through the school year. We should have a class 1/2 birthday party."

Then our teacher said, "Let's have the party 1/2 way through the week . . . on Wednesday. We'll do it 1/2 way through the day, when the two hands of the clock cut the clock in half. Any other ideas?

"Let's play some games," suggested Jason.

"Yes, and let's have some treats," said Brian.

"Great idea," said Allison, "I'll bring some treats for the whole class."

"We can have treats," said our teacher, "but there is one rule we must all remember. This is a 1/2 birthday party and you may only bring things that are 1/2 of what they normally are. Let's think of some foods that we could easily cut or break in half."

"Bananas."

"Candy bars."

"Carrots."

"Apples."

"Donuts."

"Cupcakes."

"Oranges."

"Brownies."

"This will be so fun," said Sarah. "Do you think we could play some games?"

"Your assignment for Wednesday will be to bring something to either show the class or share with the class that is only a half."

"Let's list a few more items that are not foods that you might want to bring."

"One shoe."

"One earring."

"Half of a newspaper."

"Half of a book—well, I guess I shouldn't try to cut a book in half."

"One glove."

"Great! Good luck with your assignment—think hard and be CREATIVE! I'm excited to see what you come up with. I will think of some 1/2 games that we can play."

". . . but be careful—don't cut anything in half that your Mom may want to stay whole. Have fun and we'll see you tomorrow."

Half-Birthday Party Invitation

You Are Invited
to the Half-Birthday Party
of Our Class!

Date: ____________________________

Time:____________________________

Place: ___________________________

Bring: Half of something!

(Be creative! Find something you can share with the class that is only half of what it should be.)

You Are Invited
to the Half-Birthday Party
of Our Class!

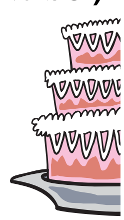
Date: ____________________________

Time:____________________________

Place: ___________________________

Bring: Half of something!

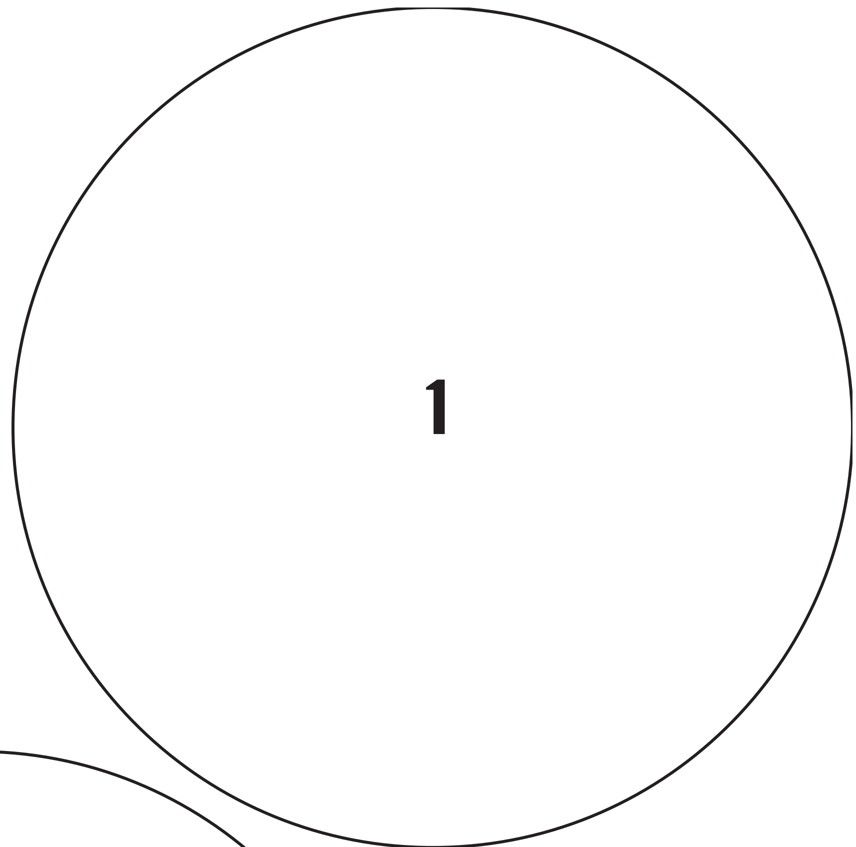
(Be creative! Find something you can share with the class that is only half of what it should be.)

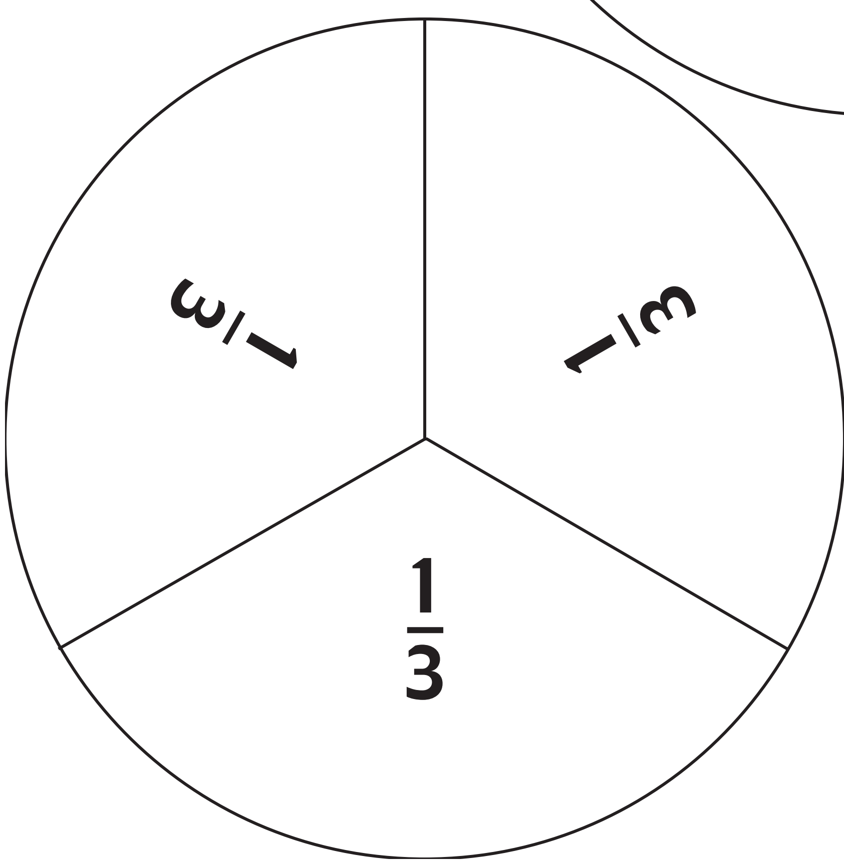


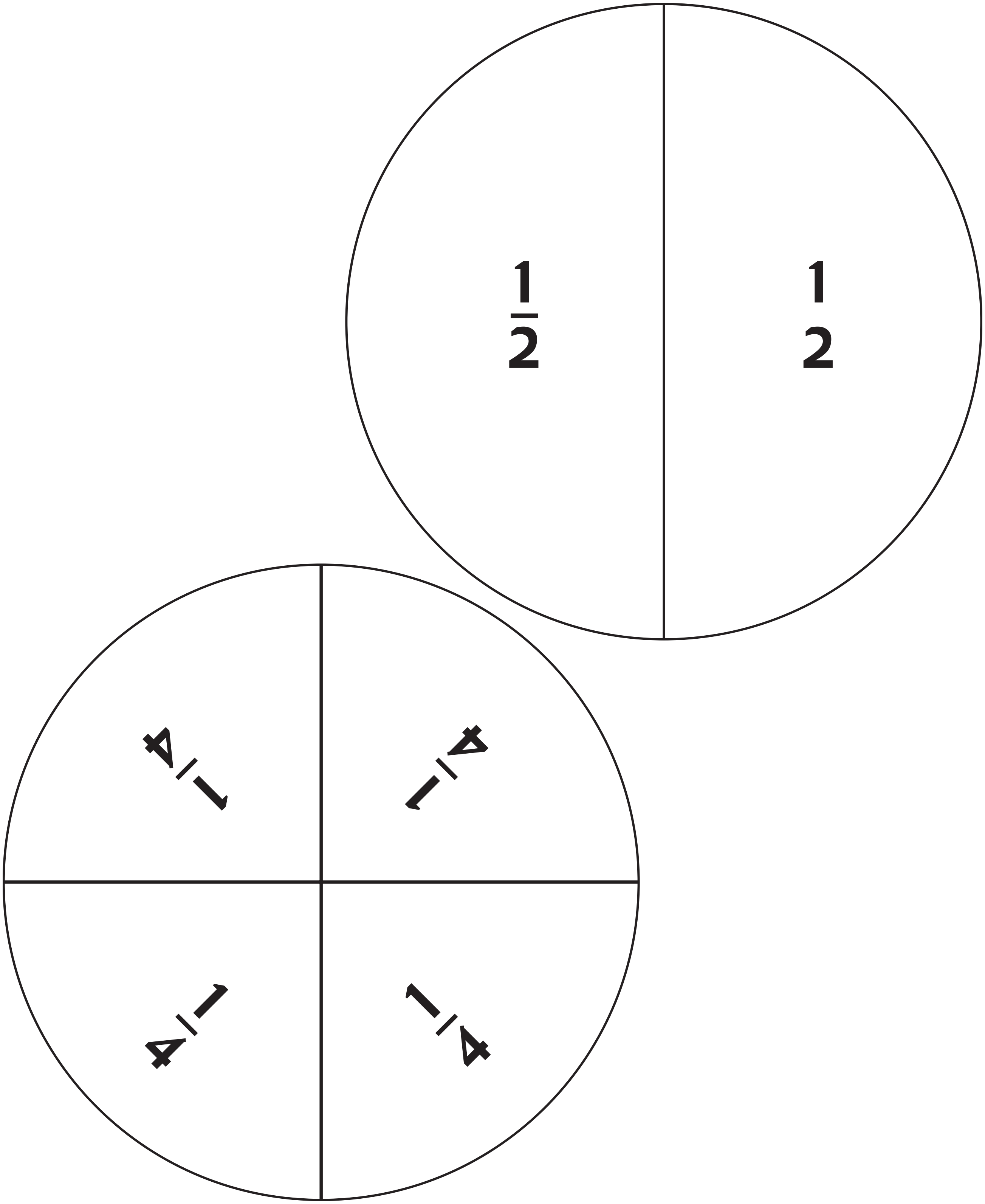
Bean Fractions

Total number of beans rolled:	The colored fraction of my beans were:	The white fraction of my beans were:
4	1/4	3/4

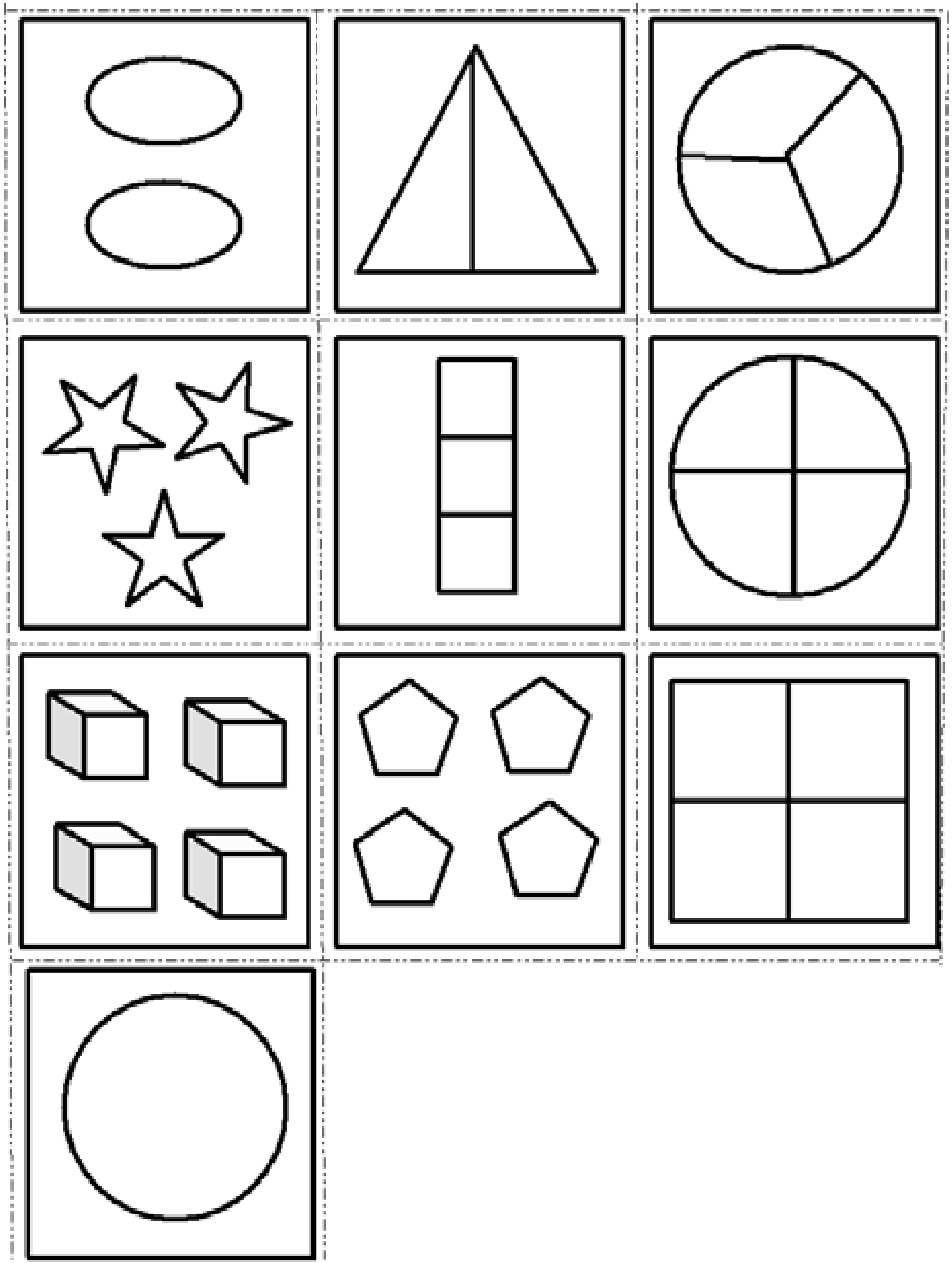
Pizza Fractions






1/2
1/2
1/4
1/4
1/4
1/4

Fraction Memory Game Pictures



Fraction Memory Game Symbols

$\frac{1}{2}$	$\frac{2}{2}$	$\frac{1}{3}$
$\frac{2}{3}$	$\frac{3}{3}$	$\frac{1}{4}$
$\frac{2}{4}$	$\frac{3}{4}$	$\frac{4}{4}$
1		

Where do I fit on the graph?

Math Standard V

Objectives 1 & 2

Connections

Math Standard V:
Students will collect and draw conclusions from data and understand basic concepts of probability.

Objective 1:
Collect, organize, and display simple data.

Objective 2:
Determine the likelihood of an event.

Intended Learning Outcomes:
1. Demonstrate a positive learning attitude.
5. Understand and use basic concepts and skills.
6. Communicate clearly in oral, artistic, written, and nonverbal form.

Content Connections:
Math III-1; Content III-2

Background Information

Students will learn and become familiar with several different types of graphs such as bar graphs, pictographs, Venn Diagrams, and organized tables (see *Graphing Samples* p. 4-19). Students will also learn to use a key to relate the meaning of various symbols on graphs.

Students will collect data and create graphs about themselves, their community, and the world around them. They will use a variety of methods to organize data, such as stickers, clothespins, name tags, coloring, tally marks, etc.

Invitation to Learn

A bar, a picture, organized tables, and a key . . . what do these things have in common?

What would you like to learn about your friends?

How can we collect, organize, and display this information?

Materials

- ❏ *Graphing Samples*
- ❏ Name cards (could be magnetic)
- ❏ Clothespins
- ❏ *Graph Templates*
- ❏ Pre-made titles, categories and/or pictures

Instructional Procedures

1. Have each student select his/her favorite candy bar.
2. Have the students sort, classify and organize their data.
3. Help the students understand that things in their everyday lives can be graphed in different ways.

4. Students graph their favorite winter activity, liquid to drink, season, etc. by using a pictograph, tally marks, and a bar graph (*Graphing Templates* p. 4-25). Explain that pictographs use pictures to represent choices.
5. Create a title for the graph. Make a key to represent the marks on the various graphs and organized tables. This will help students learn to label information.
6. Compare and discuss the data organized on the graphs and tables.

Possible Extensions/Adaptations/Integration

- Instead of candy bars, collect, organize, and graph data from a variety of subjects and life experiences.

Assessment Suggestions

- *Observational:* Observe students graphing information.
- *Written:* Have students complete a graphing worksheet.
- Have students create a graph—include title, key, and markings.

Additional Resources

Lemonade for Sale, by Stuart J. Murphy; ISBN 0064467155

Graph It!, by Lisa Trumbauer; ISBN 0736812822

Tiger Math, by Ann Whitehead Nagda; ISBN 080507161X

Graphs, by Sara Pistoia; ISBN 1567661203

Graphing Activities, by Joy Evans; ISBN 1557991243

Graphs, by Bonnie Bader; ISBN 0448432374

Family Connections

- Have students graph information about their families (e.g., graph favorite foods, eye color, hair color, favorite holiday, etc.).
- Have students gather and organize data for a particular type of graph of family information.
- Have the students teach a family member different types of graphs.

Graphing Ideas

- You can use a graph to take roll in the morning. Have the students mark the lunch chart graph or another graph and use it for your roll.
- Use graphs to enhance a standard or a particular objective (e.g., Which type of rock do you prefer?).
- You can use different types of objects to make the graphs. Some ideas might be clothespins, paper clips, magnets, name strips, Post-it® notes, tally marks, pictures of objects, etc. Use different mediums to help maintain the interest level. You might want to try Velcro® on the back of some of your graphing mediums. Electrical tape is great for dividing your graphs as it comes in a variety of colors. Another fun graph can be made by using two-liter bottles with labels on them representing a graphing choice and have students pour in 1/2 cup of liquid for the bottle of their choice (e.g., The title of the graph could be: Where is your favorite place to swim: the ocean, a lake, or a swimming pool? The graph would then be measured by the bottle holding the most water as the favorite.).
- Remember to ask probing questions about the graph after the students make it.
  - Which category had the most, greatest, fewest, or least?
  - How many more or less did one choice have vs. another?
  - Which was the class favorite?
- Graph the syllables of the spelling words or how many syllables are in a name.
- Graph treats such as M & M's, Skittles, candy bars, etc.
- Use a variety of questions when graphing:
  - What do you prefer?
  - My favorite ___________ is:
  - My choice for __________ is:
  - Which do you like best?
  - What is your estimate? (This could be used for counting, measuring, timing, etc.)

Graphing questions are unlimited. Below are just a few ideas:

Ideas for graphing questions:

- Which graph do you like best? Bar graph, tally marks, or pictographs.
- Do you prefer primary colors or secondary colors?
- What is your favorite shape? Cones, spheres, or cylinders.
- How do you feel today? Happy, frustrated, or tired.
- Do you prefer rollerskating or skateboarding?
- Which is your favorite? Fishing, camping, or hiking.
- Do you like fantasy, fiction, or non-fiction books the best?
- What is your favorite sport? Football, soccer, basketball, or baseball.
- Do you like antonyms or synonyms?
- What shape do you prefer? Circle, triangle, or parallelogram.
- What weather do you like best? Rainy, snowy, or sunny.

- Would you rather travel in a car, plane, or train?
- What is your favorite subject? Art, music, or science.
- What drink do you like best? Hot chocolate, orange juice, or punch.
- Do you prefer pizza or hamburger and fries?
- Which movie do you like best? *Finding Nemo* or *Monsters, Inc*.
- Would you rather go swimming, skiing, or sledding?
- What would you prefer? Cooking, drawing, or reading.
- What is your favorite kind of potatoes? Baked, mashed, or french fries.
- Do you prefer addition, subtraction or fractions?
- Which holiday is your favorite? Halloween or Valentine's Day.
- Which job do you think is the dirtiest? Garbage collector, a rancher, an auto mechanic, or a produce manager.
- Which farm animal is the most important? Cows, chickens, pigs, or horses.
- My home is heated by: Fireplace, gas heat, electricity, or wood-burning stove.
- Where do you prefer to live: City, suburb, rural community, or a forest.
- Which magnet is the strongest? Bar, refrigerator, or horseshoe.
- Which month do you predict will be the coldest? December, January, or February.
- What will today's temperature be at 12:00 Noon? This will vary according to the month.
- How many hours of sleep do you usually get at night? Seven, eight, nine, or ten.
- Which coin do you like the best? Quarter, nickel, dime, or penny.
- Do you predict more or less than half of our class will eat hot lunch today?
- How many televisions or telephones are in your house?
- How many glasses of milk do your drink each day?
- Is your house number even or odd?
- What month were you born? January – March, April – June, July – September, October – December.
- What time do you usually get out of bed? Before 7:00 A.M., Between 7:00 – 8:00 A.M., or After 8:00 A.M.
- Which community worker has the most dangerous job? A police officer, a firefighter, or a construction worker.
- Which pet would you prefer to have? A gerbil, a puppy, a kitten, or a bird.
- What is your favorite type of fruit? An orange, a peach, an apple, or pear.
- If you were an animal, how would you prefer to hibernate? A long uninterrupted sleep, waking up and eating periodically, or freezing.
- Where do you think a plant will live the longest? Under the sink, on the porch, or by a window.
- Do you prefer vertebrates or invertebrates?

Ideas for picturegraphs:

- What is your favorite national park?
- What is your favorite fruit?
- Which animal would you like to be?
- Which continent would you like to visit?

Ideas for two-ring Venn Diagrams:

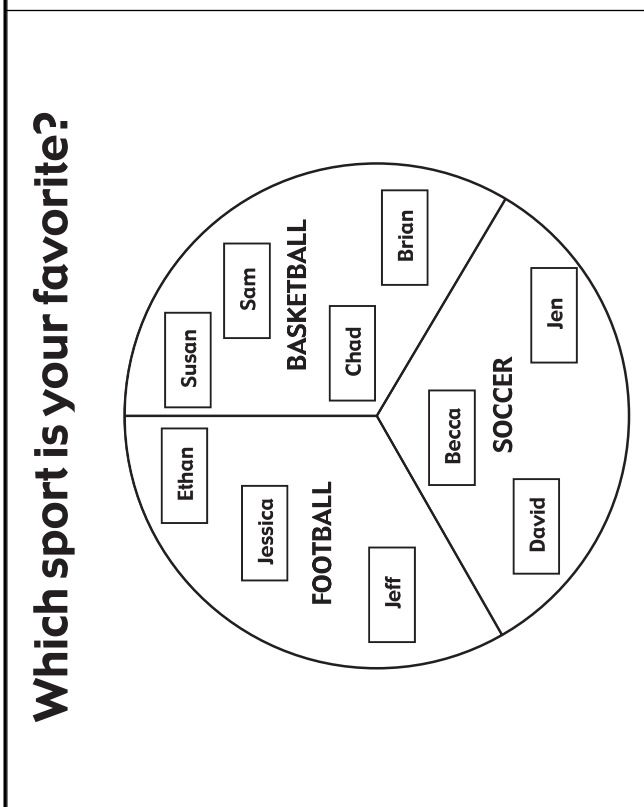
- I like eating pretzels. – I like eating potato chips.
- I like milk. – I like orange juice.
- I like pepperoni pizza. – I like Canadian bacon and pineapple.
- I like mashed potatoes. – I like baked potatoes.
- I am wearing pants with pockets. – I am wearing a shirt with a pocket.
- My clothes have a button. – My clothes have a zipper.
- I like to play soccer. – I like to play basketball.
- I am the oldest child. – I am the youngest child.
- I like it when it snows. – I like to hear thunder.
- My birthday is an even number. – The sum of my birthday digits is less than 6.
- There are more than four people living in my house. – I have a pet.
- I like to read chapter books. – I like to read picture books.

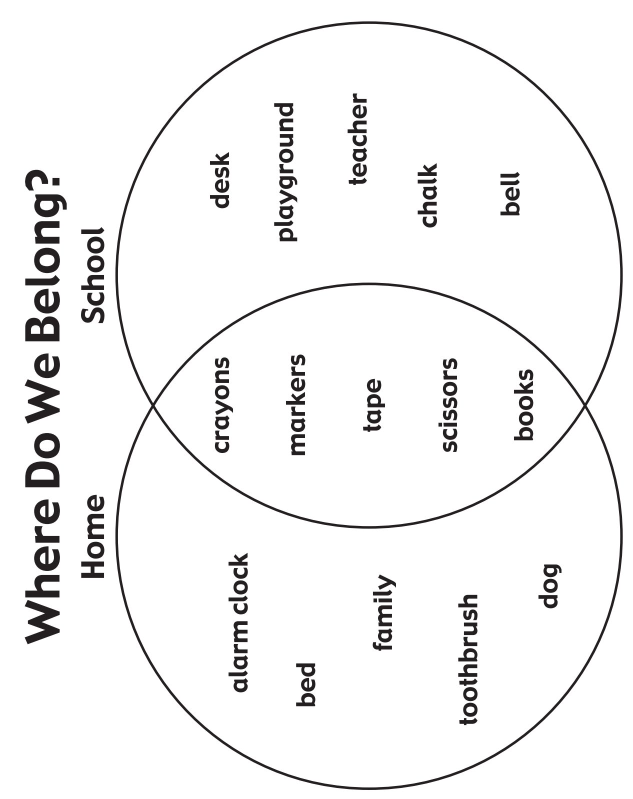
Ideas for three-ring Venn Diagrams:

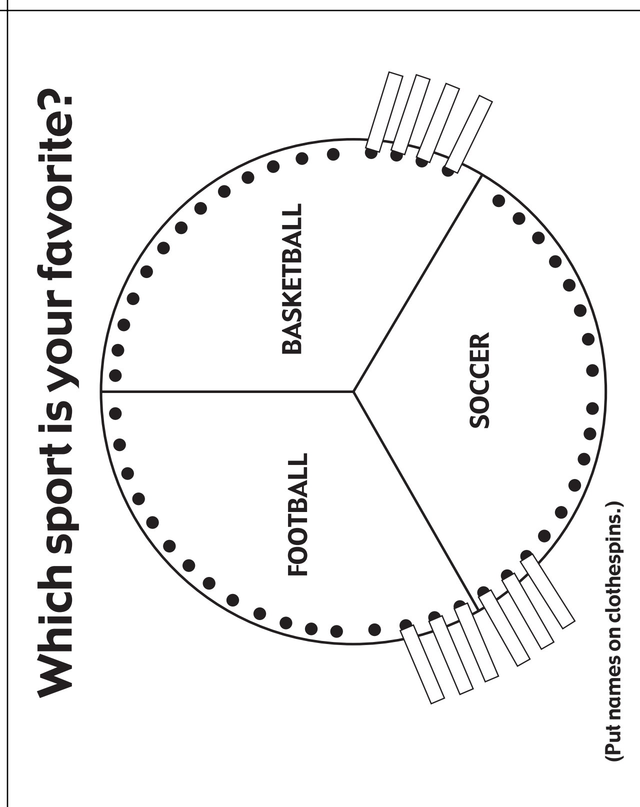
- I like to eat cake. – I like to drink milk. – I like to eat broccoli.
- I am wearing a sweatshirt. – I am wearing blue pants. – I am wearing a shoes with laces.
- I am nervous when it thunders. – I have seen a rainbow. – I like to watch the lightning.
- I wear green on St. Patrick’s Day. – I wear red on Valentine’s Day. – Christmas is my favorite holiday.
- I can name the days of the week in order. – I can name the months of the year in order. – I can tell you how many days there are in a year.
- I can count to ten in another language. – My parents speak another language. – I speak another language.

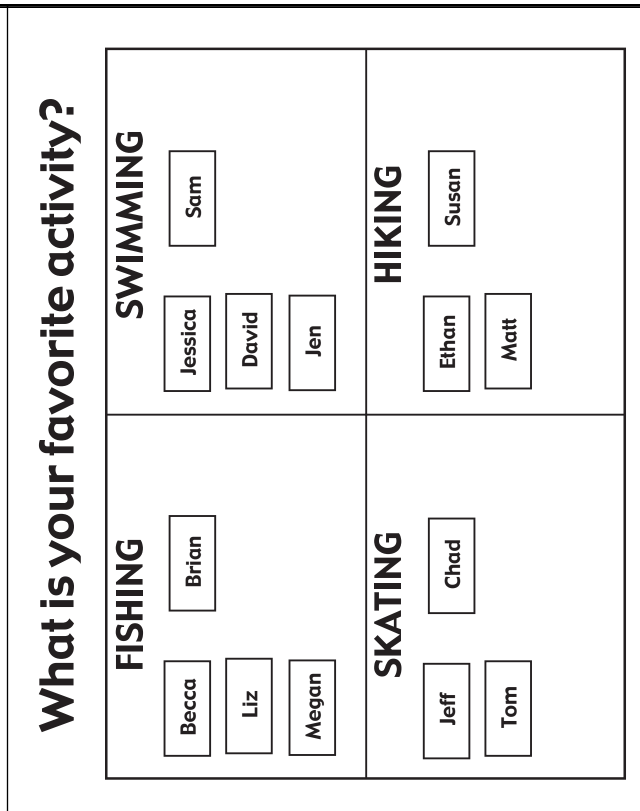
Have fun—the possibilities are endless!

Graphing Samples

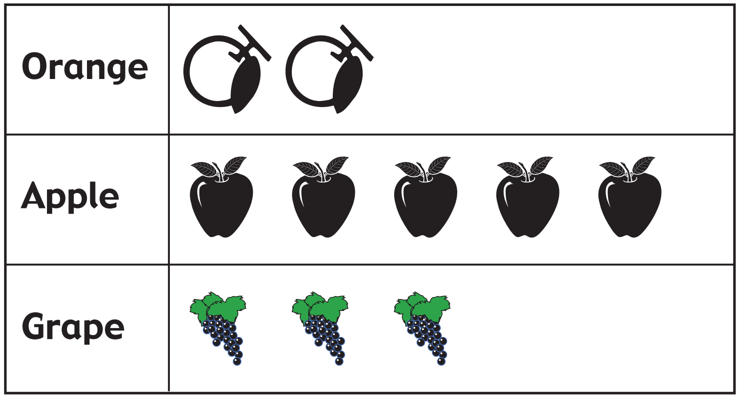






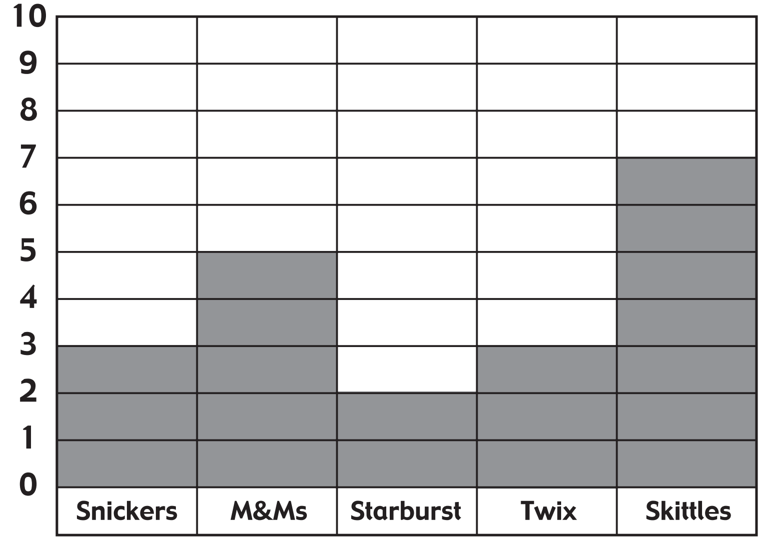


What is your favorite juice?

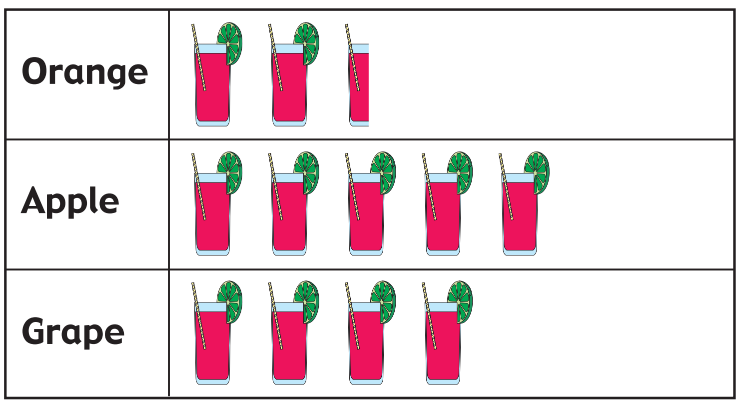


A picture graph uses different pictures in each row that match the label or category.

What is your favorite treat?



What is your favorite juice?



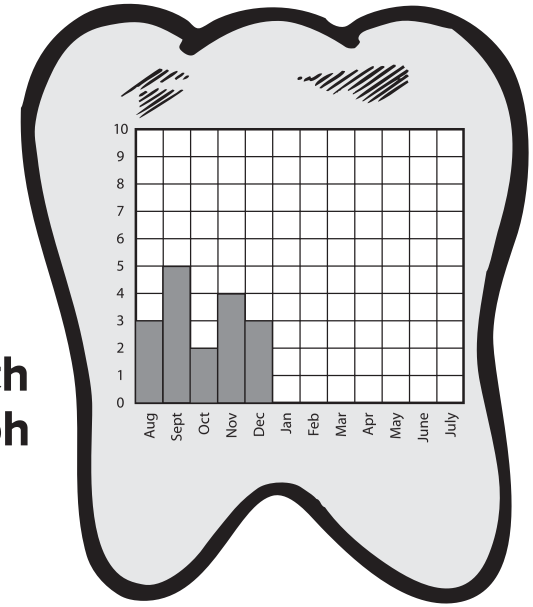
Key:  equals 2 people.

A pictograph is like a picture graph, but it uses the same symbol to represent the labels or categories.

What is your favorite treat?

Snickers	///
M&Ms	~~////~~
Starburst	//
Twix	///
Skittles	~~////~~ //

Our Lost Teeth Bar Graph



How many pets do you have?

0	////
1	~~////~~ //
2	///
3	///
4	
5	/
More than 5	/

Which type of rock do you like best?

Igneous	~~////~~ ////
Metamorphic	////
Sedimentary	~~////~~ //

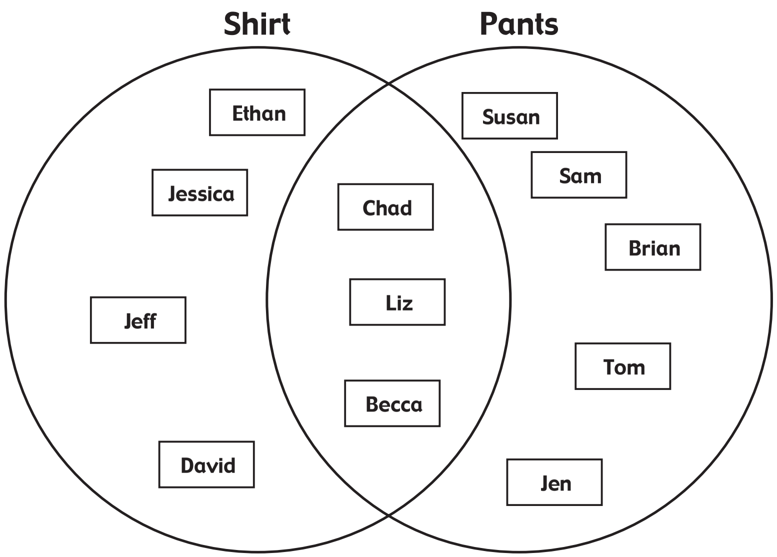
Make a laminated chart with only dots, numbers, and "I Prefer."
Then change the categories and keep using the same graph.

What is your favorite ice cream?

What is your favorite ice cream?

Strawberry	////
Cookies & Cream	~~////~~ /
Chocolate	///
Bubble Gum	~~////~~ //

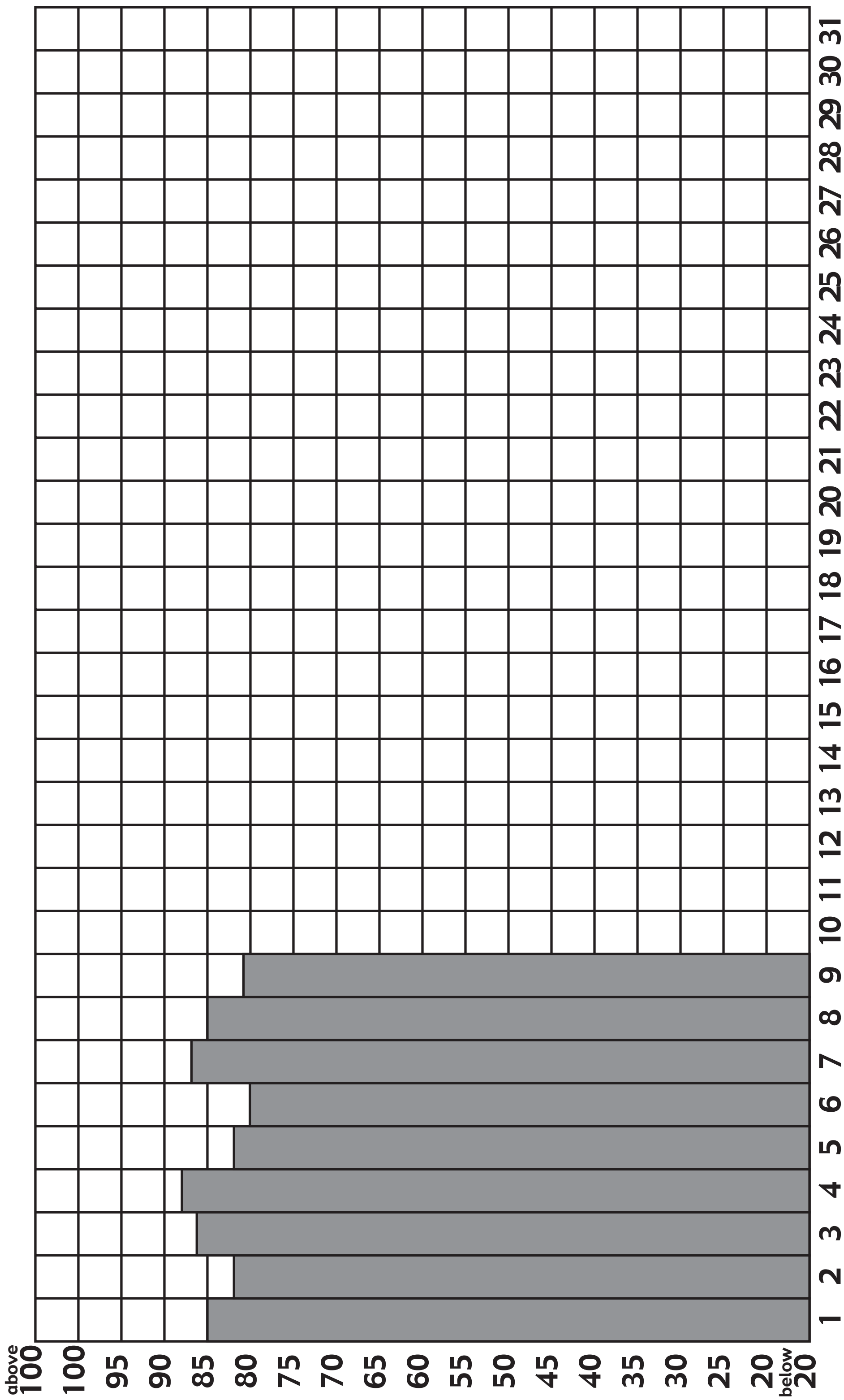
Where Are Your Pockets?



What is your favorite ice cream?

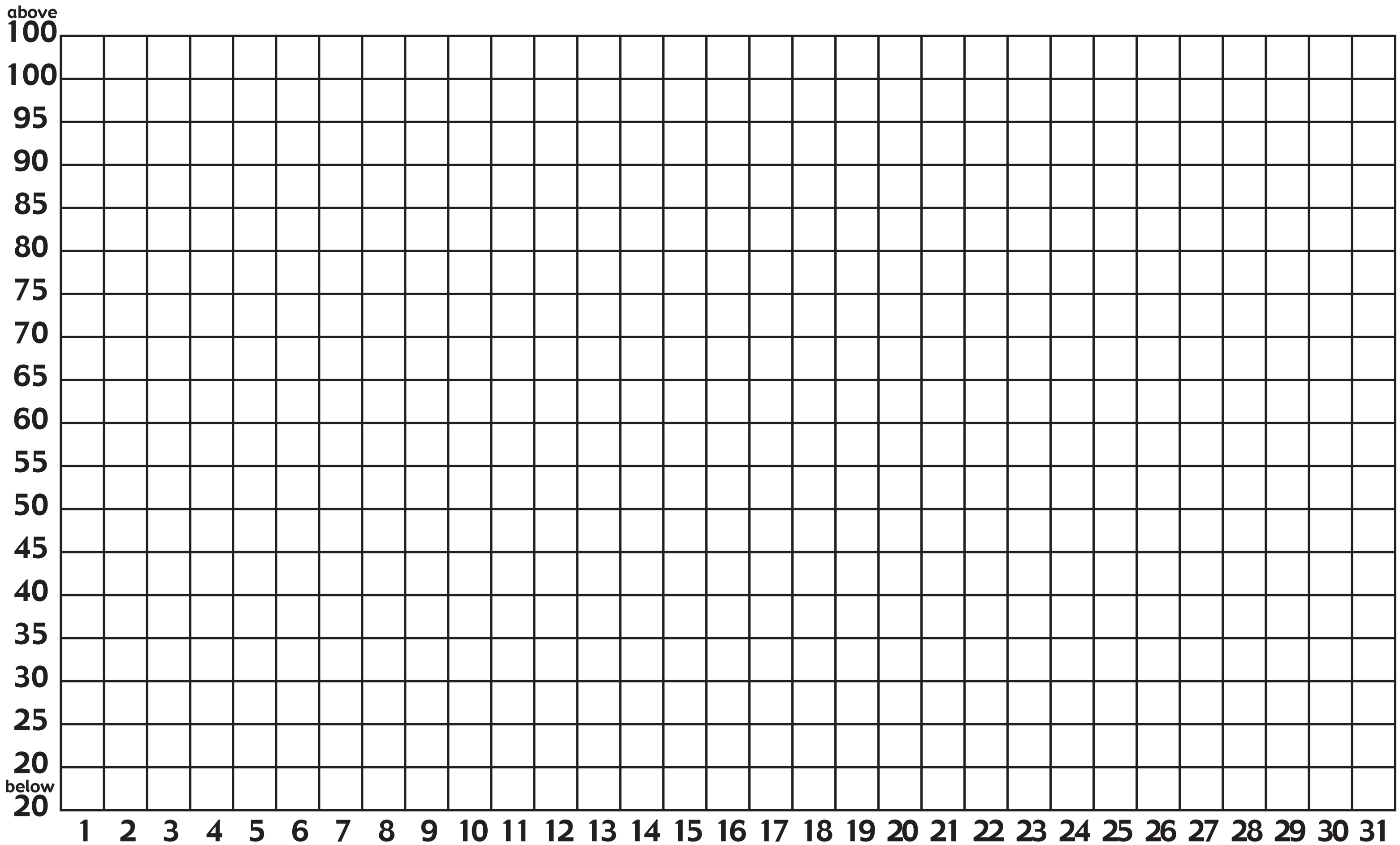
Strawberry	
Cookies & Cream	
Chocolate	
Bubble Gum	

Daily Temperature Bar Graph
September



Daily Temperature Bar Graph

For the month of ______________________________



Which day had the highest temperature? ________________________

Which day had the lowest temperature? ________________________

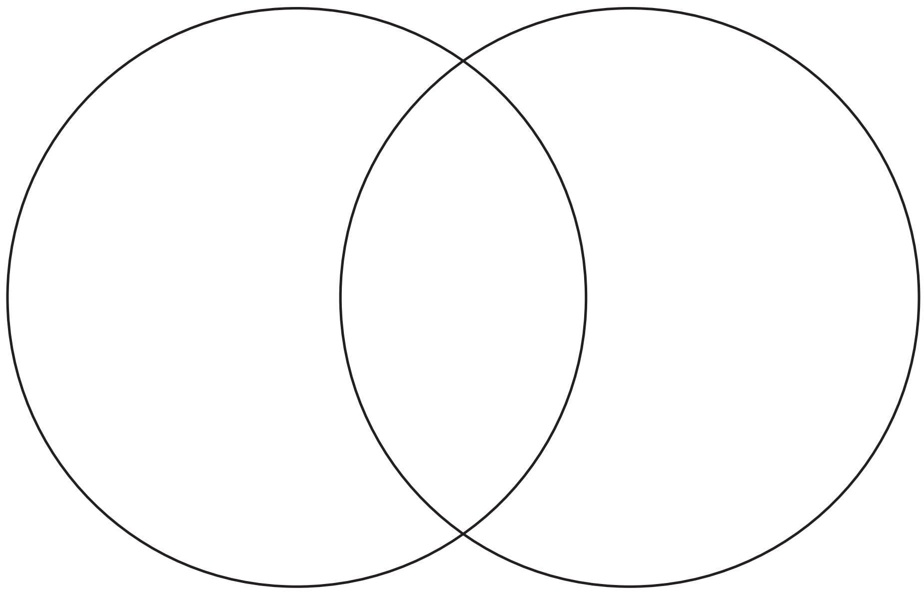
Graph Templates

Venn Diagram

Name ______________________________

Title: ______________________

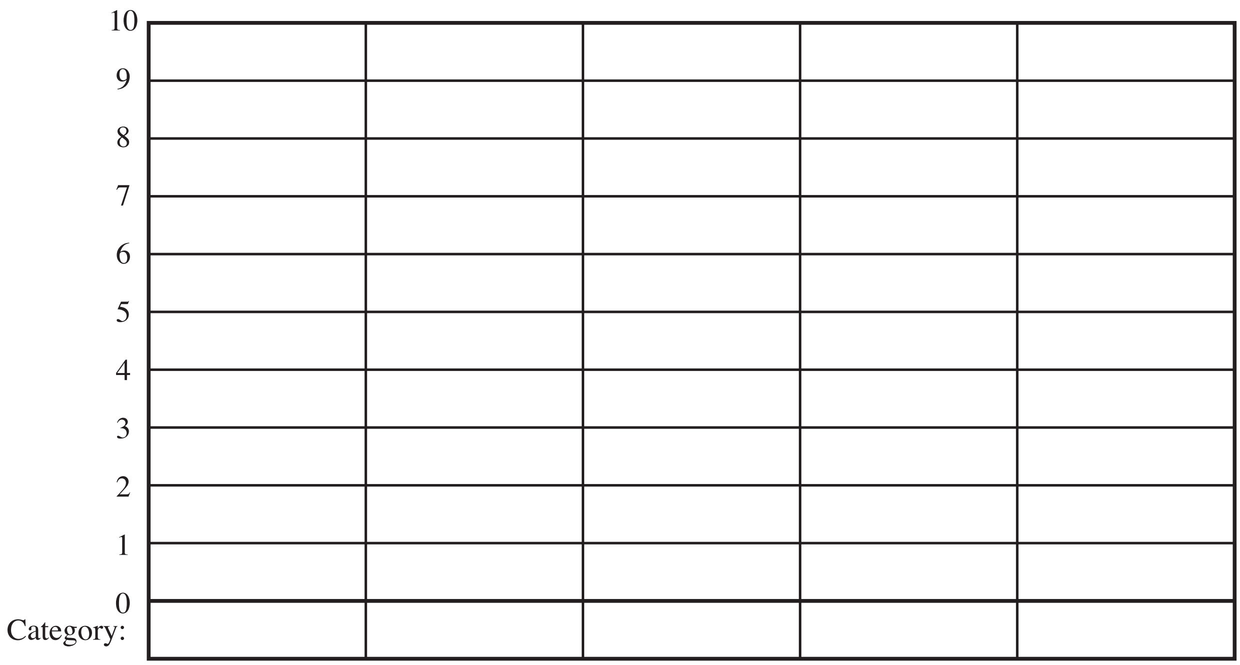
Category 1: ________________ Category 2: ________________



Bar Graph

Name ______________________________

Title: ______________________



Pictograph, Picture Graph, or Tally Graph

Name ________________________________

Title: ___________________________

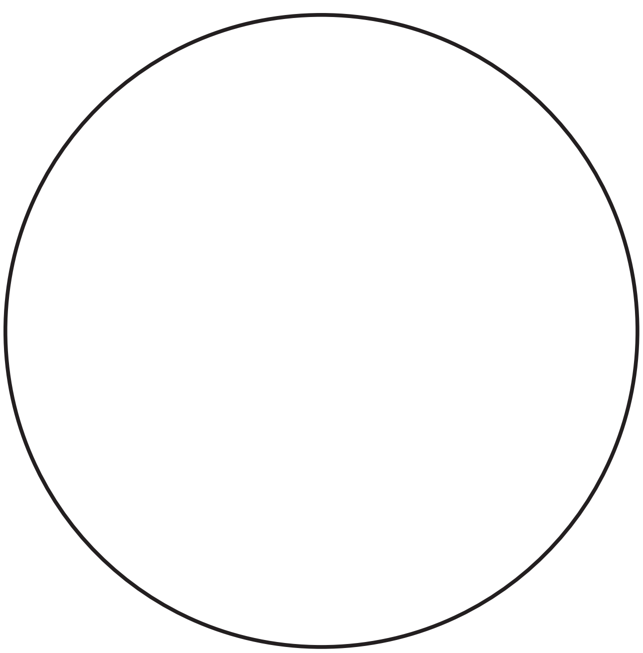
Categories:

Key: ____________ Represents ____.

Pie Graph

Name ________________________________

Title: ___________________________



Key:

☐ ____________________

☐ ____________________

☐ ____________________

☐ ____________________

What's For Lunch?

Value That Number!

Math Standard I

Objectives 1 & 2

Connections

Math Standard I:
Students will acquire number sense and perform operations with whole numbers.

Objective 1:
Represent whole numbers in a variety of ways.

Objective 2:
Identify simple relationships among whole numbers.

Intended Learning Outcomes:
1. Demonstrate a positive learning attitude.
5. Understand and use basic concepts and skills.
6. Communicate clearly in oral, artistic, written, and nonverbal form.

Background Information

Students should recognize the numbers 0 to 999. They will gain an understanding of the place values for ones, tens, and hundreds. This will be accomplished by using a variety of activities.

Students should be able to place sets of numbers in order from least to greatest and from greatest to least.

Invitation to Learn

Every number has a value . . . we just need to figure out where and how to place each number.

Instructional Procedures

Materials
- ❏ *Place Value Holder*
- ❏ *Place Value Digit Cards*
- ❏ *Stack-A-Value Cards*
- ❏ *Who Has the Value?* card set

1. Use the *Place Value Holder* (p. 4-32) with *Place Value Digit Cards* (p. 4-33) to help students create numerals and understand the place value of ones, tens, and hundreds.
2. Use the *Stack-A-Value Cards* (p. 4-34) to help students understand and be able to write the numerals in expanded form.
3. Pass out the *Who Has the Value?* card set (p. 4-38) and have students determine the value of each card.

Four in a Row

This activity emphasizes the value of ones and tens.

Directions

1. This game can either be played in teams or pairs, with each team having their own *Four in a Row Game Board* (p. 4-39).
2. One team rolls both dice at the same time and decides the best place to record the number rolled (e.g., you roll an 8 and a 5—you can record either an 85 or 58).
3. The first team to fill in four numbers in a row horizontally becomes the winner.

   Adaptation: You can insist the numbers be in order from least to greatest or just fill in squares between the specified numbers on the board.

Materials

- ❑ Two laminated *Four in a Row Game Boards* (OR disposable boards with pencils)
- ❑ Two 8-sided dice
- ❑ Fine point dry-erase marker with cloth (if using laminated game boards)

Three Card Draw

This activity helps students recognize the value of ones, tens, and hundreds. It also helps students understand which three digit number is less or greater.

Directions

1. Each player draws three cards and arranges them in order to make the greatest or smallest number possible with the three cards.
2. Whoever can make a number with the designated trait (greatest or smallest) earns a point.
3. The first player to reach ten points becomes the winner.

   This game can be played with two to four players. (The "Ace" can be used as a number 1.)

Materials

- ❑ Digit number cards 0-9

Shoot for the Stars

This activity reinforces the value of ones, tens, and hundreds. It reinforces the concept of ordering whole numbers from least to greatest and from greatest to least.

Directions

1. Each player shuffles and stacks the *Shoot for the Stars Digit Cards* (p. 4-40) face down in a pile next to his/her *Shoot for the Stars Game Board* (p. 4-41).
2. Players take turns flipping a coin at the beginning of each game to decide whether they are trying to build the highest number (heads) or the lowest number (tails).

Materials

For each player:

- ❑ *Shoot for the Stars Game Board*
- ❑ *Shoot for the Stars Digit Cards*
- ❑ Eight small game pieces (e.g., colored marking chips, coins, pieces of paper, etc.)

3. Each player, in turn, draws a card from his/her stack and chooses a rocket to place it on—remembering that the goal is to build either a high or low number which has been previously determined.
4. Players must place the number drawn on what they think will be the best position, even though a better (higher or lower) number may be drawn later. The number may not be moved after it is placed.
5. The game is over when the three-digit number is created.
6. Both players determine who built the highest or lowest number on their game boards.
7. The "winner" places a game piece on one of the letters spelling "Blast Off."
8. The first player to cover all of the letters in "Blast Off" is the winner.

Possible Extensions/Adaptations/Integration

- Activities can be altered for either slower or more advanced students by using only ones and tens or adding thousands in the place value.

Assessment Suggestions

- *Observational*—While students are doing the activities, watch to assess understanding of place value. These activities could be used with an adult volunteer to assess progress of place value knowledge.

Additional Resources

Place Value, Grade 2, by Marsha Elyn Wright; ISBN 0768208211

Lessons for Introducing Place Value (Grade 2 – Teaching Arithmetic Series), by Maryann Wickett and Marilyn Burns; ISBN 0941355454

Place Value Counting, by Donna Burk; ISBN 1886131090

One Hundred Hungry Ants, by Bonnie MacKain; ISBN 0395971233

Let's Find Out About Money, by Kathy Barabus; ISBN 0-590-73803-8

Family Connections

- Have students take one of the activities home to teach family members.
- Have students make a list of their family members to determine whether the age of each family member fits in the ones, tens or hundreds place.
- Have students list the names and ages of each family member in order from least to greatest and then add all of the ages together to determine the combined age.

Place Value Holder

ones		
tens		
hundreds		

Place Value Digit Cards

4	9
3	8
2	7
1	6
0	5

Stack-A-Value Cards

Run each set of value cards on a different color of heavy paper (e.g., the ones on yellow, the tens on blue, the hundreds on red, etc.). Cut each value card apart and fold it in the middle so it will stand up. Then you can start stacking the cards to represent different numbers. This is great to use with the *Place Value Holder* so the student can visually see a representation of the number.

0	1	2	3	4
5	6	7	8	9

1 0	2 0	3 0	4 0
5 0	6 0	7 0	8 0

	9 0

1 0 0	2 0 0	3 0 0
4 0 0	5 0 0	6 0 0

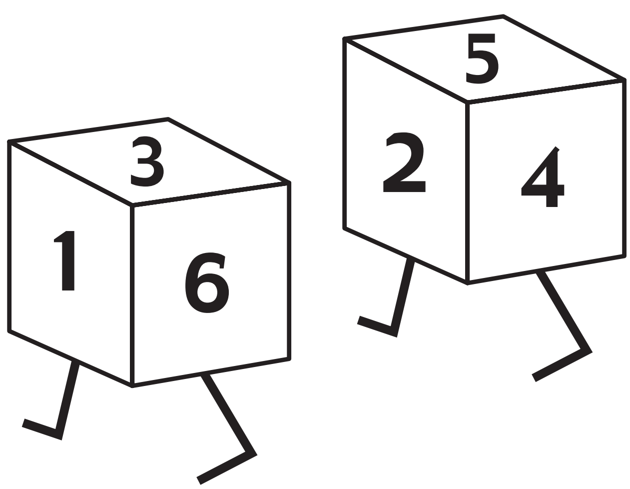
7 0 0	8 0 0
9 0 0	

"Who Has the Value?" Cards—Master List

I HAVE	WHO HAS?
I have 194,	Who has 817?
I have 817,	Who has 361?
I have 361,	Who has 540?
I have 540,	Who has 238?
I have 238,	Who has 81?
I have 81,	Who has 216?
I have 216,	Who has 482?
I have 482,	Who has 639?
I have 639,	Who has 521?
I have 521,	Who has 186?
I have 186,	Who has 455?
I have 455,	Who has 959?
I have 959,	Who has 672?
I have 672,	Who has 411?
I have 411,	Who has 741?
I have 741,	Who has 274?
I have 274,	Who has 862?
I have 862,	Who has 1,000?
I have 1,000,	Who has 316?
I have 316,	Who has 573?
I have 573,	Who has 126?
I have 126,	Who has 921?
I have 921,	Who has 728?
I have 728,	Who has 159?
I have 159,	Who has 350?
I have 350,	Who has 610?
I have 610,	Who has 387?
I have 387,	Who has 194?

Four in a Row Game Board

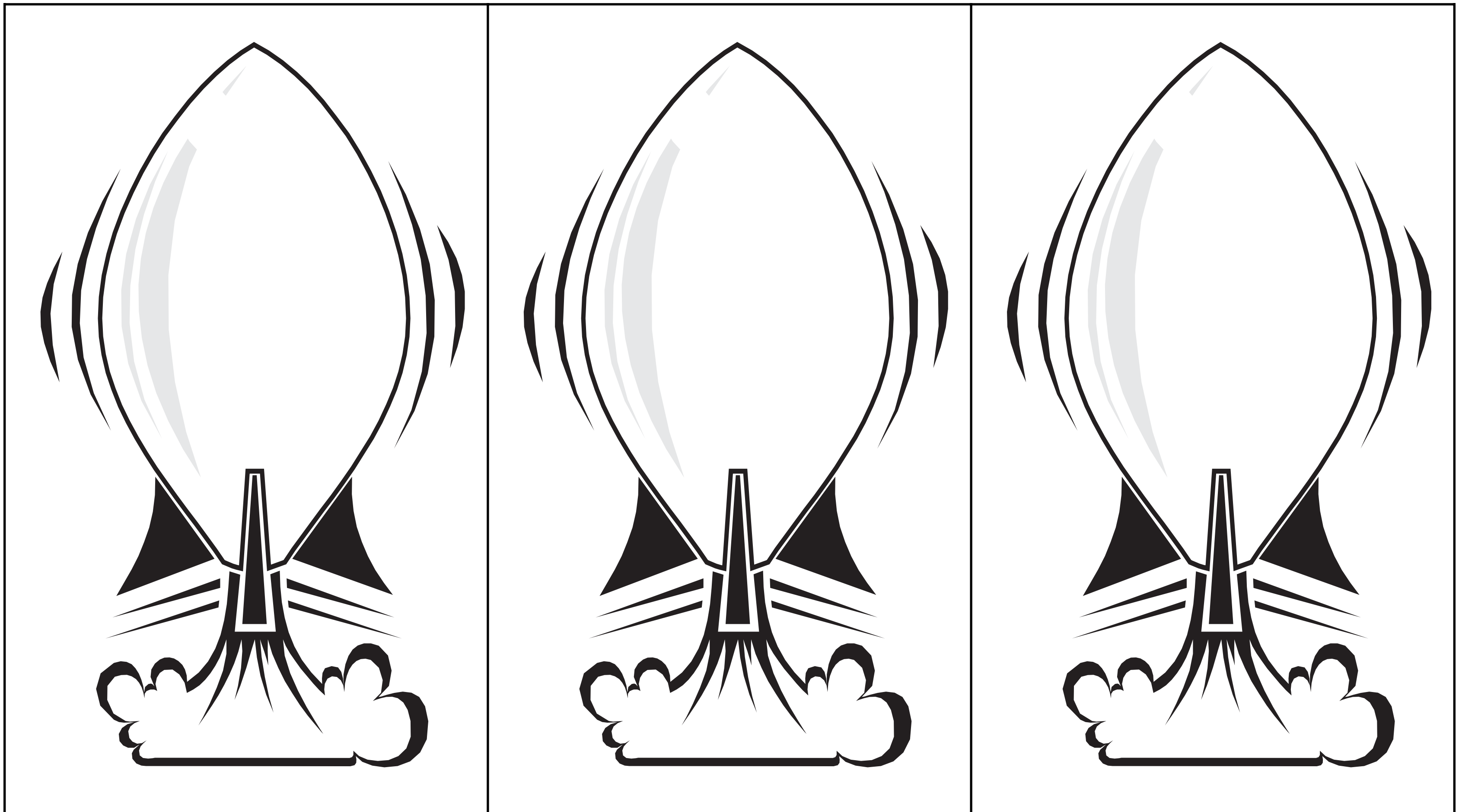
11					**29**
30					**49**
50					**69**
70					**88**



Shoot For The Stars
Digit Cards

0	1	2	3	4	5	6
7	8	9		0	1	2
3	4	5	6	7	8	9

Shoot For The Stars



hundreds	tens	ones

B L A S T O F F !

Content Standard II Activities

My Kind of Friend

Content Standard II:
Students will develop a sense of self in relation to families and community.

Objective 1:
Describe behaviors that influence relationships with family and friends.

Intended Learning Outcomes:
2. Develop social skills and ethical responsibility.
6. Communicate clearly in oral, artistic, written, and nonverbal form.

Content Connections:
Language Arts I-1, 2; Content II-1

Content Standard II

Objective 1

Connections

Background Information

Tacky the Penguin is about a little penguin whose unusual behavior often causes him problems with his friends When Tacky saves the day, his fellow penguins discover that Tacky's unique qualities can make him a wonderful friend. This lesson explores what qualities make a good friend. This is a way to help students become aware of positive and inappropriate behaviors.

Invitation to Learn

Today we are going to talk about what you like and don't like in a friend.

Do you have a best friend? What do you like best about him/her?

Instructional Procedures

Day 1

1. Read *Tacky the Penguin.* (Before beginning, instruct the students to listen and look at the illustrations for examples of Tacky's unusual behavior and his companion's reactions.)
2. After reading, begin a student discussion about Tacky's unusual behavior, recording answers on the appropriate side of the T-chart.

Tacky's Behavior	Problems Created

Next, lead the students into a discussion about the trouble each behavior caused for the other penguin. Record student answers on the T-chart under "Problems Created."

Materials

- ❑ *Tacky the Penguin*
- ❑ T-chart with the words "Tacky's Behavior" and "Problems Created"
- ❑ *Behavior Word Strips*
- ❑ *Tacky Penguin* handout
- ❑ *My Kind of Friend* worksheet
- ❑ Scissors
- ❑ Crayons and a pencil
- ❑ *Word Strips*

3. Let students share how the qualities they possess help them to overcome everyday situations.
4. Give each student a copy of the *Tacky Penguin* handout (p. 5-7).
   - Cut out the penguin along the solid lines.
   - Fold wings as indicated.
   - On the outside of the folded wings, have students write words or phrases that describe Tacky's outward appearance and behavior.
   - Instruct the students to open up the wings and on Tacky's belly, list Tacky's qualities that are discovered when the hunters arrive.
5. Let the students share their penguins. Ask each student to give an explanation for one of the positive qualities that Tacky possessed.
6. Because friends are important, I want you to think about what you like and don't like in a friend.
7. Create a "Good Friends Do These Things" / "Good Friends Try Not To Do These Things" T-chart on the board.
8. Read the *Behavior Word Strips* (p. 5-8). After the class comes to a consensus, place the strips under the appropriate side of the chart.
9. Summarize the lesson.

Day 2

1. Today, we are going to talk a little more about what you like and don't like in a friend. Let's start with "I don't like it when a friend..." (Write statement on board.) What are some of the words I could write under this sentence? Elicit student responses. (Some examples might be put downs, brags, tattles, teases, dishonest, etc.)

   Repeat activity using the statement "I like it when a friend..." (Some examples might be honesty, kindness, talk to each other, do things for each others, share compliments, etc.)
2. Role play different situations in which students demonstrate what they like and dislike about friends (e.g., taking sides, put-downs, arguing with a friend, etc.).

   Select two students to role play.

   First role play—Have the two students pretend to run into each other in the lunch room. Have them get into an argument and say mean things to each other

Second role play—Have the two students pretend to run into each other in the lunch room, but this time they are to be nice to each other.

Ask: How do you think both children felt in the first situation? How do you think both children felt in the second situation?

Remind the students that handling situations in a positive way can make everyone feel good.

3. Hand out *My Kind of Friend* worksheet (p. 5-9). Have students brainstorm as many words as they can that describe the characteristics they like in friends and write them inside their person. Encourage the students to think of as many words as they can.
4. On a previously prepared poster or illustration on the board, duplicate the student worksheet. Ask the students to share one of the things they wrote inside their *My Kind of Friend* person. Write student responses on your illustration.

   If we look at our *My Kind of Friend* illustration, we can get some good ideas about friendship. We could say, "A friend is ____________."
5. What do you think the saying, "A way to have a friend is to be one" means? (student response)

   Try to think of a few ways you can be a friend. (Allow students time to contemplate.)

   Let the students share some of the ways they can be a friend.
6. Summarize lesson. (Remind the students that we talked about qualities we like and dislike in a friend. We also discussed ways in which we can be a good friend to others.)

Possible Extensions/Adaptations/Integration

- *Role Play*—Aesop's fable, *The Lion and the Mouse*. Share the fable with the class. Let the students choose a partner and take turns acting out the roles of the lion and the mouse. This fable is about a friendship between a very unlikely pair.
- Create the words for an original friendship song to a familiar tune (e.g., *Row, Row Your Boat, B-I-N-G-O, The Farmer in the Dell*, etc.).
- Guide the students into taking Tacky on another adventure! Ask the class to brainstorm ideas of another problem that Tacky and his companions could face, such as a polar bear invasion, or a

blizzard. List student ideas on the board. Then have each student use one of the ideas to write a story, emphasizing that it should have a beginning, middle, and ending.

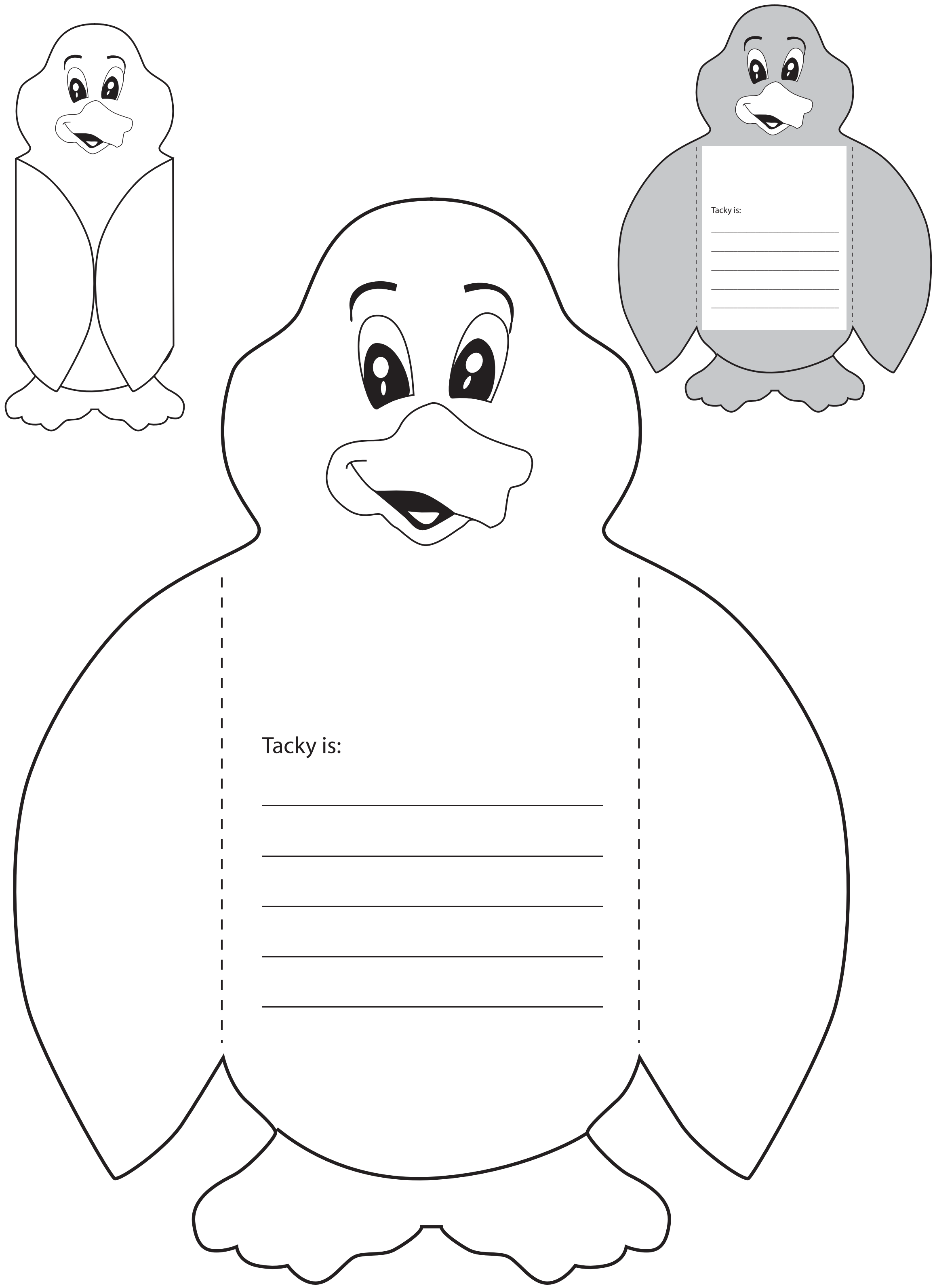
Assessment Suggestions

Assessment is based on teacher observation of student performance and participation.

Additional Resources

Tacky the Penguin, by Helen Lester; ISBN 0-395-45536-7

Tacky Penguin

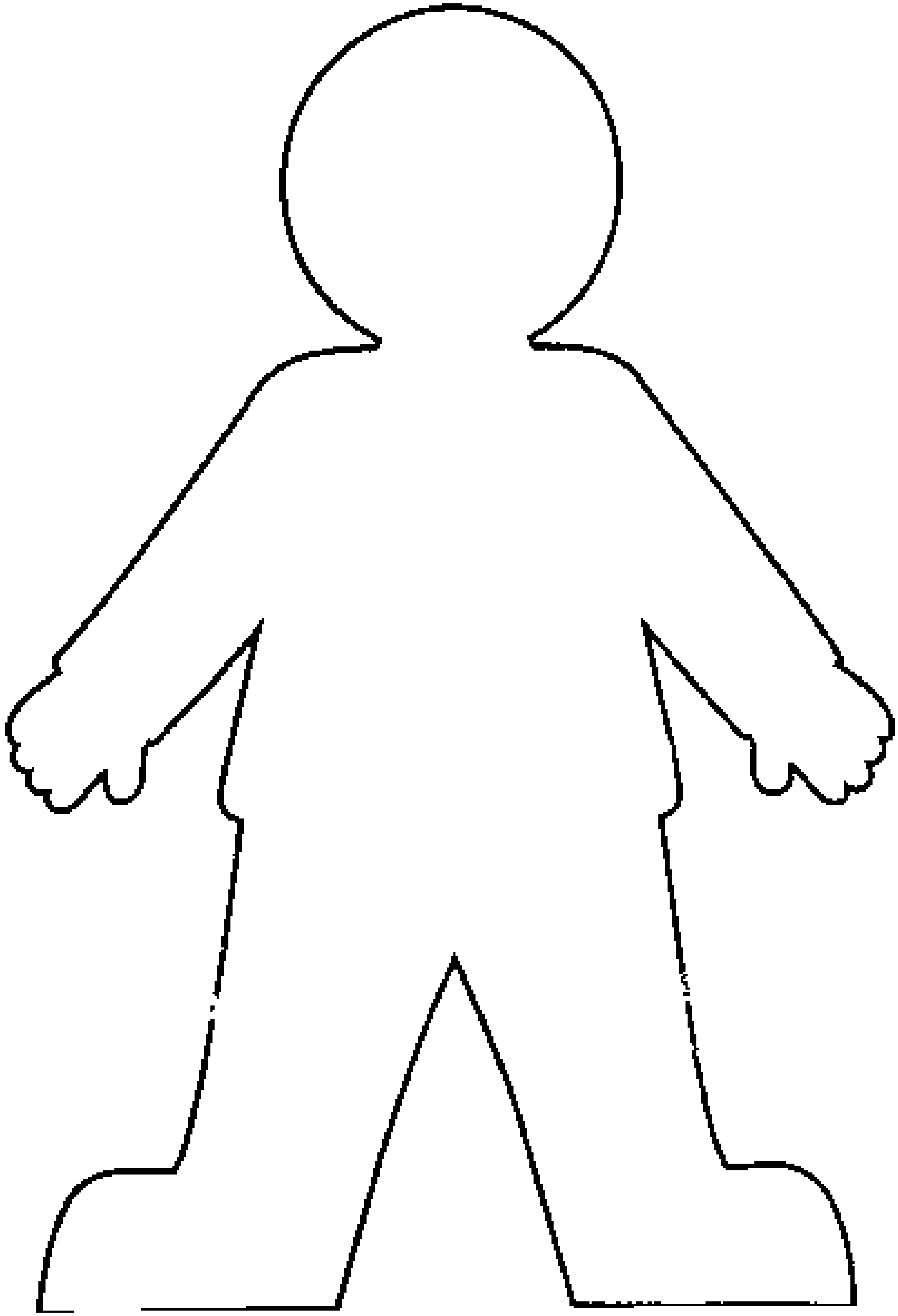


Behavior Word Strips

saying kind words
punching your friend in the stomach
giving a compliment
telling someone to shut up
picking on your little sister
calling someone a bad or silly name
letting everyone play at recess
tattle telling
taking turns with others
helping others

Make additional word strips that are applicable to your classroom.

My Kind of Friend



What Can I Do To Help?

Content Standard II

Objective 1

Connections

Content Standard II:
Students will develop a sense of self in relation to families and community.

Objective 1:
Describe behaviors that influence relationships with family and friends.

Intended Learning Outcomes:
2. Develop social skills and ethical responsibility.
6. Communicate clearly in oral, artistic, written, and nonverbal form.

Content Connections:
Language Arts VII-3

Background Information

While Frederick's family collects nuts and berries for winter, Frederick gathers sunshine, colors, and ideas. When the family's stored food runs out, Frederick is able to contribute to his family in his own unique way. We learn that everyone has a responsibility to contribute and that each person's contribution is important.

Invitation to Learn

Talk about the various groups in which students in your class belong (e.g., families, sports teams, clubs, etc.). Ask several students to choose a group they belong to and tell how they help that particular group (e.g, doing chores, reading to younger brother, babysitting, kicking the ball during the game, etc.).

Instructional Procedures

Day 1

1. Show the students the book, *Frederick*. Tell them that it is a story about Frederick, a little mouse, and his family.

   Let students predict ways Frederick might help his family, such as gathering food for winter or preparing a winter home.
2. Read the book *Frederick* to your students.
3. Discuss the contributions of Frederick and his brothers and sisters to their family. Examine the illustrations to find ways the mice worked together in the story. Did you think Frederick was working when he said he was? Explain. How was Frederick's contribution differs from that of his brothers and sisters?

4. Move the class into a previously prepared "hibernation" space in your classroom. Crowd the entire class into this area. Ask the children to pretend that they are Frederick and his family. Tell them that they are going to spend the whole winter here. What will each one do to pass the time? What can you do to help others feel happy?
5. Are you good at different things than your friends or family?
6. What are some of the ways students in the classroom work together?
7. Give each student a piece of white art paper. Ask them to draw a picture of themselves as a member of their class. In their picture they should show one way they can contribute to make their class a better place.
8. Let students share their illustrations with the class.

Day 2

1. Review the concepts from day one with the class.
2. Tell students that they are going to work in cooperative groups (approximately three students per group). Together they will be writing name poems (acrostic poems) about the various seasons of the year. As a group, they need to pick two seasons they would like to write about and illustrate. Remind them of how important it is that every member of the group contributes to the completion of the assigned tasks. They will be evaluated on how well they contribute their own special gift or talent.

   Acrostic poem

   Write descriptive words or phrases beginning with the accompanying letter from the name of a season (i.e., spring, summer, autumn, winter) using the *Season Acrostic Poem* worksheets (p. 5-13).

   For example: **F**alling leaves
   All over the ground
   Leaves of every color
   Lovely sight to see
3. Have each group complete the project on a large sheet of chart paper.
4. Let each group share their poems. Have each member of the group tell how s/he personally contributed.

Materials

- ❑ *Frederick*
- ❑ Previously prepared "hibernation" area (Create a small space in your room that is barely large enough to hold your class. You can use desks, sheets or blankets, large cardboard boxes, etc.)
- ❑ 9" x 12" sheet of white art paper for each student
- ❑ Large chart paper
- ❑ Pencils and crayons
- ❑ *Season Acrostic Poem* worksheets

Possible Extensions/Adaptations/Integration

- Create torn paper murals depicting the fall or winter. Before you start, discuss the objects you want to include and their colors. Share responsibility in your group for tearing, arranging, and pasting.
- *Journal Writing*—Mice and other animals prepare for winter by collecting food. How do people prepare for winter?

Assessment Suggestions

- Students will be evaluated on their class participation during the discussions and on how well they worked on a cooperatively assigned task.

Additional Resources

Frederick, by Leo Lionni; ISBN 0-440-84093-7

Season Acrostic Poem

S ________________

P ________________

R ________________

I ________________

N ________________

G ________________

S________________

U________________

M________________

M________________

E________________

R________________

A ______________________________

U ______________________________

T ______________________________

U ______________________________

M ______________________________

N ______________________________

W ______________________

I ______________________

N ______________________

T ______________________

E ______________________

R ______________________

Grandma Thinks It's Cake Baking Weather

Content Standard II: Students will develop a sense of self in relation to families and community.
Objective 1: Describe behaviors that influence relationships with family and friends.
Objective 3: Express relationships in a variety of ways.
Intended Learning Outcomes: 5. Understand and use basic concepts and skills. 6. Communicate clearly in oral, artistic, written, and nonverbal form.
Content Connections: Language Arts VIII-6, I-1, VII-2; Content III-2

Content Standard II

Objectives 1 & 3

Connections

Background Information

Thunder Cake is a story based on the author's memories of life on her grandmother's farm in Michigan. It explores a young girl's fear of a thunderstorm and how her grandmother helped her overcome her anxieties.

Invitation to Learn

1. Direct the students to sit in a circle.
2. "Games, in the old days, often helped sharpen skills needed in adult life. Games were also sometimes played just for fun." The *Rain Game* was played along time ago on the Northwest coast by the Native American children who lived there. It rained a lot, and so the children often stayed inside and made up games, often imitating mother nature. One game they made up created the sound of a rain storm.
3. *Rain Game*

   Ask your students what often goes before the rain. (the wind)

   a. **Rub hands together so they make a swishing noise.** *(wind sound)*

   Ask your students what usually comes next. (small drops of rain)

   b. **Slowly begin to snap the fingers of both hands.**
   c. **Continue snapping fingers picking up the tempo. Add a clicking sound with your tongue.** *(Rain is beginning to fall.)*
   d. **Slap hands on your knees.** *(The rain is really beginning to come down.)*

e. **Pound the ground with the palms of your hands.** *(The storm is reaching its climax.)*

f. **Slap hand on your knees a little more quietly.** *(Begin to slightly slow down motions. the storm is beginning to subside.)*

g. **Snap fingers very gently.**

h. **Rub hands forward and back, pressing lightly.**

i. **Stop all movements and sit quietly.**

After the students have learned how to create the various sounds, they are performed starting with the teacher and then continuing around the circle one by one. Each time around the teacher starts the next step. If available, a cymbal can be used at the climax of the storm to create thunder.

After the students have mastered the various steps, it might be fun to have them close their eyes and listen as the storm is created. They love to turn off the lights and do it in a dark room.

Instructional Procedures

Materials

- ❏ *Thunder Cake*
- ❏ Interview form

1. Prompt the students to examine the illustration on the front of the book and read the title. Ask them to predict some of the problems characters might face in this book.
2. Read *Thunder Cake*. Encourage the students to look at the illustrations and describe what is happening.
3. Explain that many years ago farm families provided for many of their own needs, such as growing gardens, raising chickens to lay eggs, animals for providing meat and milk, sewing their own clothes, etc. Sometimes they were able to go to the store and buy some items like wheat or sugar. Stores were usually quite a distance away, so they bought these things in bulk. They often had separate buildings on their farm designed to store these things, such as a smoke house, granary, dry shed, etc. Daily life was very different from ours today.
4. Ask to students to compare how life has changed over the past 150 years. (transportation, food, houses, technology, etc.)

   Draw a chart on the board and list student responses.

Many Years Ago	Now

5. To help students more fully understand how life has changed, assign students to interview a much older relative or neighbor, such as their grandparents or great-grandparents.

   Pass out *Interview Form* (p. 5-20) and explain what they are expected to do.

   Demonstrate an interview for the class, modeling good interviewing techniques (i.e., stating the purpose of the interview, asking questions, listening to the speaker, repeating or rephrasing ideas, recording information).

   Have the students bring their completed *Interview Forms* back and share them with the class.

Possible Extensions/Adaptations/Integration

- Use the information gathered and write a biography for the interviewee.
- Write a personal narrative about a storm they might have experienced. Remind them to tell what the storm was like and how they felt during it.
- Write a poem about a noisy storm.
- Find out about the accuracy of Grandma's method for figuring out how far away a storm is. There are many types of resources available such as books from the library or Web sites on the Internet.
- Invite grandparents or older citizens of the community into your class to share experiences or tell stories.
- Write follow-up letters to the people interviewed.
- Create original dance movement to accompany the rainstorm.

Assessment Suggestion

- Assessment is based upon teacher observation of participation and cooperation and by the completion of their interview form.

Additional Resources

Thunder Cake, by Patricia Polacco; ISBN 0698-11581

Interview Form

1. Name of person interviewed____

2. Their relationship to the student (interviewer)___________________________________

3. Where were you born?____

4. When were you born?____

5. When you were a child what kinds of chores did you do?_________________________

____

____

____

6. What kinds of things did you do for fun when you were a child?_____________________

____

____

7. What do you remember about going to school? __________________________________

____

____

8. What are some of the things that has changed in our world since you were a child?

____

____

____

9. Write down any other things you find interesting during your interview.

____

____

____

____

Math Standards II and III Activities

That's So Square

Math Standard III:
Students will describe, identify, and create geometric shapes and describe spatial relationships.

Objective 1:
Describe, identify, and create geometric shapes.

Intended Learning Outcomes:
1. Demonstrate a positive learning attitude.
5. Understand and use basic concepts and skills.
6. Communicate clearly in oral, artistic, written and nonverbal form.

Content Connections:
Language Arts I-1, 2, IV-2, 3, VI-1, 2, VII-1, 2, 3, VIII-1, 6; Content I-3, II-3

Math Standard III

Objective 1

Connections

Background Information

This activity is meant to help students become more familiar with the three most common types of geometric shapes: circles, triangles and parallelograms. This will take place as the children create the shapes with their bodies and then observe their environment and see the shapes in actual use. The boys and girls will sketch the shapes, which draws attention to characteristics for sorting. Once the drawings are sorted, names can be assigned to the shapes.

This lesson should take one math period lasting approximately one hour. The teacher can lead the activity with the full class or ask parents to work with small groups. (Be careful that groups aren't too small or Procedure 1 will be hard to implement.)

Invitation to Learn

Read *The Greedy Triangle*.

Ask questions and discuss:

1. What did you learn about shapes?
2. Where are shapes found?
3. What role do shapes play?
4. How many different shapes did you see?
5. Are there shapes in our environment?

Materials

- ❑ *The Greedy Triangle*
- ❑ View-thru geometric solids
- ❑ Drawing paper
- ❑ Pencils
- ❑ Scissors
- ❑ A variety of places within the school environment that incorporate shapes (classroom windows, gym and playground circles, etc.)

Instructional Procedures

1. To review basic shapes: Take the students into the gym. Have them stand around a circular line. Ask what shape they have created. Have the students stand on lines forming a parallelogram (square, rectangle, etc.). Ask what shape has been created. Have the children on two sides of the parallelogram move together to form the third side of a triangle. Ask what shape has been created.
2. After returning to the classroom, use geometric solids to show the shapes again. Encourage the students to brainstorm what is unique about each shape (leading to the idea of how each shape can be identified).
3. Give each child a piece of paper. Fold the papers into fourths (or sixths, etc. depending on how many shapes you wish the children to find and draw). Instruct students that they will be taking a walking tour of the school and that they will be drawing some shapes they find. Begin the tour in the classroom and ask students what around them shows a basic shape. As the students name objects (globe, window, blackboard, desk, etc.), have them sketch one or two items. Continue your tour by going through the halls (bulletin boards, signs, etc.) and onto the playground (balls, basketball court, hopscotch squares, etc.)
4. Bring the students back to the room and ask them to cut out the sections of their paper. Divide the students into groups and have them show and explain their drawings to their groups. Tell the students to sort their shapes into circles, triangles and parallelograms. When all the groups are done, have the groups share their work with each other.

Possible Extensions/Adaptations/Integration

- Use the shapes to draw basic animals, faces, etc.
- Draw a building using the shapes.
- Ask the students to write “Concrete Poems” using the shapes.
- For students who are ready, use the shapes to discuss area, arrays, etc.
- While studying rocks, ask students to identify the geometric shape of mineral crystals.
- Work with tangrams.

Assessment Suggestions

- Have students write about their experience in their math journal.
- Create a simple class presentations.
- Interview and/or film the students talking about what they learned.
- Have the students present their work to another second grade class.

Additional Resources

Books

"How to Draw" books

The Greedy Triangle, by Marilyn Burns; ISBN 0590489917

Grandfather Tang's Story, by Ann Tompert; ISBN 0517885581

Web site

National Council of Teachers of Mathematics, www.nctm.org

Video

Math Monsters Episode 5—Geometry (available at www.slimgoodbody.com Item SGVD023 or Amazon.com); ASIN 1887028145

Additional media

Paper crystal shapes folding patterns

An architect, artist, landscaper, etc. to describe how s/he uses shapes.

Family Connections

- The students could lead their family on a shape search and teach their families what they learned.
- Parents could explain how they use shapes every day.
- The family could build something that used geometric shapes.

Dejá Vu

Math Standard II

Objective 1

Connections

Math Standard II:
Students will identify and use patterns and relations to represent mathematical situations.

Objective 1:
Recognize and represent patterns having multiple attributes.

Intended Learning Outcomes:
1. Demonstrate a positive learning attitude.
5. Understand and use basic concepts and skills.
6. Communicate clearly in oral, artistic, written and nonverbal form.

Content Connections:
Language Arts I-1, 2, IV-2, 3, VI-1, 2, VII-1, 2, 3, VIII-1, 6; Content I-3, II-3

Background Information

Patterns are an integral part of life. These patterns become apparent when our senses differentiate the attributes that make up everything around us. Think about the distinguishing attributes of leaves, snowflakes, tiles, pieces of material, habits, poetry, etc. Math uses patterns in a variety of ways (e.g., Fibonacci sequences, attributes of geometric figures, hundreds boards, etc.). It is very important that students know that by recognizing patterns, they are well on their way to understanding mathematics.

This lesson can be done by the teacher alone or with parent helpers to run demonstrations with groups. It can be as simple or as complex as desired (using *Possible Extensions/Adaptations/Integration*). It is suggested, however, that either two math periods, or one math period and one music, language, or art period be used to conduct the entire lesson. (Further extensions could follow.)

Invitation to Learn

1. Read *Math for All Seasons* or *Grandfather Tang's Story*. Look for and discuss the patterns found.
2. Pick several students to come to the front of the class. Brainstorm what they have in common and what is different about them. Use this to introduce the idea of attributes.

Instructional Procedures

Day 1

1. Use overhead attribute blocks to acquaint students with basic attributes (length, size, width, color, shape, etc.).
2. Prepare several identical attribute kits. Divide the class into groups and let them sort (classify) the objects in the kits according to attributes. (The teacher may either designate the required attributes or may allow the students to decide for themselves.) Allow the students to share their group's work.
3. Now that students are acquainted with the idea of attributes, ask students why it might be important to recognize attributes. (For descriptions, to classify or sort things, to recognize how things are alike or different—patterns.)
4. Use five charts, each labeled with a different sense (e.g., sight, sound, etc.). Brainstorm and record patterns that our senses can detect.

Day 2

1. Briefly review the previous day's lesson attributes.
2. Prepare each student with a piece of paper divided into three columns (object, attributes, pattern), a pencil and a clipboard. Take a "pattern walk" through the school. Have the students point out and record objects, attributes and patterns. (Drawings may be used instead of words.) Be sure to point out that smaller patterns may be found within larger patterns. Return to the classroom and summarize the students' findings.
3. Break the students into groups that rotate through the following stations:

   Writing: Point out that patterns can be found in writing. Read some samples of rhythmic poetry. Give the students a simple rhyming pattern to follow and then write a poem. A limerick is a good example of an AABBA pattern:

   I once saw a bird in a tree.
   He was looking down upon me.
   His wings were bright yellow.
   He was quite a fellow.
   I'm glad he was happy and free.

   Music: Ask the students to listen to a simple tune or simple lyrics. Point out that a repeating pattern may be used. If the rhythm repeats, have the students imitate it through clapping.

Materials

- ❑ *Math for All Seasons*
- ❑ *Grandfather Tang's Story*
- ❑ Overhead attribute blocks
- ❑ Attribute kits (Ziploc bag with attribute blocks, tangrams or similar objects)
- ❑ Clipboard
- ❑ Paper: writing and chart
- ❑ Pencil
- ❑ Access to various areas in the school
- ❑ Sample melodies on tape or CD
- ❑ Tile or cloth sample books
- ❑ Copies of people sketches (optional)

Then have the students assign letters or numbers to the notes and write down the pattern. If the lyrics repeat, analyze how they repeat. Old MacDonald is a good example of both types of patterns. If all five verses of the song are sung, the following lines repeat the number of times indicated:

Old MacDonald had a farm	10
EIEIO	15
And on this farm he had a cow	1
With a moo, moo here...	5
And on this farm he had a chicken	1
With a cluck, cluck here...	4
And on this farm he had a dog	1
With a bow, wow here...	3
And on this farm he had a pig	1
With an oink, oink here...	2
And on this farm he had a duck	1
With a quack, quack here	1

Art: View wallpaper, borders, tiles, cloth, posters, jewelry, etc. that show patterns or tessellations. You could note that a tessellation is created by turning, flipping, and/or sliding the shapes. Try creating a simple tessellation.

Science: Take a nature walk and look for patterns in nature.

Possible Extensions/Adaptations/Integration

- Graph the results of patterns or attributes found during the activities.
- Write what has been learned in a math journal.
- Use geometric patterns to create bulletin board borders.

Assessment Suggestions

- Write in math journals.
- Use graphing to record student findings regarding attributes and patterns.
- Create artwork that use patterns (tessellations, snowflakes, etc.).
- Teacher observation.

Additional Resources

Books

Patternables™ Activity Book (Learning Resources, www.learningresources.com, Item LER0336); ISBN 1569119821

Math for All Seasons, by Greg Tang; ISBN 0439210429

Grandfather Tang's Story, by Ann Tompert; ISBN 0517885581

Web site

National Council of Teachers of Mathematics, http://www.nctm.org

National Library of Virtual Manipulatives, http://www.matti.usu.edu

Video

Math Monsters Episode 9—Patterns (available at www.slimgoodbody.com Item SGVD027 or Amazon.com); ASIN 0970823037

Additional media

Tangram patterns

Tesselation patterns/posters

Family Connections

- Look for attribute patterns among relatives.
- Look at patterns used in the parents' work places.
- Help design and/or decorate a room using materials with geometric patterns.

How Coordinated Are You?

Math Standard III

Objective 2

Connections

Math Standard III:
Students will describe, identify, and create geometric shapes and describe spatial relationships.

Objective 2:
Describe spatial relationships.

Intended Learning Outcomes:
1. Demonstrate a positive learning attitude.
5. Understand and use basic concepts and skills.
6. Communicate clearly in oral, artistic, written and nonverbal form.

Content Connections:
Language Arts I-1, 2, IV-2, 3, VI-1, 2, VII-1, 2, 3, VIII-1, 6; Content I-3, II-3

Background Information

From the time we first begin to walk and follow instructions, we place ourselves in "coordinate positions." (Your mother tells you to move left or right, to sit in "that chair," etc.) We simply do not think of these places in terms of coordinates. Later, we use more clearly defined spaces when we are assigned seats in school, positions on a team, etc. Eventually, we learn to use coordinate designations in math, and then use that knowledge for jobs in aviation, archaeology, geology, architecture, art, etc.

This lesson should take two math periods of approximately one hour each. It would be best to use some parent volunteers to coordinate different centers during the activities.

Invitation to Learn

- Read *One Hundred Hungry Ants*.
- Discuss the difference between rows and columns.
- Brainstorm various ways to identify where a certain ant would be in a column or a row. Introduce the idea that it would be helpful to have a way to identify places so that everyone would know what was being talked about.

Instructional Procedures

Day 1

1. Ahead of time, lay out a vinyl graphing mat and spread out objects (candies, counters, balls, etc.) on it. (An area outside can be prepared by using string and stakes to create a grid.)
2. Tell students that they are going to be archaeologists who are going to report on objects (artifacts) that have been found from another community. Take the students to the prepared area and let students observe what is there. Explain that if the objects are moved before they are recorded, no one will ever know for sure what was left by the missing people. (A variation on this would be a detective finding stolen goods and having to report them.) Ask how we could show in detail where the objects were on the floor (or ground). Suggest the use of rows and columns.
3. Ask if there would be a way to create a description of the area so that a person anywhere could know what the mat (ground) looked like with the objects. Praise the idea of using numbers. Also, ask if another person would know whether you were numbering the squares or the lines. Suggest that you keep using numbers, but add something else to make the description more clear. Suggest combining numbers with alphabet letters.
4. Place the placards on the intersections of the rows and columns. Practice using the coordinates by having one student at a time go stand by a coordinate as it is called.

Day 2

1. Show students the completed grids showing animal movements as found in *Mathematickles!*
2. Spread out your vinyl mat. Call on students to place the coordinate placards on the grid. Move a counter on the grid as if it were climbing stairs. Have the students name or record the coordinates for each movement.
3. Reinforce learning by using *Grids and Coordinates* handouts (p. 6-13).
4. Brainstorm what other uses there might be for using coordinates. After the students have offered some suggestions, divide the children into groups. Have each group go to a different station where a parent will show and explain to the children how coordinates are used in a particular way. (Examples: Designations on a chess board, bases on a baseball field, *Battleship*, etc.) Rotate the groups.

Materials

- ❏ *One Hundred Hungry Ants*
- ❏ Vinyl real graph—2 sided mat, string and stakes (outdoor use)
- ❏ Small objects for indoor use
- ❏ Objects the size of baseballs for outdoor use
- ❏ Placards with coordinates [A1, B2, or (1,1), (1,2), etc.]
- ❏ *Mathematickles!*
- ❏ Graph paper
- ❏ Pencils
- ❏ Parent volunteers to coordinate centers
- ❏ Anything that has a geometric shape and can be assigned coordinate points (Chess/checkers board, baseball diamond, etc.)
- ❏ *Grids and Coordinates* handouts

Possible Extensions/Adaptations/Integration

- Create a grid on your classroom floor. Have students seated according to assigned coordinates.
- When lining up students, have them place themselves in position according to an assigned coordinate.
- Change the game *Twister* from colors to coordinates and play the game.
- Have a professional person come who uses coordinates (archaeologist, artist, architect, etc.) and present his/her use of coordinates.

Assessment Suggestions

- Use the *Grids and Coordinates* handouts (p. 6-13).
- Have the students create a simple graph art or string art project.
- Write about what was learned in a math journal.

Additional Resources

Books

One Hundred Hungry Ants, by Elinor J. Pinezes; ISBN 0395971233

Mathematickles, by Betsy Franco; ISBN 0689843577

Graph art books
Graphing Fun, by Vivian and Donald Cook; ISBN 0382293037

String art books
Easy String Art For All Seasons, by Darline Andelin;
ISBN 1568610475

Web site

National Council of Teachers of Mathematics, www.nctm.org

Family Connections

- Ask parents to give the student a city map that uses a grid. Have the students plot out a route and then guide the family to a site by using coordinates.

Name ___________________________________

Grids and Coordinates #1

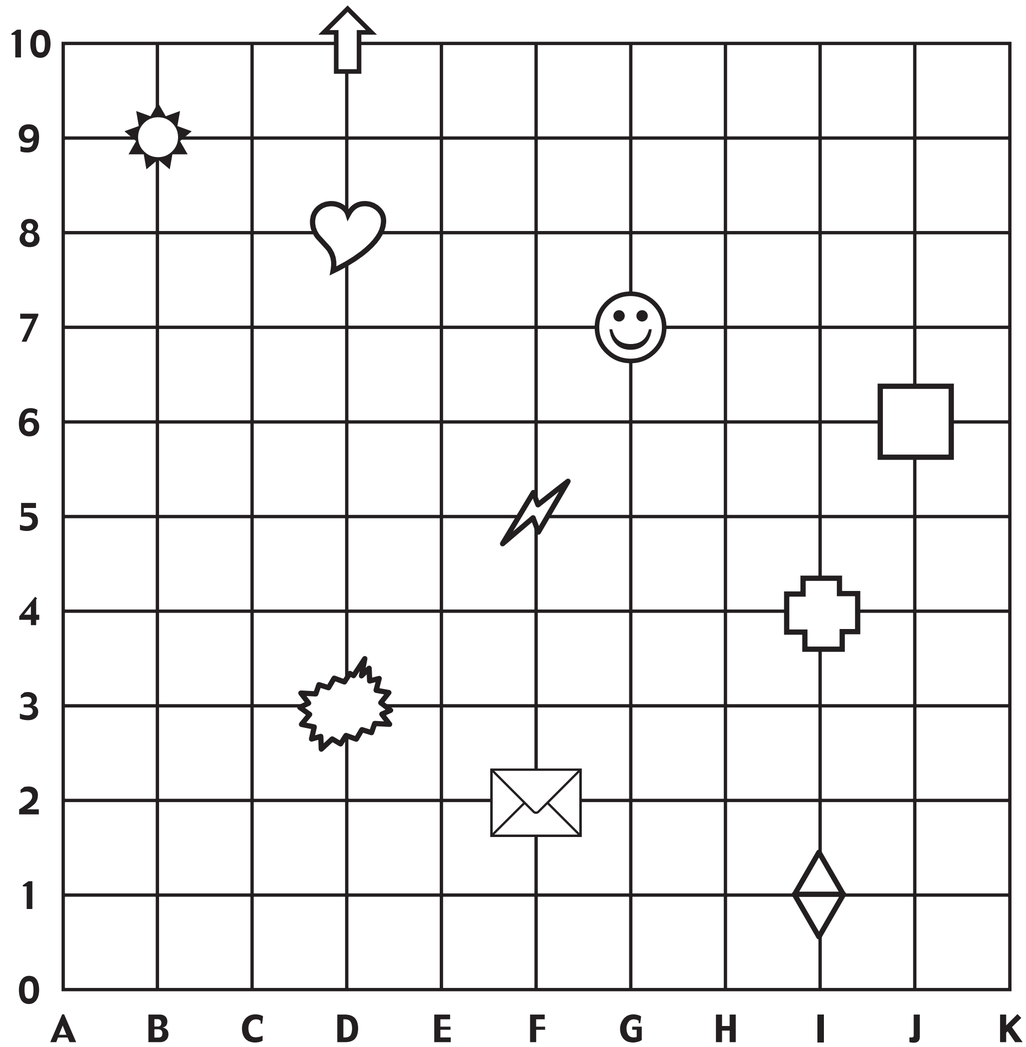
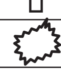


Figure	Across	Up
		
		
		
		
		
		
		
		
		
		

Name ____________________________________

Grids and Coordinates #2

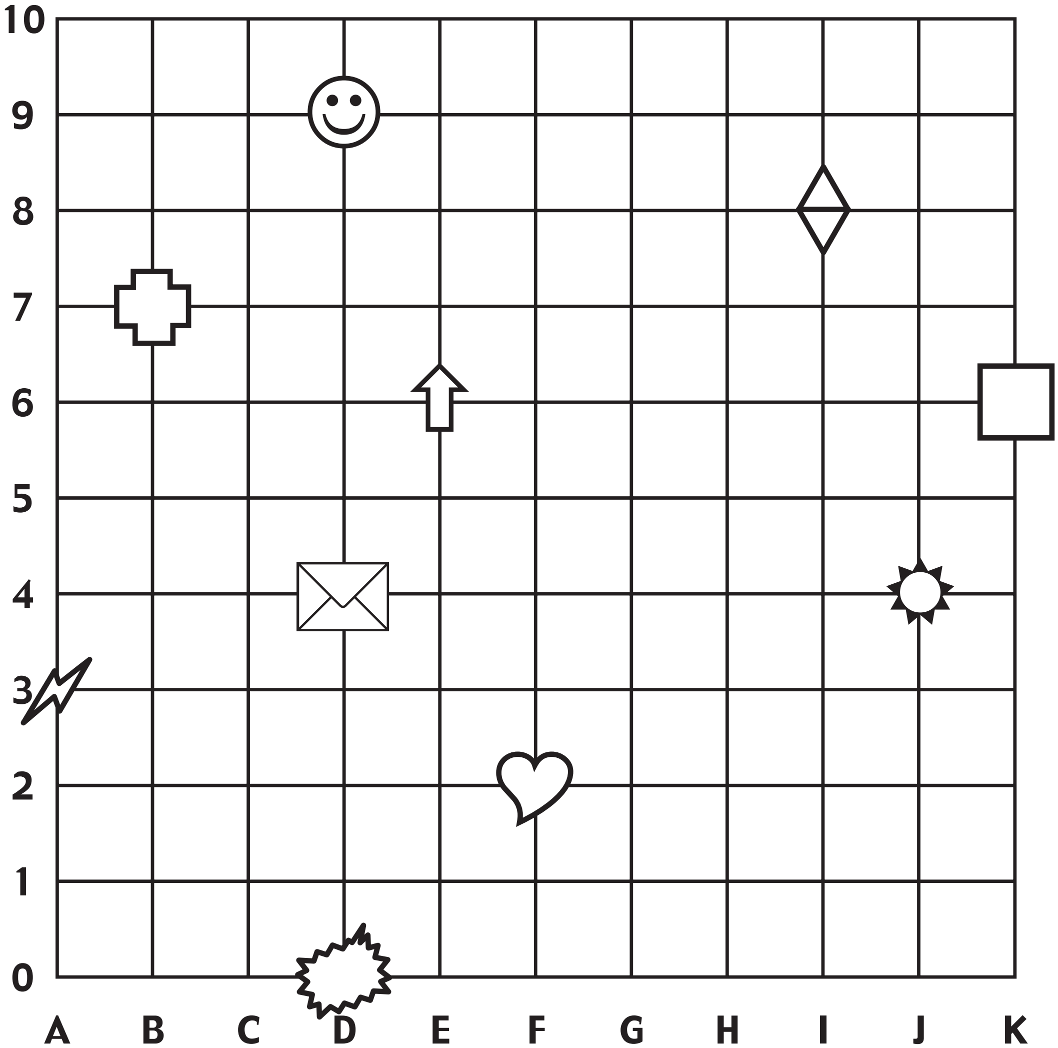
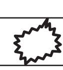


Figure	Across	Up
	E	6
		8
	A	3
	D	
		
	J	
	D	4
		
	F	2
		6

Name ___________________________________

Grids and Coordinates #3

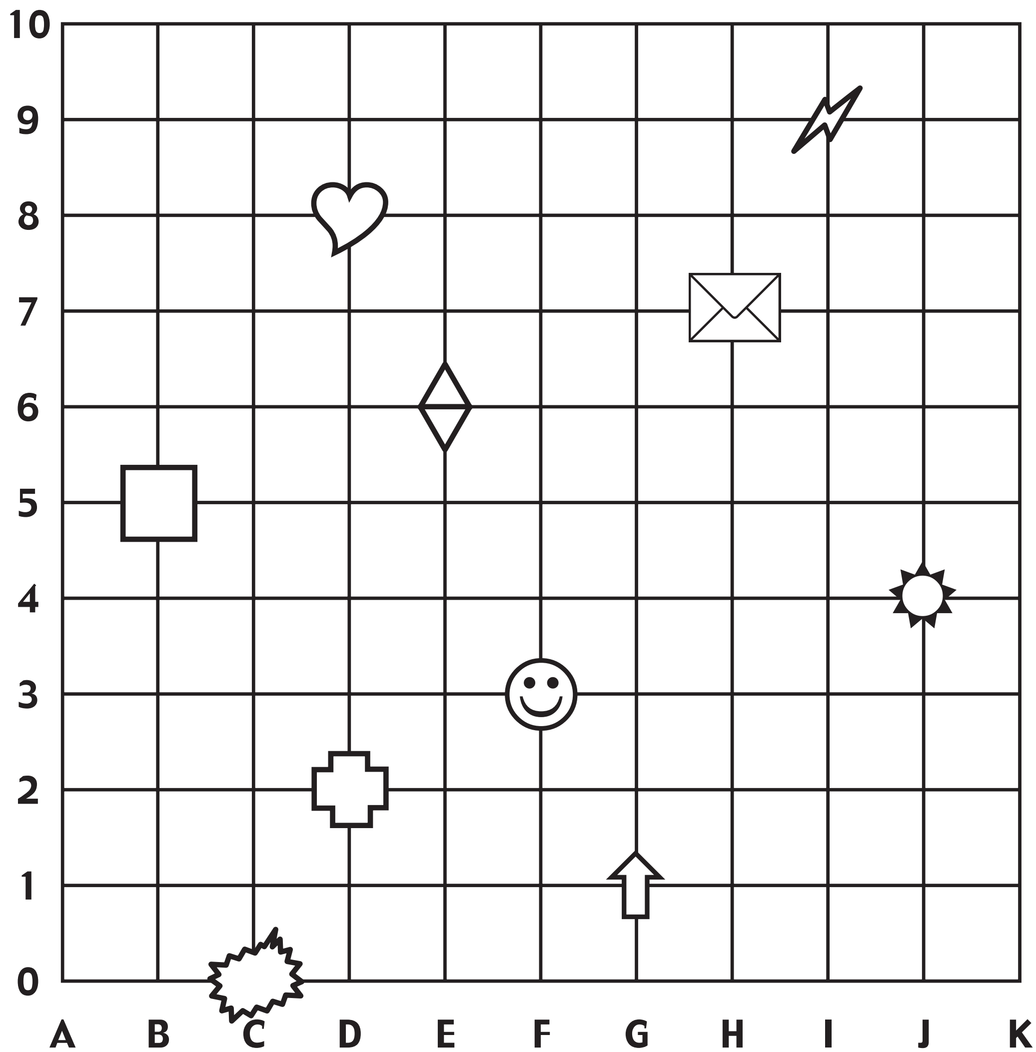


Figure	Across	Up
	E	6
	D	2
	B	5
	J	4
	H	7
	I	9
	C	0
	G	1
	D	8
	F	3

Content Standard III Activities

I Spy

Content Standard III:
Students will develop an understanding of their environment.

Objective 3:
Investigate the properties and uses of rocks.

Intended Learning Outcome:
5. Understand and use basic concepts and skills.

Content Connections:
Content III-4

Content Standard III

Objective 3

Connections

Background Information

All material on Earth can be sorted into three categories—animal, plant, or mineral. Some materials are easily identified, such as dogs, carrots, or rocks. Other materials may be less obvious, such as rubber, glass, and aluminum. These categories can be more specifically defined as living, once living, and nonliving. The availability, and properties of these resources will determine how humans use these materials.

Invitation to Learn

Play a game of *I Spy*. Start by saying, "I spy something that was made from a rock." Let students ask yes/no questions to discover the answer.

Instructional Procedures

1. Pass out magazine pictures to table groups. Have students sort the pictures according to living and nonliving objects. Allow each table to explain why they sorted their objects the way they did.
2. Go on an *I Spy* search on the playground. Students are searching for objects made from rock material—items that are nonliving. When an object is found,students should do the following in their *Rock Journals* (p. 7-5):
   a. Make a rubbing of the item.
   b. Describe the item.
   c. Mark the item on their playground map.
3. When the *I Spy* search is over, take students back into the classroom and compare some of their findings. Be sure to call on any student who found items that may not have been easily identified as rock material (e.g., a metal link from a swing).

Materials

- ❏ Magazine pictures of living and nonliving objects
- ❏ Hand lens for each student
- ❏ Pencil
- ❏ Crayons
- ❏ Clipboard
- ❏ Map of the school playground (can be hand-drawn or aerial satellite photos can be acquired for a small fee at landvoyage.com and intelius.com)
- ❏ *Rock Journal*

Possible Extensions/Adaptations/Integration

- Have students make maps of the classroom or of the school and complete the same activity. Be sure to have them describe the object and label it on their maps.
- Have students make an *I Spy* book by cutting out magazine pictures of living or nonliving items and gluing them into a collage. Using the writing process, students can write the text and put it into a class book.
- If you have access to several technology sources, students could get into groups and create mini collections of objects made from rock material (e.g., keys, paper clips, rocks, coins, thumb tacks, staples, chalk, etc.). Take a digital picture, which could also be used to create a class book in the computer lab. (A regular camera could also be used.)

Assessment Suggestions

Use the first *Rock Journal* as a pre-assessment tool. At the end of the unit, go on another hunt and have the students compare their journals. Were the items they found just simple rocks, or were they were more complicated, less obvious items? Students who can identify material made of metal or glass probably have a solid understanding of this concept.

Additional Resources

Web sites

http://www.landvoyage.com (aerial satellite photos)

http://www.intelius.com (aerial satellite photos)

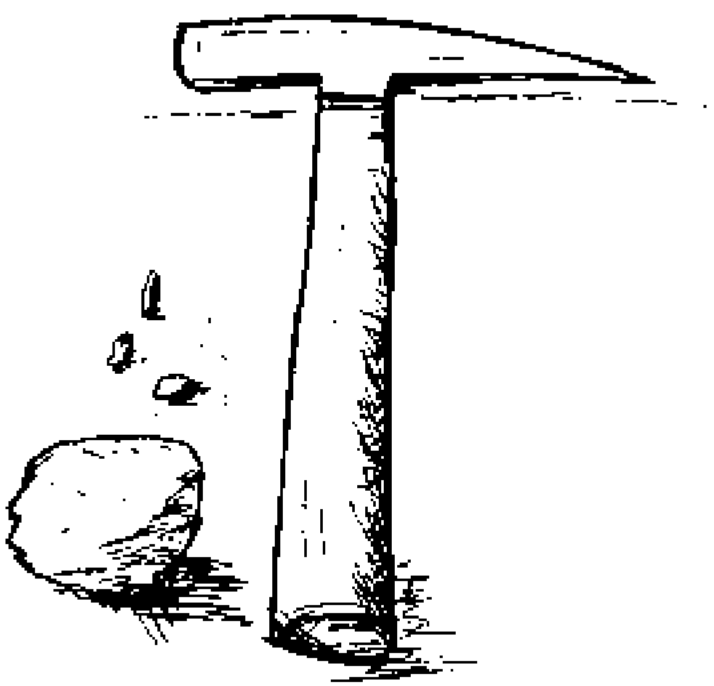
Family Connections

- Students could create an *I Spy* box, bottle, or photograph at home and bring it to class to share.
- Students could make a map of their bedroom and use a symbol to identify items made from rock material.
- With their families, students could go on an *I Spy* hunt around their house. Ask students to bring in or share unusual items found at their homes that were made from rock materials.

_______________’s

Rock Journal

Date Started ___________



______________ School

Use a colored circle to mark each place you found a rock or rock material.

(place map/photo of school here)

Key:

○ = Rock 1 ○ = Rock 2 ○ = Rock 3 ○ = Rock 4

(Use a different colored dot for each rock.)

I Spy Rock Material

Number your rock, make a rubbing of your rock, and describe your rock. Be sure to mark where you found it on the map.

Rock #1

Description of your rock:

Make a rubbing of your rock:

Rock #2

Description of your rock:

Make a rubbing of your rock:

I Spy Rock Material

Number your rock, make a rubbing of your rock, and describe your rock. Be sure to mark where you found it on the map.

Rock #3

Description of your rock:

Make a rubbing of your rock:

Rock #4

Description of your rock:

Make a rubbing of your rock:

Cool Collectibles and Super Sorts

Content Standard III: Students will develop an understanding of their environment.	
Objective 3: Investigate the properties and uses of rocks.	
Intended Learning Outcome: 5. Understand and use basic concepts and skills.	
Content Connections: Math V-1	

Content Standard III

Objective 3

Connections

Background Information

Rocks have many different properties. The properties of rocks will determine how rocks are used. Rocks can be sorted and classified according to their properties. Rock collecting is a popular hobby. Many people enjoy collecting rocks. People who collect rocks for fun are called "rock hounds."

Invitation to Learn

Ask students, "Does anyone have a collection?" "Why do you like to collect _____?" Read *Everybody Needs a Rock* by Byrd Baylor.

Instructional Procedures

1. Explain to students that they will start a classroom rock collection. Explain the general rules:
   a. Rocks should not be purchased at a store.
   b. Rocks should fit in one of the egg carton compartments.
   c. Ask permission before taking a rock from private property.
   d. Try to get rocks from different locations.
2. At this point you may want to decorate your "rock" cartons and put them in an area where they will be safe. When students bring in rocks, allow them to clean them, label them, and put them in their cartons.
3. When everyone has several rocks, it is time to play the super sort. Get in a giant circle. (You may want to do this in the gym.) Ask each student to take off one shoe and place it in the center of the circle. How many ways can the shoes be sorted? Sort them by color, by size, by design, by material, by how they

Materials

- ❏ *Everybody Needs A Rock*
- ❏ Egg carton for each student (Ask students in advance to bring these in. Cardboard egg cartons work best if you want to paint them. Otherwise it doesn't matter.)
- ❏ Rock cleaning station with water, an old toothbrush, and a permanent marker to label rocks with student initials
- ❏ A space to keep the egg cartons
- ❏ Sorting cards
- ❏ Venn Diagram sheets (two circles)

are fastened, etc. Have the students move into groups depending on the shoe that they are wearing. (If you are doing this for a physical education activity, have them use different locomotor skills as they move from group to group, such as skipping, jumping, galloping, etc.) Next, ask what would happen if you decided to sort using two attributes? Hopefully the students will decide to use two intersecting circles—a Venn Diagram. Try a few of those examples such as, black shoes and Velcro®, or white laces and zigzag soles.

4. When the shoe sort is complete, go back to class and try the sort with rocks. Ask the students to brainstorm some attributes of the rocks. Write the attributes on the board or overhead (e.g., speckled, smooth, brown, rough, shiny, striped, black, white, etc.). Have some attribute sorting cards already prepared. Pass them out to the students by table. As a group, ask the students to sort their rocks into the Venn Diagrams. When the groups are finished, have students walk around the room and observe the different sorts. They may repeat this activity several times.

Possible Extensions/Adaptations/Integration

- Once students have completed the activity using a Venn Diagram have them sort their rocks using a bull's eye graph, where the rocks in the center of the bull's eye have all of the attributes of the outlying rings.
- Some students may be ready to try a three circle Venn Diagram. Ask them what happens if they choose attributes that are completely opposite of each other like smooth and rough. Would they be able to put any rocks in the intersecting area?
- For students with special needs you may want to include a picture on each of the attribute sorting cards. For example, if it says speckled, draw an illustration of a speckled rock. You may also want to create a word list to hang in the classroom, which would include the same pictures.
- Using the attribute sorting cards, sort the cards according to hardness, color, texture, layering, and particle size.

Assessment Suggestion

- Students could draw a Venn Diagram in their *Rock Journals*. Have them choose two attributes and draw what a sample rock sort might look like. Be sure to have them label the attributes of each of the circles.

Additional Resources

Everybody Needs a Rock, by Byrd Baylor; ISBN 0-689-71051-8

Grandmas's Button Box, by Linda Williams Aber; ISBN 1-57565-110-6

If You Find a Rock, by Peggy Christian; ISBN 0-15-239339-0

Let's Go Rock Collecting, by Roma Gans; ISBN 0-06-445170-4

Rocks and Minerals Sticker Book, by Alan Woolley (E D C Publications, Spotter's Guide Sticker Books Series); ISBN 0-7460-2999-3

Family Connections

- If you don't have space to clean or store egg cartons, you may want to have the students collect, clean, and label their rocks at home with their family and then bring the completed collection to school in the egg carton.
- Students could bring in rock collections from home for show and tell. If they have a large rock or a precious rock they could display it in the classroom.
- When someone goes on vacation or on a business trip, ask families to bring rock samples to add to the class collection. Be sure to have them label where the rock was located and remind families not to collect rocks in national parks or protected places.

Rock Star Centers

Content Standard III

Objective 3

Connections

Content Standard III:
Students will develop an understanding of their environment.

Objective 3:
Investigate the properties and uses of rocks.

Intended Learning Outcomes:
1. Demonstrate a positive learning attitude
5. Understand and use basic concepts and skills.

Content Connections:
Math IV-2

Background Information

All rocks are made of minerals or a combination of minerals. They are used to make many products. Common minerals, such as graphite, are used to make the lead in pencils, while other minerals are more rare, such as gold and silver. These minerals are often used to make jewelry or money. Common minerals can be identified by looking at some of their properties or attributes, such as color, texture, hardness, and luster.

Invitation to Learn

Tell the students they are going to study a rock star. They each get to choose their own rock star, and then they are going to learn everything they can about their "rock" star.

Instructional Procedures

1. Have each student select one rock from his/her rock collection. Give each student a *Rock Star Journal* (p. 7-16). Put the rock in a bag that is stapled to the front of his/her journal. It is important that they keep it safe and don't loose it. When they are finished you will want to discuss the results and try to determine a good use for their rock.
2. Students will rotate through the different centers and complete tasks to help determine the different properties of their rock. These are the centers:

Materials

- ❏ *Rock Star Journal*
- ❏ Ziploc bags
- ❏ Rock for each student
- ❏ Pencil
- ❏ Center materials
- ❏ Crayons

Center 1—Weight

Students will use a balance scale to determine how heavy their rock is. They may add teddy bear counters, marbles, or some other nonstandard unit of measure to determine the weight of their rock.

Materials
- ❑ Balance scale
- ❑ Nonstandard weights (e.g., teddy bear counters, marbles, etc.)

Center 2—Size and Shape

Students will trace their rock onto their paper. They will also use string to determine the circumference of their rock.

Materials
- ❑ Scissors
- ❑ Ball of sturdy string

Center 3—Hardness

Students will determine how hard their rock is by scratching it with several objects (e.g., fingernail, penny, nail, etc.). If the object does not make a mark, then the rock is harder then the object.

Materials
- ❑ Penny
- ❑ Nail

Center 4—Texture

Students will compare the texture of their rock to varying grits of sandpaper. They will take a small square of the sandpaper that matches their rock's texture and glue it into their journal.

Materials
- ❑ Several pieces of sandpaper with different grits

Center 5—Sink or Float (density)

Students will predict whether or not their rock will sink or float. Have a sample of pumice so students can compare it to their rocks before they test for density.

Materials
- ❑ Container of water
- ❑ Paper towels
- ❑ Sample of pumice

Materials
- ❑ Aluminum foil
- ❑ Glitter or sequins
- ❑ Brown paper sack
- ❑ Wax paper

Center 6—Shiny or Dull (luster)

Students will compare their rocks to pieces of aluminum foil, sparkly sequins or glitter, wax paper, or a brown paper sack. They will take a sample of the one that is most like their rock and glue it in their journal.

Center 7—Color

Students will draw their rock and how it looks on the outside. They should pay close attention to whether or not the rock has layers or multiple colors.

Materials
- ❑ Crayons

3. When each child has had a chance to complete each center, have a short discussion about the findings. Based on these findings, see if they can come up with some ideas for uses of the rock.

Possible Extensions/Adaptations/Integration

- Using the word MINERALS, conduct a "making words" activity. Some possible words and chunks that can be created are: a, an, in, me, ran, man, nail, sail, rail, mine, line, miner, Reams, linear etc.
- Make an interactive writing book about the properties of rocks and their uses. For example, a page may read, "Some rocks are hard. Hard rocks can be used to make tools like hammers and jewelry like diamond rings. Some rocks are soft. Soft rocks can be used to make things to write with like chalk and pencil lead."
- Be sure to include pictures alongside difficult vocabulary words for learners with special needs. You may also want to have students work with partners as they move through the centers.

Assessment Suggestions

- The *Rock Star Journal* is a good indicator as to whether or not the student understood the centers. When the centers are complete, students could also be asked to write a short descriptive paragraph about their rock using information they discovered at the centers.

Additional Resources

Books

Rocks and Minerals, by Dr. R. F. Symes (Eyewitness Books); ISBN 0-394-89621-1

Rocks and Minerals, by Ann O. Squire; ISBN 0-516-22505-9

Gemstones, by Ann O. Squire; ISBN 0-516-22505-7

Investigating Rocks, by Natalie Lunis and Nancy White (Big Book); ISBN 1582730814

Remarkable Rocks, by Ron Cole (Big Book); ISBN 1-56784-221-6

Rocks, Minerals, and Fossils, by Rebecca Hunter; ISBN 0-7398-3250-6

Video

Uses of Rocks and Minerals; ISBN 1-58541-088-8

Web site

http://www.mii.org (Mineral Information Institute)

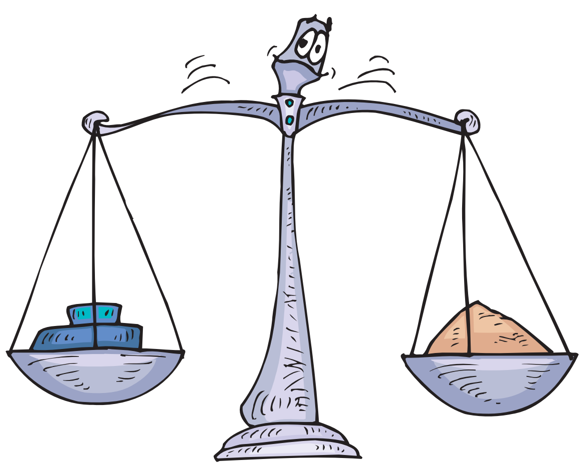
Family Connections

- Teachers could send a short summary of each of the centers home and ask families to test more rocks for hardness, texture, etc.
- Give families the Web site to the Mineral Information Institute. Ask students to look up one of their favorite minerals. Bring in a sample or printed picture.
- Issue a challenge for families to find three kid-friendly Web sites about rocks and minerals.

Rock Star Journal

Name____________________________ Date____________

Center 1—Weight



My rock is as heavy as ____________ teddy bears.

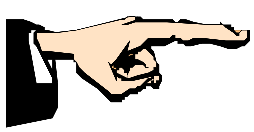
Center 2—Size and Shapes

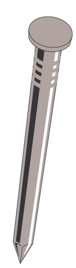
This string will fit around the widest part of my rock.
(Tape string here.)

This is what my rock looks like when I trace it.

Center 3—Hardness

Check each item that scratches your rock.





?

Fingernail _____ Penny _____ Nail _____ Nothing ____

Center 4—Texture

The surface of my rock feels like this.

Glue sandpaper here.

Center 5—Sink or Float

Predict what will happen to your rock when you place it in water. (Color in the box.)

Sink	**Float**

What happened to your rock when you placed it in water? (Color in the box.)

Sink	**Float**

Center 6—Shiny or Dull

The surface of my rock looks like this.

Glue paper here.

Center 7—Color

The color of my rock looks like this:

Be sure to draw any layers or multi-colored areas.

Mineral Munch

Content Standard III

Objective 3

Connections

Content Standard III:
Students will develop an understanding of their environment.

Objective 3:
Investigate the properties and uses of rocks.

Intended Learning Outcomes:
4. Develop physical skills and personal hygiene.
5. Understand and use basic concepts and skills.

Content Connections:
Content I-1; Math V-1

Background Information

Halite, which is also called sodium chloride or salt, is a common mineral found in many products, including food. Salt can be used as a food seasoning and is valuable for preserving meats, especially in hot climates. In the U.S. only about 1% of processed salt is used in food, the rest is used as a deicer for the roads or in the chemical industry. In Roman times salt was used as currency and the English word *salary* actually comes from the Latin word *Sal*. You may have heard that a person is "worth their salt" or the "salt of the earth" meaning they are very valuable and highly praised. The recommended daily allowance of sodium is 2,400 mg.

Invitation to Learn

Explain to students that you would like to invite two students to come to a "mineral munch." The two students who can name the most items in the place setting that are made from rock materials (e.g., plates, silverware, vase, salt and pepper shakers, etc.) will be invited to dinner. Unveil the table for 5 seconds. Then give the class a minute to write down as many items as they can remember. Determine which two students had the most items made from rock material. Invite these students to come to the front of the class and become diners.

Instructional Procedures

1. Serve each of the "diners" a low sodium cracker. Don't tell them it's low sodium. Ask them to describe the taste. Then serve them the regular cracker. Ask them if they noticed any difference. Compare the two crackers. Did they like one more than the other? (Students may not be able to tell the difference—even low sodium crackers still have some added salt.) It is okay if the students like

the lower sodium cracker better. There is no right answer, just a comparison of taste.

2. Allow all of the students in the class to taste the low sodium cracker and then the regular cracker. Can they tell a difference?
3. Discuss some of the benefits and uses of salt. Also discuss some of the problems that can occur if there is too much salt in your diet.
4. Show an overhead of a cereal nutrition label. Point out the sodium content.
5. Explain that when the sodium content is lower, the nutritional value is generally higher.
6. Break into table groups and fill out the *Sodium Content* handouts (p. 7-23) for various cereal nutrition labels. When students are finished, compare results.

Materials

- ❏ Table setting
- ❏ Low sodium crackers
- ❏ Regular crackers
- ❏ Overhead of a cereal nutrition label
- ❏ Cereal nutrition label for each student
- ❏ *Sodium Content* handout

Possible Extensions/Adaptations/Integration

- Compare rocks to a cookie with several ingredients (e.g., chocolate chips, nuts, raisins, M&Ms, etc.). Students can dissect the cookie and divide them into parts. The comparison can be made that chunks of ingredients are the minerals and the remaining cookie parts hold them together—just like real rocks and minerals.
- Using cream, you can make two sets of homemade butter. Salt one set and leave the other plain. Ask the class to see if they can taste the difference.
- Using a cereal with a high iron content like Total, crush the cereal. Add warm water to make a watery mush. Using a powerful magnet pull the iron particles from the cereal by stirring it with the magnet. This is a very visual example of how minerals are found in what we eat.
- For learners with special needs you may want to highlight the sodium line on their nutritional label. Labels can be hard to read and this will help them find the information quickly.

Assessment Suggestions

- Ask students to complete the same activity, but this time look at the calorie count or iron content.

Additional Resources

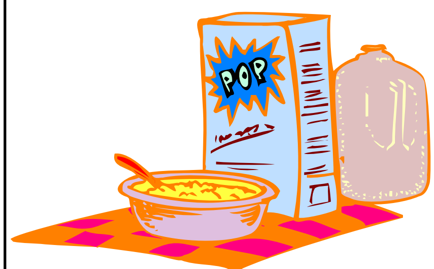
http://www.mii.org (Mineral Information Institute)

Family Connections

- Go shopping with a family member and help determine a low sodium purchase.
- Look at all the cereal in your cupboard. Which cereal has the best nutritional value when you compare the sodium, iron, and calories?
- Try to go a day without adding any extra salt to your meals. How did the food taste? Report back to the class.

Sodium Content

Fill in the table with your group. Using information from the table, answer the questions.

Name	Cereal Name	Sodium Content
		

The cereal with the least amount of sodium is

______________________________.

The cereal with the greatest amount of sodium is

______________________________.

Math Standards I and IV Activities

It's a Fact!

Math Standard I:
Students will acquire number sense and perform operations with whole numbers.

Objective 5:
Solve whole number problems using addition and subtraction in vertical and horizontal notation.

Intended Learning Outcomes:
1. Demonstrate a positive learning attitude.
5. Understand and use basic concepts and skills.
6. Communicate clearly in oral, artistic, written, and nonverbal form.

Content Connections:
Language Arts VIII-6

Math Standard I

Objective 5

Connections

Background Information

There is an order of teaching addition strategies that is beneficial to helping children understand and learn the basic facts. It is:

1. counting on
2. doubles
3. combinations of 10
4. doubles +1
5. bridging 10
6. in-betweens

These same strategies work for subtraction, with the addition of the counting back strategy and fact families.

These strategies should be taught and retaught using many different methods and manipulatives. Herein is not a single lesson, but a compilation of activities for several of the strategies that can be used throughout the year.

Invitation to Learn

Literature is always an enticing way to introduce math concepts. We are fortunate to have an abundance of quality math literature to choose from. Here are a few suggestions of how to introduce these fact strategies.

Concept of Addition and Subtraction

Mission: Addition

Subtraction Action

Counting On

Counting Crocodiles

Domino Addition

Counting Back

Ten Sly Piranhas

Elevator Magic

Doubles

Two of Everything

Double the Ducks

Making Tens

10 For Dinner

Ten Dirty Pigs

Instructional Procedures

Counting On—Count the Dots

Counting on is the first and simplest addition strategy. Children learn to start at one of the addends, which may be a number other than one, and count on from there. Eventually they are able to see the advantage of starting with the largest number and counting on from there. This strategy is most effective when the addends are small: 1, 2, or 3. It can be used with larger numbers, but is not as efficient.

1. Before playing the game, children need to spend some time just rolling the dice (explained in *Materials*) and counting on, starting with the die marked with the numeral, and counting on with the die with the dots. After some experience, ask the class to determine the smallest and largest number that can be rolled with these dice. Then ask them to predict which total they think will come up most often if they roll the dice 30 times. Have them explain their thinking.
2. Give each group one set of dice and one *Count the Dots* worksheet (p. 8-10).
3. One child rolls the dice, another determines the amount, and the third marks the tally by the appropriate number and records the roll. After ten rolls, the children rotate duties so that by the end of 30 rolls each child has participated in each task.
4. After 30 rolls, the children count the tallies for each number and record on the bar graph at the bottom of the worksheet.

Materials

For every group of three children:

- ❏ Two dice (One marked with the numerals 4, 5, 6, 7, 8, 9; the other marked with one dot, two dots, three dots in the formation of regular dice dots.) If blank dice are not available, use 3” x 5” cards to make two sets of the numeral cards and four sets of the dot cards. Place the numeral cards in one pile and the dot cards in another.
- ❏ *Count the Dots* worksheet

5. Record each team's totals on a class graph. Discuss if any team predicted correctly which total would come up most often. Discuss why the graph looks the way it does. Does the class graph look like the individual team graphs? Would it look the same if we played the game again?

Doubles

Doubles are facts in which both addends are the same. Children find the double facts easy to remember. This is an important strategy because the doubles can work as landmark or benchmark facts that can help children to find answers to other related facts, such as doubles + 1 and in-betweens. Doubles + 1 are facts in which one addend is one more than the other (3 + 4, 7 + 8). In-betweens are facts in which one addend is two more than the other; the number in between them is doubled to find the sum (6 + 8 = 7 + 7)

Any game that uses dice can be adapted so that it involves doubles. Simply use one die doubled instead of two.

1. Mirrors and counters can be used to write equations for doubles. Partners put counters in front of a mirror so that both the objects and their reflections are visible. Then they write an equation for what they see.
2. Double dominos can also be used for writing doubles equations.
3. The activity from the 2nd Grade 2003 Elementary CORE Academy Handbook entitled "Our Class and the Magic Pot" is an excellent way to discover doubles. This activity uses the book *Two of Everything*.

Materials

- ❏ Mirrors
- ❏ Dominos

Doubles and Doubles +1: Slap It Fast

Whole Class

1. Spread *Slap It Fast Number Cards* (p. 8-11) in random order, in a pocket chart, or attached to white board.
2. Divide class into two teams. One person from each team comes to the front with a paddle.
3. Caller says a number. Players mentally double the number, find it on the *Slap It Fast Team Board* (p. 8-18) and slap it with the paddle. The first player to slap the number gets a point for his/her team.
4. This activity can be extended to doubles + 1. Players mentally double the number and add 1.

Materials

- ❏ *Slap It Fast* paddles
- ❏ *Slap It Fast Number Cards*
- ❏ *Slap It Fast Team Boards*

For groups of three

For this game, it is a good idea to match children by ability.

1. Two children have mini-paddles, one calls the number.
2. Use the *Slap it Fast Team Boards*.

Combinations of 10

Combinations of ten are any facts that have a sum of 10. These are also landmark facts that can help children find related facts.
(If 7 + 3 = 10, then 7 + 4 = 11)

Materials

- ❑ Egg cartons cut into ten-frames
- ❑ *Ten-frames*
- ❑ Two-sided counters
- ❑ Unifix cubes
- ❑ Playing cards or number cards

1. Egg cartons cut into a ten-frames are helpful in finding combinations of ten when used with two-sided counters (see *Ten-frames* p. 8-28). A counter can be placed in each compartment with the same color showing. Record the equation 10 + 0 = 10. Turn counter in bottom right-hand corner over. Record equation 9 + 1 = 10. Continue turning one counter at a time and recording until all counters have been turned. Ask children if they have found all combinations of ten.
2. The activity above can also be done with 20 Unifix cubes in two colors of ten each. Start with a train of ten in one color and record equation. Trade one cube for a different color and record again. Continue until train is completely the other color.
3. Play concentration with playing cards, using the ace through nine, or number cards zero through ten. Place in a 4 x 4 array. Children take turns turning over two cards at a time. If the sum of the cards is ten, it is a match and the child keeps the cards. The empty spaces are filled with two cards from the draw pile. Play continues until all cards have been matched.
4. Use ten-frame flashcards. Flash a card for three seconds. Use the card in any of these ways:
   - Have students tell you how they “saw” the number.
   - Have students tell you the missing number.
   - Flash two cards. Have students tell you how they recombined the numbers to get the total.

Combinations of 10: Fishing for Tens

Four players

1. Players are each dealt five *Fishing For Tens Number Cards* (p. 8-24). The rest of the cards are spread out into a "pond." Any pairs that total ten are immediately matched and replaced with cards from the "pond." The matched pairs are placed in front of the player to be counted at the end of the game.
2. Players take turns asking each other for a card that will help them make a ten. If the player asked has the card, the player whose turn it is gets another turn. If not, s/he must take a card from the pond.
3. If a card drawn from the pond is the card originally asked for the player gets another turn. If the card makes a ten with another card in the hand, it can be placed in the pile with the other matches but play moves on to the next player.
4. Play continues until all cards have been matched. The player with the most matches is the winner.
5. Each player must then record all their matches in the form of equations on the *Fishing For Tens* worksheet (p. 8-23).

Materials

❑ Playing cards ace through 9 or *Fishing For Tens Number Cards* 0 through 10

❑ *Fishing for Tens* worksheet

Bridging 10

The facts assisted by this strategy are those in which one addend is close to ten (7, 8, 9). In this strategy, the child mentally moves partial value from one addend to the other to make a ten, thus making the fact easier to solve ($5 + 9 = 4 + 10$).

1. The egg carton as a ten-frame can also be used effectively for this strategy.

   Children can build the fact with counters by putting the larger number in the ten-frame and the smaller number outside of it. Then they rebuild the fact by taking counters from the outside number and filling the ten-frame to make a ten.
2. Build a bridging ten tool by stringing ten beads of one color and then ten beads of another color onto a pipe cleaner. Turn up and twist the ends so the beads don't come off. Start with the largest addend and show it with beads. Leave a space and count out the smaller addend. Move the beads of the first color together to show a new fact using ten.

Materials

❑ Egg carton cut into ten-frames

❑ Counters

❑ Pipe cleaners

❑ Beads

Materials

- ❑ Dominos—the higher the number, the bigger variety of practice
- ❑ Dice—the higher the number, the bigger variety of practice
- ❑ Unifix cubes
- ❑ *Dice Fact Families* worksheets
- ❑ *Domino Fact Families* worksheets
- ❑ *Unifix Cube Fact Families* worksheets
- ❑ Triangular flash cards
- ❑ Number cards 0-10
- ❑ *Fact Families* worksheet

Fact Families

This strategy helps children to see the commutative property of addition as well as the inverse operation of subtraction. Children begin to see the relationship between addition and subtraction. The more exposure children have to the two or three numbers involved in each fact family, the more comfortable they become with facts, particularly subtraction facts.

1. Dominos, 12-sided dice, and Unifix cubes are all good manipulatives for exploring fact families. *Dice Fact Families* (p. 8-29), *Domino Fact Families* (p. 8-30), and *Unifix Cube Families* (p. 8-31) worksheets are good practice for each of these tools.
2. Triangular flash cards are also helpful in reinforcing fact families. Each number in the family is written in one of the vertices of the triangle, with the two smaller numbers written in black and the larger number written in red. These may be used in several ways. At first, the children may use them to write 4 equations for the family represented by the card. Later, they can be used to find the missing number by covering any of the vertices.
3. Using two sets of cards numbered from zero to ten, children can work in pairs to draw two cards and fill in the *Fact Families* worksheet (p. 8-32). This activity can also be done with dominos, using each side of the domino as an addend.
4. Use children's names, spelling words, vocabulary words, or special unit words to make fact families—# of vowels, # of consonants, total # of letters.

Possible Extensions/Adaptations/Integration

Writing Connections

Math Journals Entries

1. Write the rules to one of the games you have learned.
2. Write about and describe a favorite strategy for adding and why it works for you.
3. For the *Counting Crocodiles* book: How many crocodiles did the monkey trick? Use words, pictures, and numbers to explain.

Class Books

1. *Two of Everything*—I put ____ in the magic pot and I took out ____.

2. *Elevator Magic*—I'm on Floor____and I want to go down to Floor _____. On that Floor I found______.

For Learners with Special Needs

- Give instructions for games, individually, one step at a time.
- When appropriate, use smaller numbers and gradually increase.
- In *Fishing for Tens* activity, give a "cheat' sheet with combinations of ten.

Assessment Suggestions

- Observation of children while participating in any of the activities.
- Journal entries from *Possible Extensions/Adaptations/Integration*.

Additional Resources

Mission: Addition, by Loreen Leedy; ISBN 0-8234-1307-1

Subtraction Action, by Loreen Leedy; ISBN 0-8234-1454-X

Counting Crocodiles, by Judy Sierra; ISBN 0-1520-0192-1

Domino Addition, by Lynette Long; ISBN 0-590-33027-6

Ten Sly Piranhas, by William Wise; ISBN 0-8037-1200-6

Elevator Magic, by Stuart Murphy; ISBN 0-0644-6709-0

Two of Everything, by Lily Toy Hong; ISBN 0-8075-8157-7

Double the Ducks, by Stuart Murphy; ISBN 0-0644-6249-8

10 For Dinner, by Jo Ellen Bogart; ISBN 0590731734

Ten Dirty Pigs, by Carol Roth; ISBN 0-7358-1569-0

Family Connections

- Teach games to family.
- Teach strategies to family.
- Make a fact family using family members (# of girls, # of boys, total # in family).

Names: ______________________________ Date: __________

COUNT THE DOTS

Which answer do you predict will happen the most often?

5 6 7 8 9 10 11 12

Record the numbers for each counting on problem.

Tally the answer for each counting on problem.

5 ____________________ 9 ____________________

6 ____________________ 10 ____________________

7 ____________________ 11 ____________________

8 ____________________ 12 ____________________

Graph the answers for the counting on problems.

5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			

Slap It Fast Number Cards

1	0

3	2
5	4

7	6
9	8

11	10
13	12

15	14
17	16

19	18
21	20

23	22
25	24

Slap It Fast Team Board

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

Slap It Fast Team Board

12	19	24	20	7
1	14	3	25	2
5	18	15	22	17
4	23	11	16	10
8	13	21	9	6

Slap It Fast Team Board

14	22	2	25	11
6	19	18	4	1
3	9	24	20	12
17	5	10	8	7
15	23	16	13	21

Slap It Fast Team Board

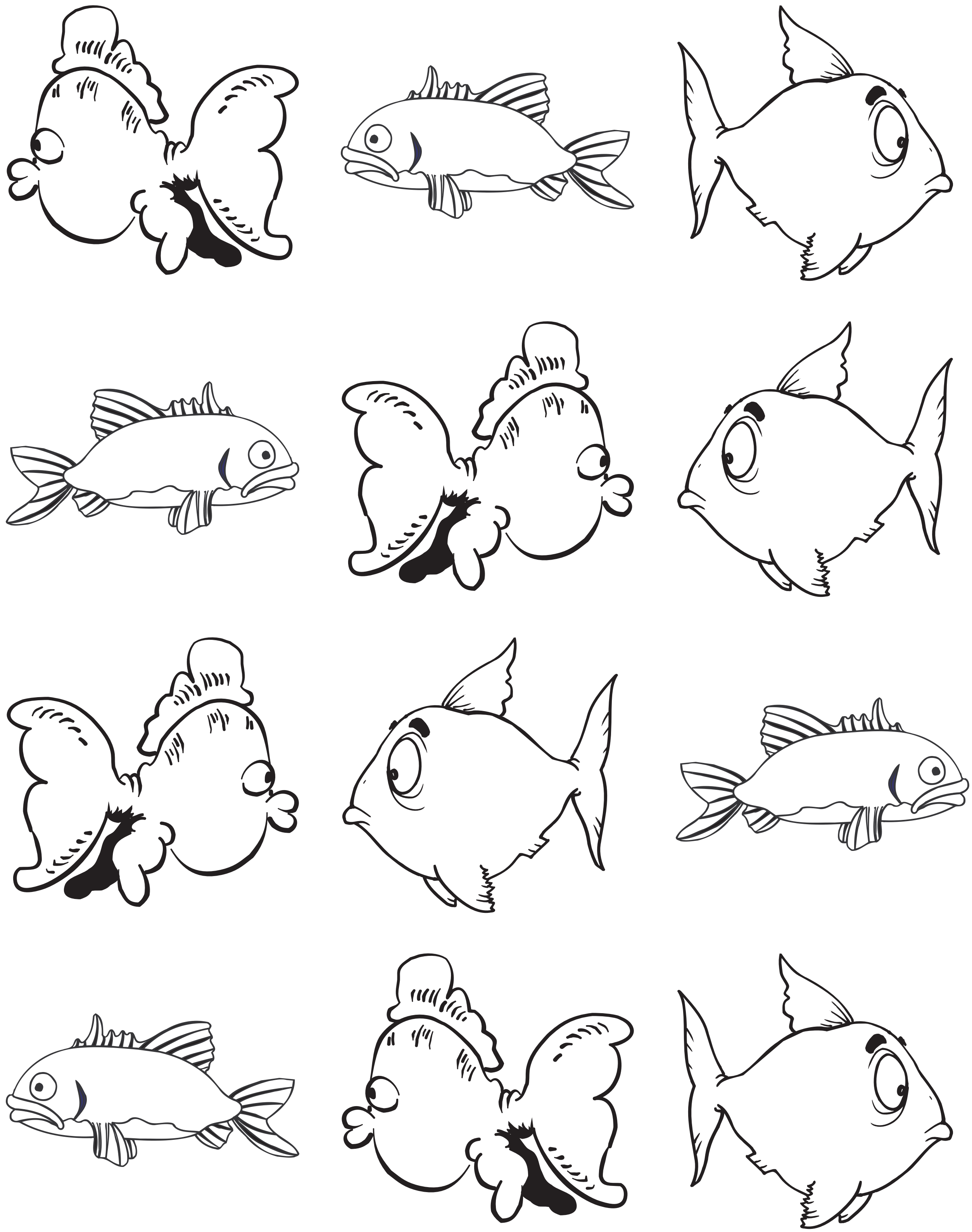
20	3	6	14	4
5	23	18	1	9
10	11	16	21	7
24	8	12	22	17
15	2	25	13	19

Slap It Fast Team Board

2	13	9	4	18
17	7	24	8	14
23	3	16	6	25
15	11	5	20	19
10	22	12	21	1

Name________________________________

Fishing For Tens



Fishing For Tens Number Cards

1	1	1	1
2	2	2	2
3	3	3	3

4	4	4	4
5	5	5	5
6	6	6	6

7	7	7	7
8	8	8	8
9	9	9	9

10	10	10	10
0	0	0	0
W I L D	W I L D	W I L D	W I L D

Ten-frames

Name________________________________ #__________

Dice Fact Families

____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____	____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____	____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____
____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____	____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____	____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____
____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____	____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____	____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____

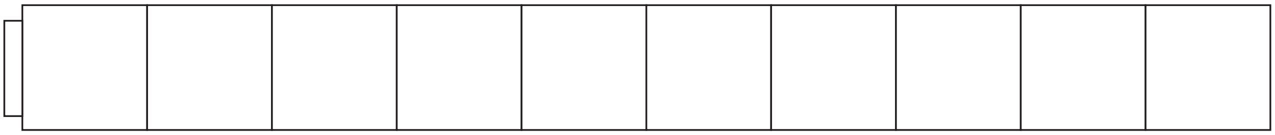
Name ________________________________

Domino Fact Families

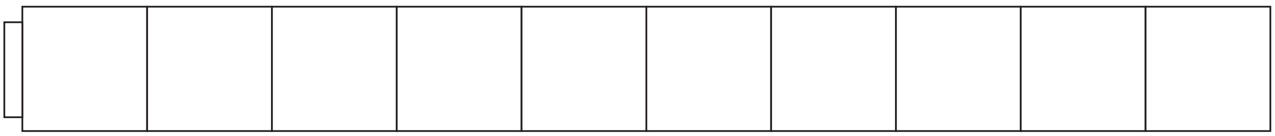
____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____	____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____	____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____
____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____	____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____	____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____
____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____	____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____	____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____

Name________________________________ #_________

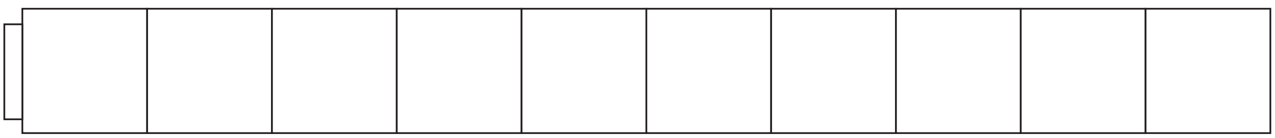
Unifix Cube Fact Families



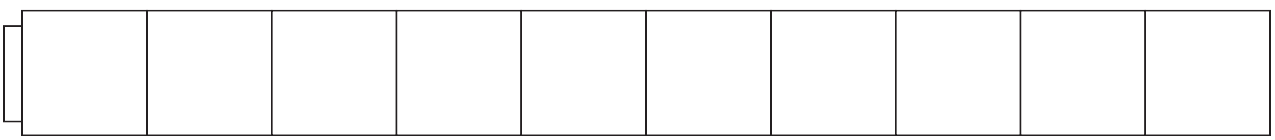
____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____



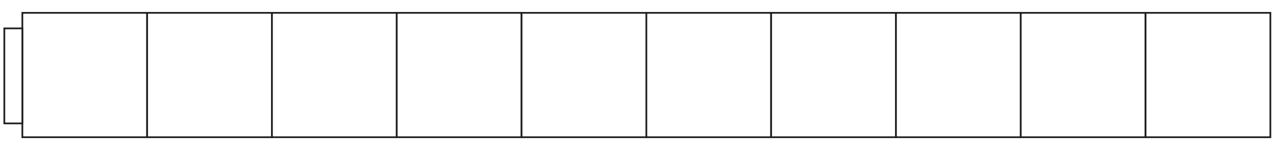
____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____



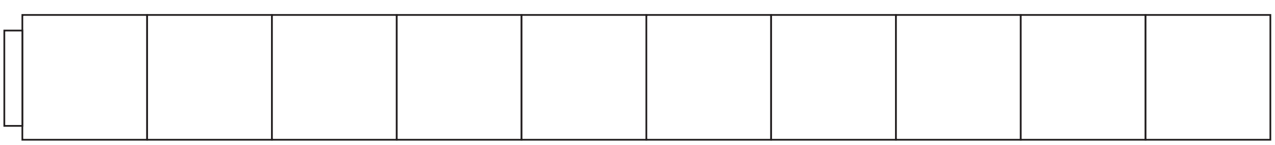
____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____



____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____



____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____



____ + ____ = ____ ____ + ____ = ____ ____ – ____ = ____ ____ – ____ = ____

Name________________________________

Fact Families

Sum	Addend	Addend	Addition Fact	Addition Fact	Subtraction Fact	Subtraction Fact

Measurement Mania

Math Standard IV: Students will understand and use measurement tools and techniques.
Objective 1: Identify measurable attributes of objects and units of measurement.
Objective 2: Use appropriate techniques and tools to determine measurements.
Intended Learning Outcomes: 1. Demonstrate a positive learning attitude. 5. Understand basic concepts and skills. 6. Communicate clearly in oral, artistic, written, and nonverbal form.
Content Connections: Content III

Math Standard IV

Objectives 1 & 2

Connections

Background Information

Measurement allows us to quantify objects, enablling us to compare them. We can determine the height, length, weight, depth, area, temperature, volume, perimeter, area, or capacity of an object. We can predict these things and then check our estimates. Measurement can be done using standard or nonstandard units.

We use measurements almost daily—either estimates or actual measurements.

Invitation to Learn

1. Read a book about the object you are going to measure. For example, read a nonfiction book on apples when you are measuring apples.
2. Read a fiction book on the topic. For example, read *Corduroy* on the day you are measuring teddy bears.
3. Read a story with measurement as its theme such as *Measuring Penny* by Loreen Leedy.

Materials

- ❑ *Measurement Mania Recording Sheet*
- ❑ Manipulatives to match questions on recording sheet
- ❑ Writing utensil
- ❑ Object to be measured (See *Possible Objects to Measure* chart on page 8-37.)

Instructional Procedures

1. Before the lesson, prepare the *Measurement Mania Recording Sheet* (p. 8-38). Choose questions and measuring techniques that 'fit' with the object. For example don't choose a weight question for a paper teddy bear, or a capacity question for an apple. Choose nine questions that will require your students to use techniques you want them to practice. Remember that students need multiple exposures to these techniques to become proficient.
2. Set up the classroom or center with the manipulatives your students will need.
3. Do a quick review of what is required for each question. You can have students estimate all nine answers first and then check them, or estimate and check each question one at a time. Having students use colored pencil or crayon can help with those students who want to change their estimates after they know the answer.

Possible Extensions/Adaptations/Integration

Integration

Bring in objects to measure that you are studying in other curriculum areas (e.g., measure rocks, plants, students, etc.). The setup of the recording sheet lends itself to many different objects. Pick almost any subject to integrate with this measurement activity.

Writing Connections

Have students write about and describe their objects. This is a great time to talk about adjectives.

For example, certain measurement objects lend themselves to creative writing. Students can write a story about the monster or teddy bear they create.

For Learners with Special Needs

1. Have students skip the estimations until they have had plenty of practice with measuring.
2. Have students work with a partner who can review the directions.
3. Visit students at each station to review procedures.
4. Eliminate a couple of questions for students who take more time.
5. Use the student's object for the example at the beginning. Let that student make their estimations as you go.

6. Make a separate recording sheet for that student. Make most of the questions a review. Let them practice things they have had exposure to. Then add one or two questions that will introduce them to new ways of measuring.

Assessment Suggestions

- Keep recording sheets throughout the year. Check to see if the student's measurement estimates are improving.
- Compare answers of students when they are measuring very similar items. Watch students who get very different answers the next time they measure. Review concepts and give them practice.
- Observe, observe, observe. Measuring is hands on; watch how your students handle the tasks on the recording sheet.
- Have students journal about measurement.
  1. What is measurement?
  2. Why do we have standard measurements?
  3. How do you choose what to measure with?

Additional Resources

Books

Corduroy, by Dan Freeman; ISBN 0670241334

Measuring Penny, by Loreen Leedy; ISBN 0-8050-5360-3

A Pig Is Big, by Douglas Florian; ISBN 0-688-17126-5

The Grouchy Ladybug, by Eric Carle; ISBN 0064434508

Super Saturday Sand Castle, by Stuart Murphy; ISBN 0-06-446720-1

Room For Ripley, by Stuart Murphy; ISBN 0-06-027620-7

Racing Around, by Stuart Murphy; ISBN 0-06-028913-9

How Tall, How Short, How Faraway, by David A. Adler; ISBN 0823416321

Web sites

http://www.nctm.org

Virtual Manipulatives, http://matti.usu.edu/nlvm/nav

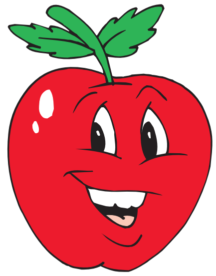
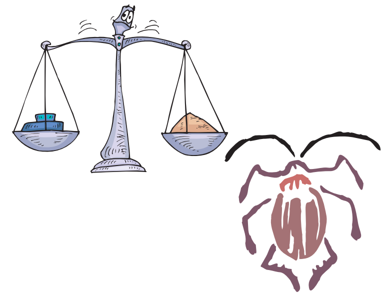
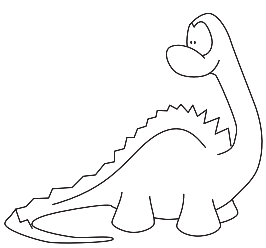
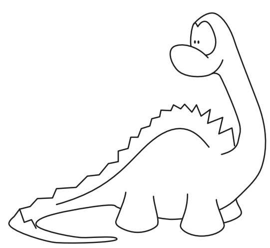
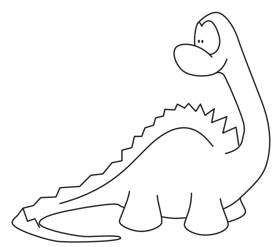
Family Connections

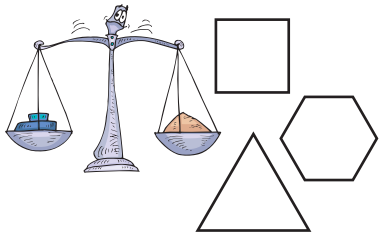
- Have students 'teach' their family how to measure with nonstandard units.
- Have students order and compare some of their toys (like stuffed animals). Have them chart or graph the information. Tell them the comparison you want them to make (e.g., size, height, weight, length, etc.).
- Make a recording sheet for homework. Have students answer all questions about a specific object like the Kool-Aid® pitcher, Dad's shoe, the kitchen table, or the sink. This is a great place to include capacity using water. Students get to practice with parent supervision and you don't have 25 wet students or wet carpet in the classroom.
- Have students find and list ten things from home that are about the same length. Remind them to make a guess first, then check.

Possible Objects to Measure

Sample Measurement Tools	Possible Objects to Measure (Items that each student may have.)	Other possible objects to measure (Larger items for use in a center.)
• Unifix cubes • Links • Rulers • Measuring tape • Graph paper • Blank paper • Inch worms • Straws • Popsicle sticks • Beans • Measuring cups • Measuring spoons • Scoops • Pattern blocks • All sizes of cubes • Yarn or string • Balances • Tiles • Beads • Bears • Scales • Sand, rice, or popcorn	• Apples • Leaves • Gourds • Rocks • Hands (traced) • Construction paper teddy bears • Construction paper monsters • Construction paper object that corresponds to current unit or lesson • Kiss print • Plastic animals • Assortment of crackers • Shoes or slippers • Students' own heads • Students (outline on butcher paper) • Vegetables or fruit • Shells • Popcorn balls • Stuffed animals • Books • Balls (small enough to hold in hand—no bigger than a baseball) • Wristwatches • Sunglasses • Hats • Items linked to a book (A chocolate bar after you read T*he Chocolate Touch*) • Plastic containers (buckets, cups, bowls, food containers etc.) • Lids • Pine cones	• Pumpkin • Styrofoam snowman • Seasonal shaped candy dishes (plastic) • Class mascot (stuffed animal) • Easter basket • Fake plant • Vase • Globe • Containers (all sizes that will hold liquid) • Laundry basket • Ice cubes (for use in small groups—freeze in different sized containers) • Cat tail (or other interesting plant) • Kite • Pop bottle • Hat • Large poster characters (like a large Halloween skeleton)

Measurement Mania Recording Sheets

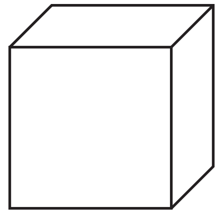
 **Mine will be _____ in line.** estimate _____ actual _____	 **I can eat mine in _______bites.** estimate _____ actual _____	 **How many bugs weigh the same?** estimate _____ actual _____
 **How many bugs wide?** estimate _____ actual _____	 **How many bugs tall?** estimate _____ actual _____	 **How many bugs long?** estimate _____ actual _____
 **How many animals long?** estimate _____ actual _____	 **How many animals tall?** estimate _____ actual _____	 **How many animals wide?** estimate _____ actual _____



How many pattern blocks weigh the same?

estimate ______

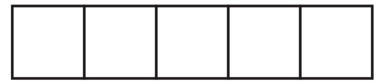
actual ______



How many cubes equal the same height?

estimate ______

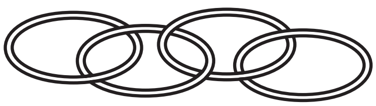
actual ______



How many tiles would be as long as this is around?

estimate ______

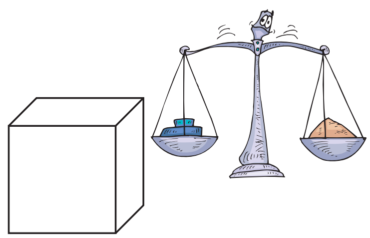
actual ______



How many links would it take to go around?

estimate ______

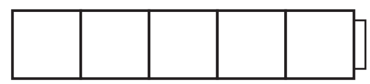
actual ______



How many blocks weigh the same?

estimate ______

actual ______



How many snap cubes would it take to make a cube about the same?

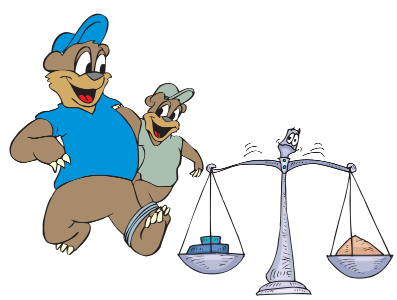
estimate ______

actual ______

How many beads would it take to go around?

estimate ______

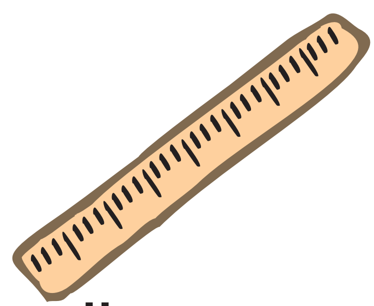
actual ______



How many bears weigh the same?

estimate ______

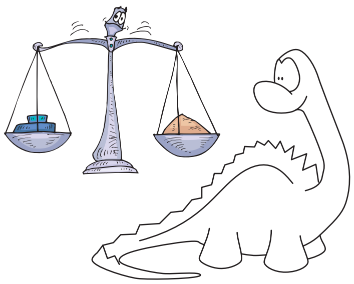
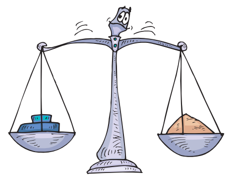
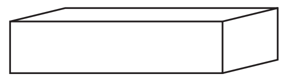
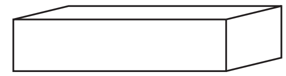
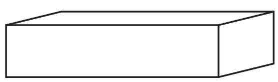
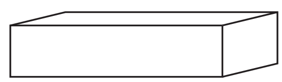
actual ______

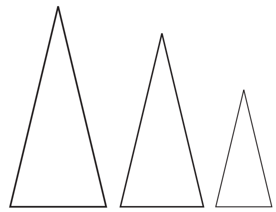
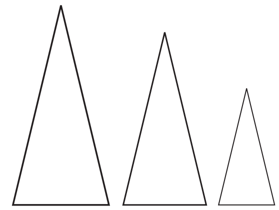
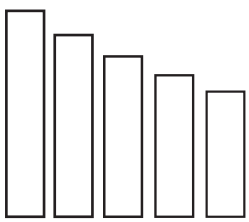
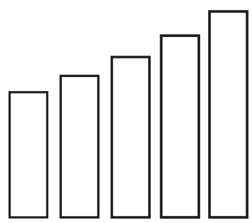
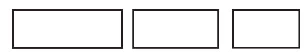


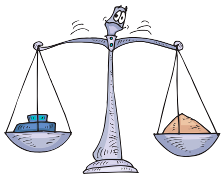
How many inches around?

estimate ______

actual ______

 **How many animals weigh the same?** **estimate** _____ **actual** ______	  **How many erasers weigh the same?** **estimate** _____ **actual** ______	 **How many erasers wide?** **estimate** _____ **actual** ______
 **How many erasers tall?** **estimate** _____ **actual** ______	 **How many erasers long?** **estimate** _____ **actual** ______	**How many _________ wide?** **estimate** _____ **actual** ______
How many _________ long? **estimate** _____ **actual** ______	**How many _____________ weigh the same?** **estimate** _____ **actual** ______	**How many _________ tall?** **estimate** _____ **actual** ______

Mine is ______ than ________. **True ____** **False _____**	 **________________** **is the biggest.** **True ____** **False _____**	 **________________** **is the smallest.** **True ____** **False _____**
 **________________** **is the tallest.** **True ____** **False _____**	 **________________** **is the shortest.** **True ____** **False _____**	 **________________** **is the shortest.** **True ____** **False _____**
________________ **________________** **________________** **estimate ____** **actual _____**	**________________** **________________** **________________** **True ____** **False _____**	**How many** **________________** **will cover it?** **estimate ____** **actual _____**



How many pounds does it weigh?

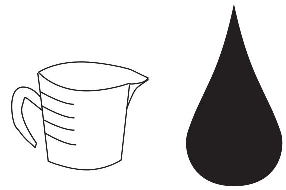
estimate _____

actual ______

How many cups of beans will it hold?

estimate _____

actual ______



How many cups of water will it hold?

estimate _____

actual ______

How many cups of rice will it hold?

estimate _____

actual ______

How many scoops of beans will it hold?

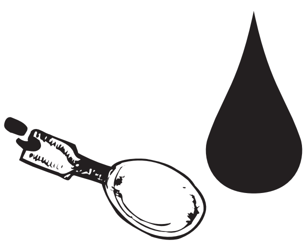
estimate _____

actual ______

How many scoops of rice will it hold?

estimate _____

actual ______



How many scoops of water will it hold?

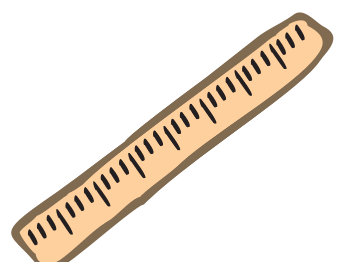
estimate _____

actual ______

How many inchworms tall?

estimate _____

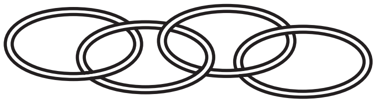
actual ______



How many inches wide?

estimate _____

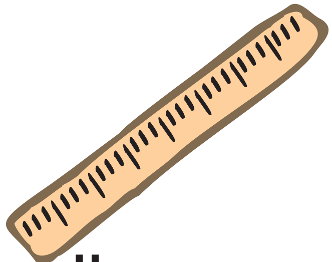
actual ______



How many links tall?

estimate ______

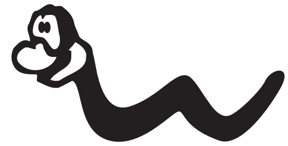
actual ______



How many inches tall?

estimate ______

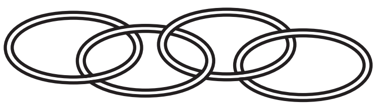
actual ______



How many inchworms wide?

estimate ______

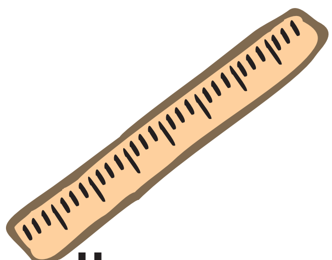
actual ______



How many links wide?

estimate ______

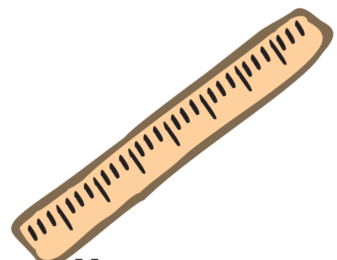
actual ______



How many feet tall?

estimate ______

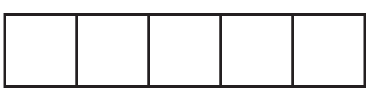
actual ______



How many feet wide?

estimate ______

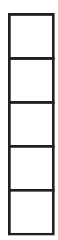
actual ______



How many tiles wide?

estimate ______

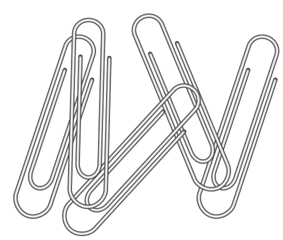
actual ______



How many tiles tall?

estimate ______

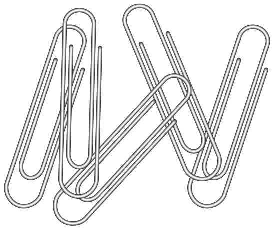
actual ______



How many paperclips tall?

estimate ______

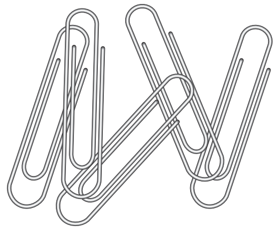
actual ______



How many paperclips wide?

estimate ______

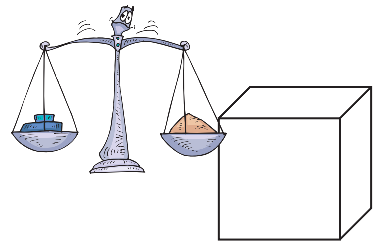
actual ______



How many paperclips long?

estimate ______

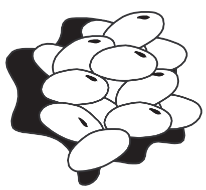
actual ______



How many cubes weigh the same?

estimate ______

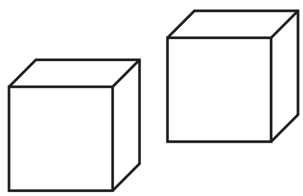
actual ______



How many beans will cover it?

estimate ______

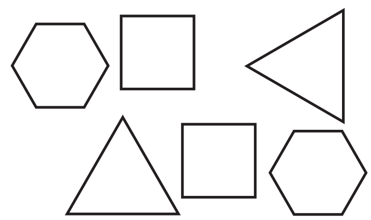
actual ______



How many cubes will cover it?

estimate ______

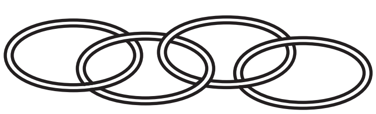
actual ______



How many pattern blocks will cover it?

estimate ______

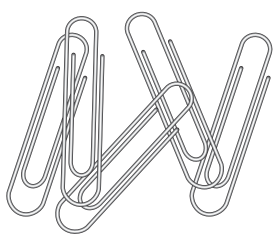
actual ______



How many links will go around it?

estimate ______

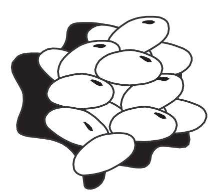
actual ______



How many paperclips will go around it?

estimate ______

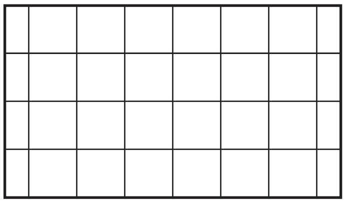
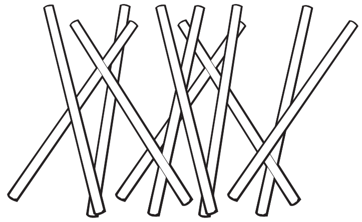
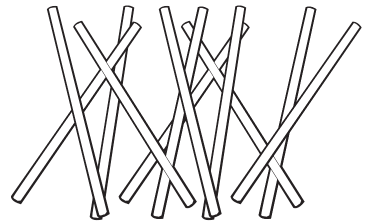
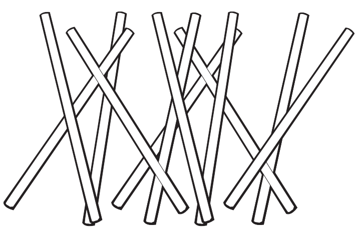
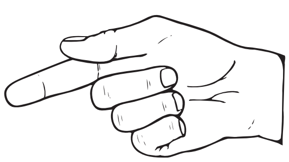
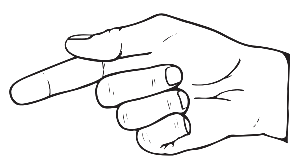
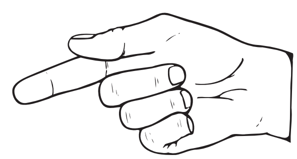
actual ______

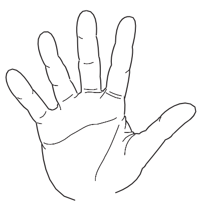
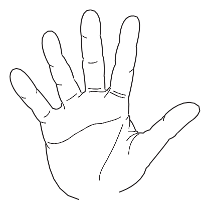
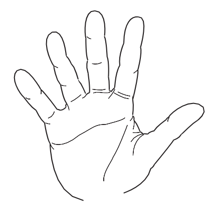
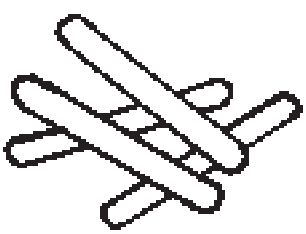
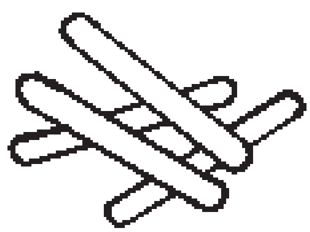
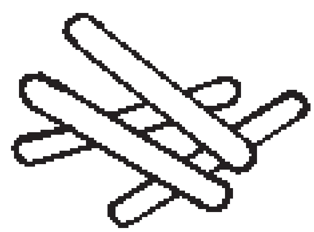


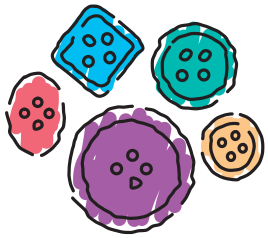
How many beans will go around it?

estimate ______

actual ______

 **How many graph paper squares will it touch?** estimate _____ actual ______	 **How many straws tall?** estimate _____ actual ______	 **How many straws wide?** estimate _____ actual ______
 **How many straws long?** estimate _____ actual ______	 **How many shoes wide?** estimate _____ actual ______	 **How many shoes long?** estimate _____ actual ______
 **How many fingers wide?** estimate _____ actual ______	 **How many fingers tall?** estimate _____ actual ______	 **How many fingers long?** estimate _____ actual ______

 **How many hand widths wide?** estimate _____ actual ______	 **How many hand widths tall?** estimate _____ actual ______	 **How many hand widths long?** estimate _____ actual ______
 **How many finger spans wide?** estimate _____ actual ______	 **How many finger spans long?** estimate _____ actual ______	 **How many finger spans tall?** estimate _____ actual ______
 **How many craft sticks tall?** estimate _____ actual ______	 **How many craft sticks wide?** estimate _____ actual ______	 **How many craft sticks long?** estimate _____ actual ______



How many buttons will cover it?

estimate _____

actual _____

How many beads tall?

estimate _____

actual _____

How many beads wide?

estimate _____

actual _____

How many beads long?

estimate _____

actual _____

How many pennies will cover it?

estimate _____

actual _____

How many dimes will cover it?

estimate _____

actual _____

How many nickels will cover it?

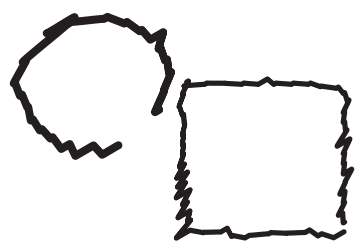
estimate _____

actual _____

How many quarters will cover it?

estimate _____

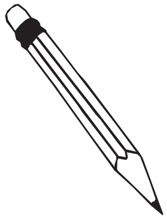
actual _____



How many pipe cleaners to outline it?

estimate _____

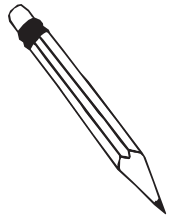
actual _____



How many pencils tall?

estimate _____

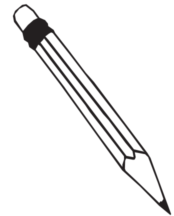
actual ______



How many pencils wide?

estimate _____

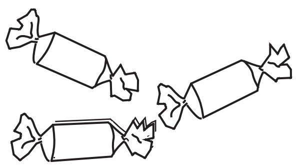
actual ______



How many pencils long?

estimate _____

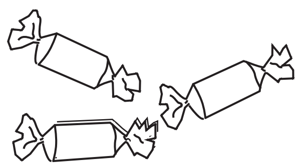
actual ______



How many candies long?

estimate _____

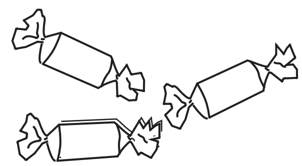
actual ______



How many candies tall?

estimate _____

actual ______



How many candies wide?

estimate _____

actual ______

How many cotton balls will cover it?

estimate _____

actual ______

How many chips will cover it?

estimate _____

actual ______

Mine will hold more or less than the teacher's?

estimate _____

actual ______

Name________________________________ #_________

Measurement Mania

1/2" Grid

5/8” Grid

3/4" Grid

1” Grid

Appendix

Birthday Guess Sheet

A

1	17
3	19
5	21
7	23
9	25
11	27
13	29
15	31

B

2	18
3	19
6	22
7	23
10	26
11	27
14	30
15	31

C

4	20
5	21
6	22
7	23
12	28
13	29
14	30
15	31

D

8	24
9	25
10	26
11	27
12	28
13	29
14	30
15	31

E

16	24
17	25
18	26
19	27
20	28
21	29
22	30
23	31

Categories Chart

	Animals	Weather Words	Rock Descriptions	Things on a Map/Globe
M				
S				
R				
T				
P				

RAFT Chart

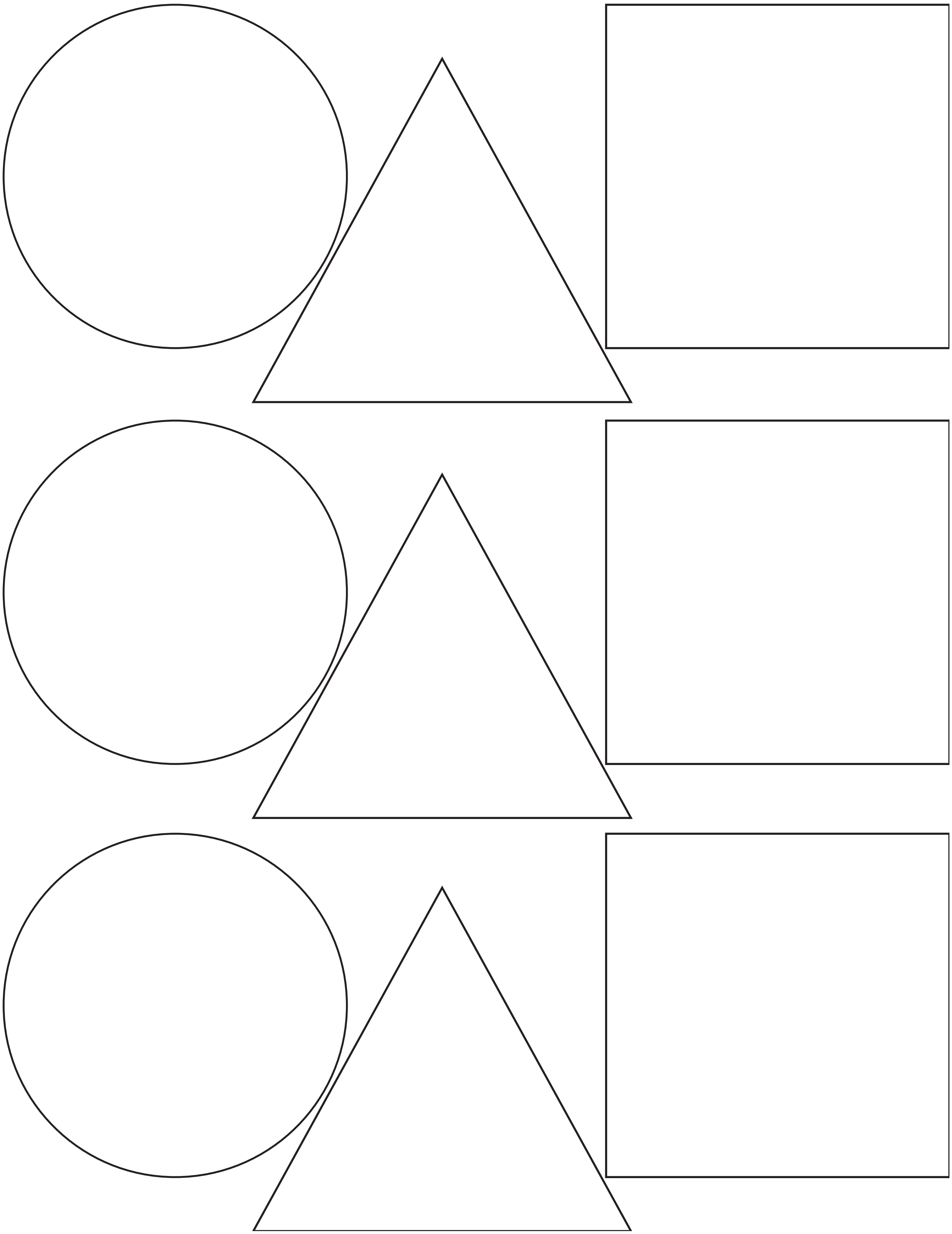
Role	Audience	Format	Topic

Tic-Tac-Toe

Create	Teach	Compare
Draw	Graph	Demonstrate
Survey	Design	Choose

Tic-Tac-Toe

My Choices Shapes



Implementation Plan

3 ideas I plan to implement in my classroom as soon as possible:

1. ______________________________________
____
2. ______________________________________
____
3. ______________________________________
____

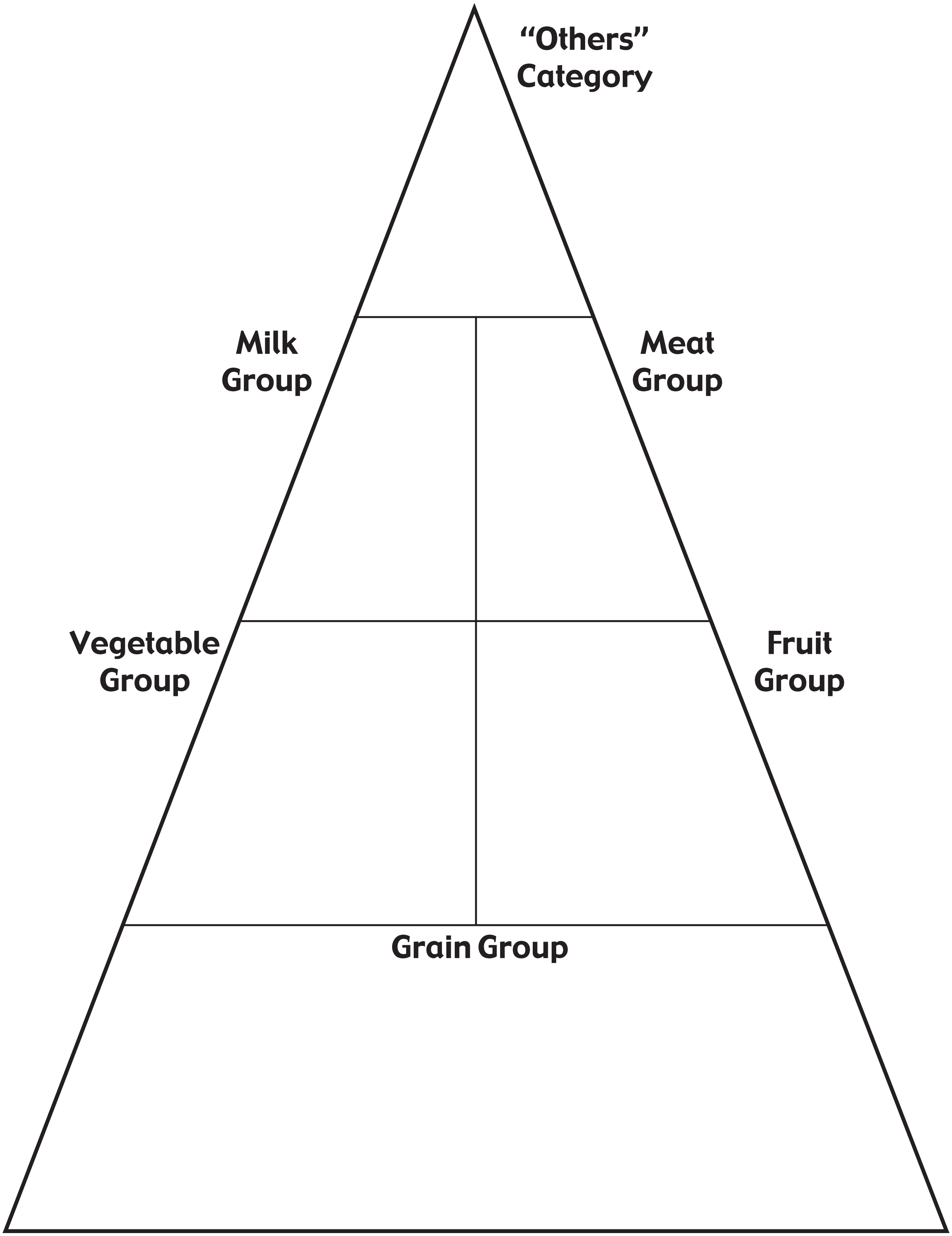
2 ideas I am considering implementing in my classroom:

1. ______________________________________
____
____
2. ______________________________________
____
____

1 idea that I really want to learn more about:

1. ______________________________________
____
____
____
____
____
____

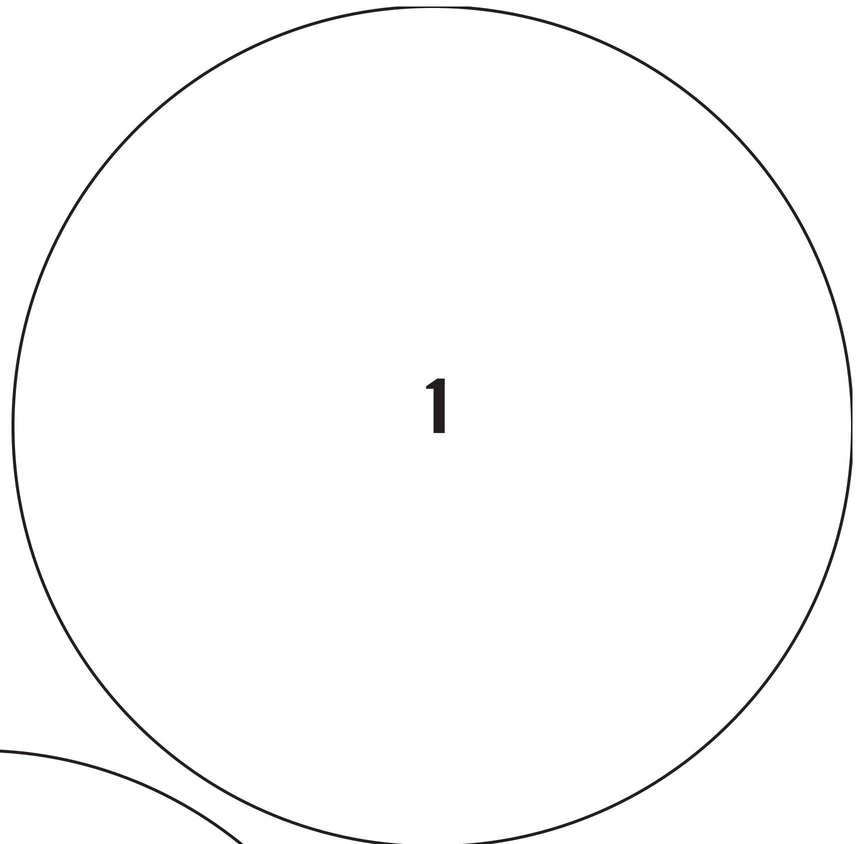
Food Pyramid

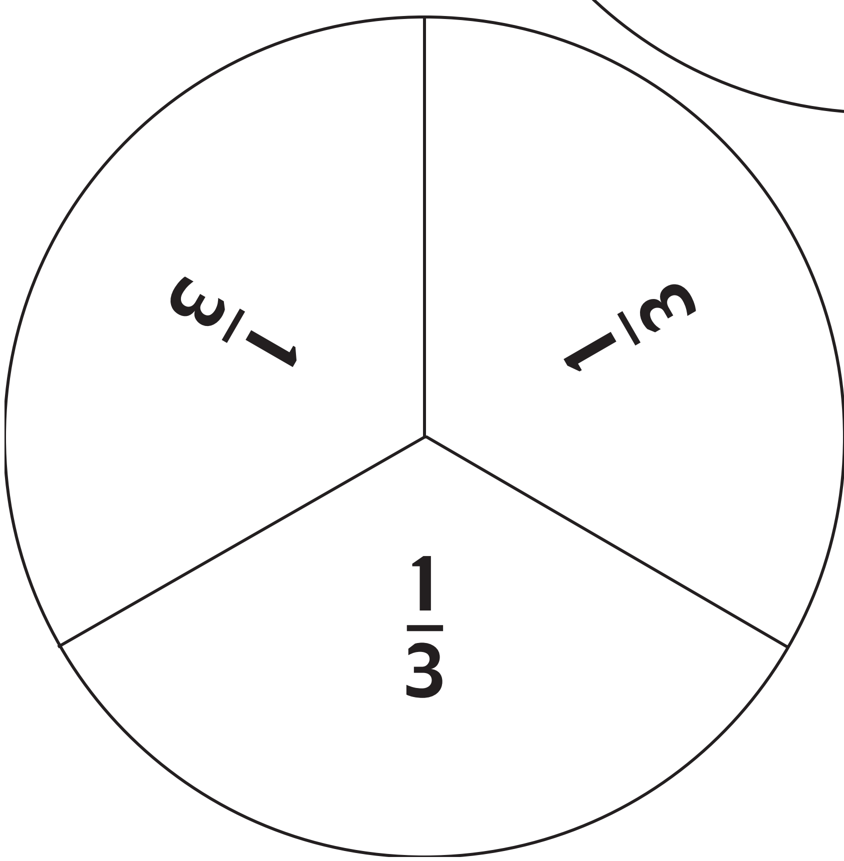


Food Group Chart

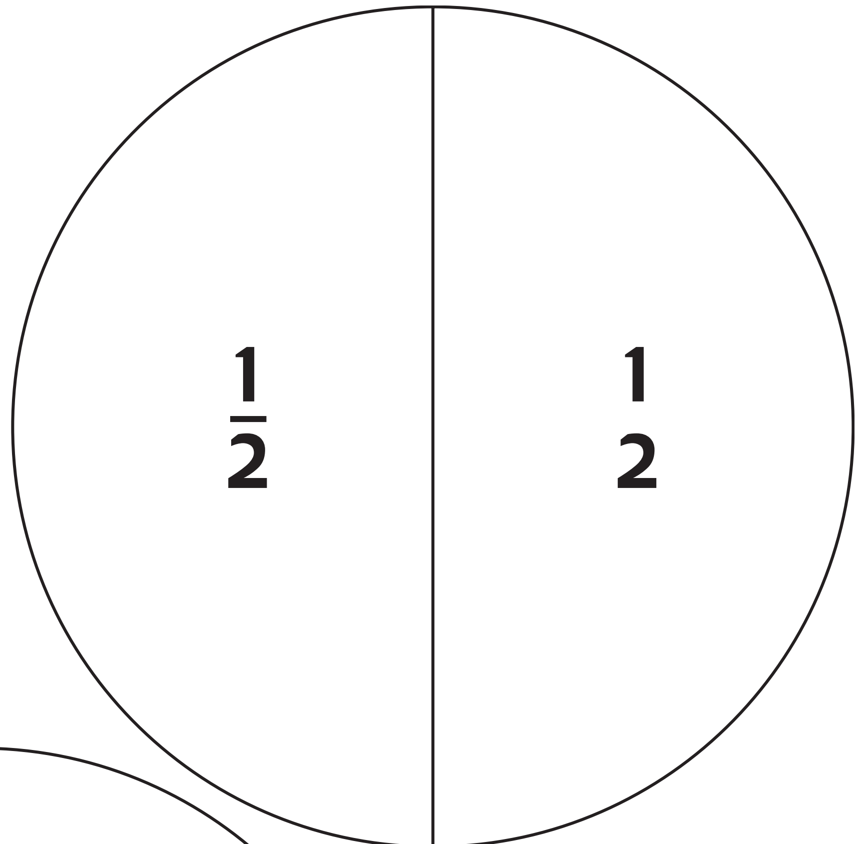
Food Groups	Breakfast	Lunch	Dinner
Grains 6 servings			
Fruits 2 servings			
Vegetables 3 servings			
Dairy 3 servings			
Meat 2 servings			
Others			

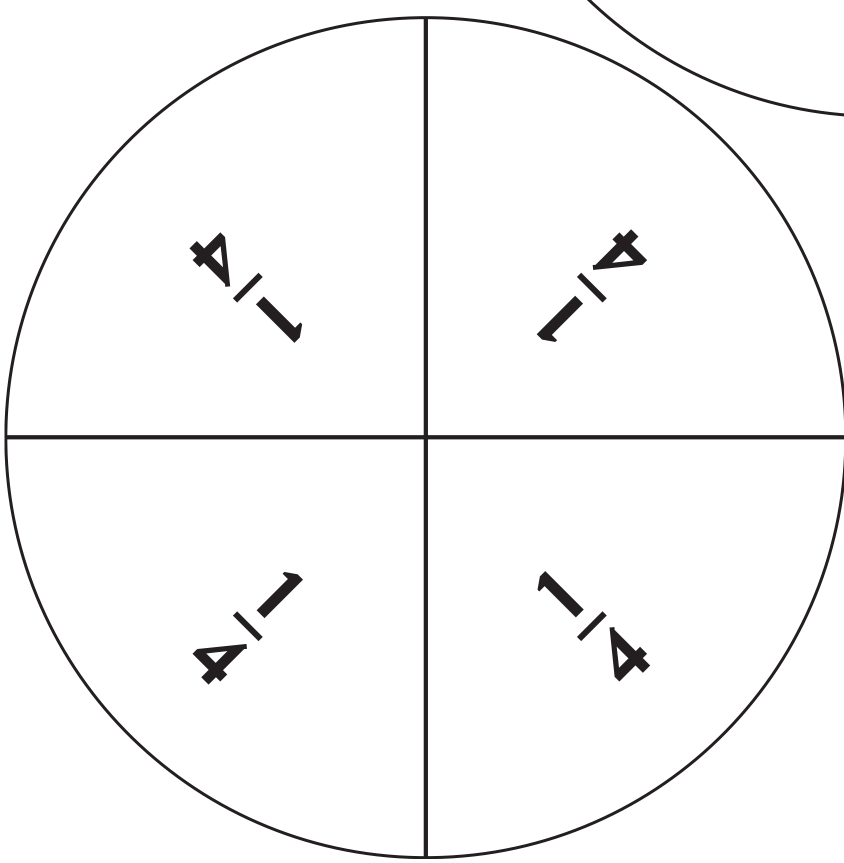
Pizza Fractions 1





Pizza Fractions 2



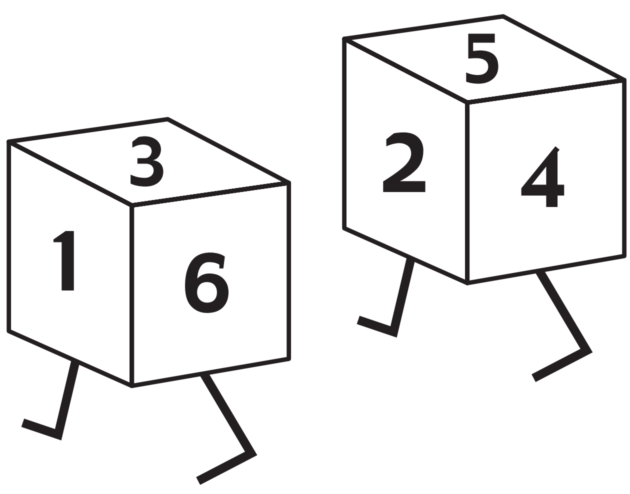


Bean Fractions

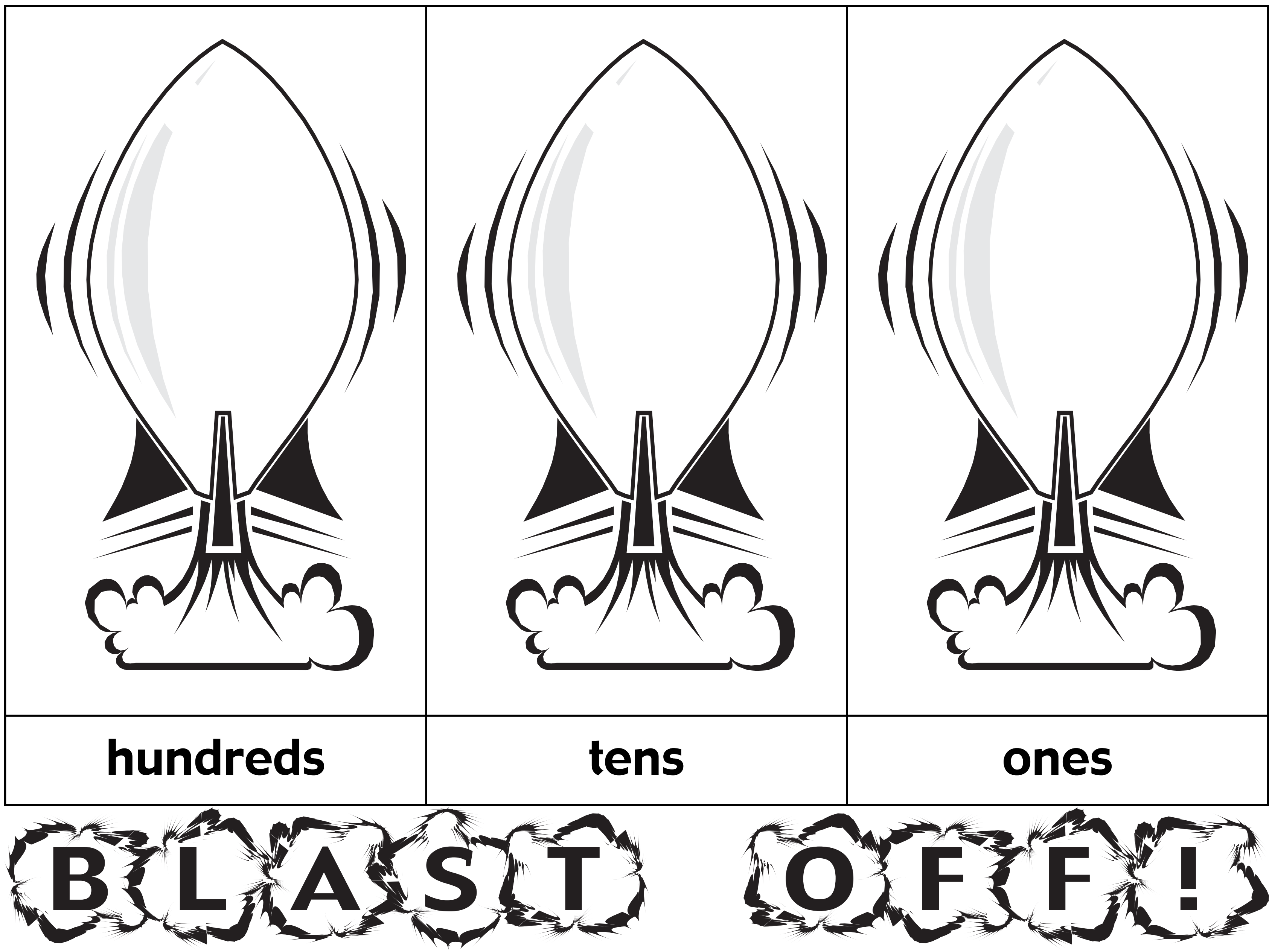
Total number of beans rolled:	The colored fraction of my beans were:	The white fraction of my beans were:
4	1/4	3/4

Four in a Row Game Board

11					**29**
30					**49**
50					**69**
70					**88**



Shoot For The Stars



Shoot For The Stars
Digit Cards

0	1	2	3	4	5	<u>6</u>
7	8	<u>9</u>		0	1	2
3	4	5	<u>6</u>	7	8	<u>9</u>

Place Value Holder

ones		
tens		
hundreds		

Place Value Digit Cards

4	9
3	8
2	7
1	6
0	5

Stack-A-Value Cards

Run each set of value cards on a different color of heavy paper (i.e., the ones on yellow, the tens on blue, the hundreds on red, etc.). Cut each value card apart and fold it in the middle so it will stand up. Then you can start stacking the cards to represent different numbers. This is great to use with the digit card holder so the student can visually see a representation of the number.

0	1	2	3	4
5	6	7	8	9

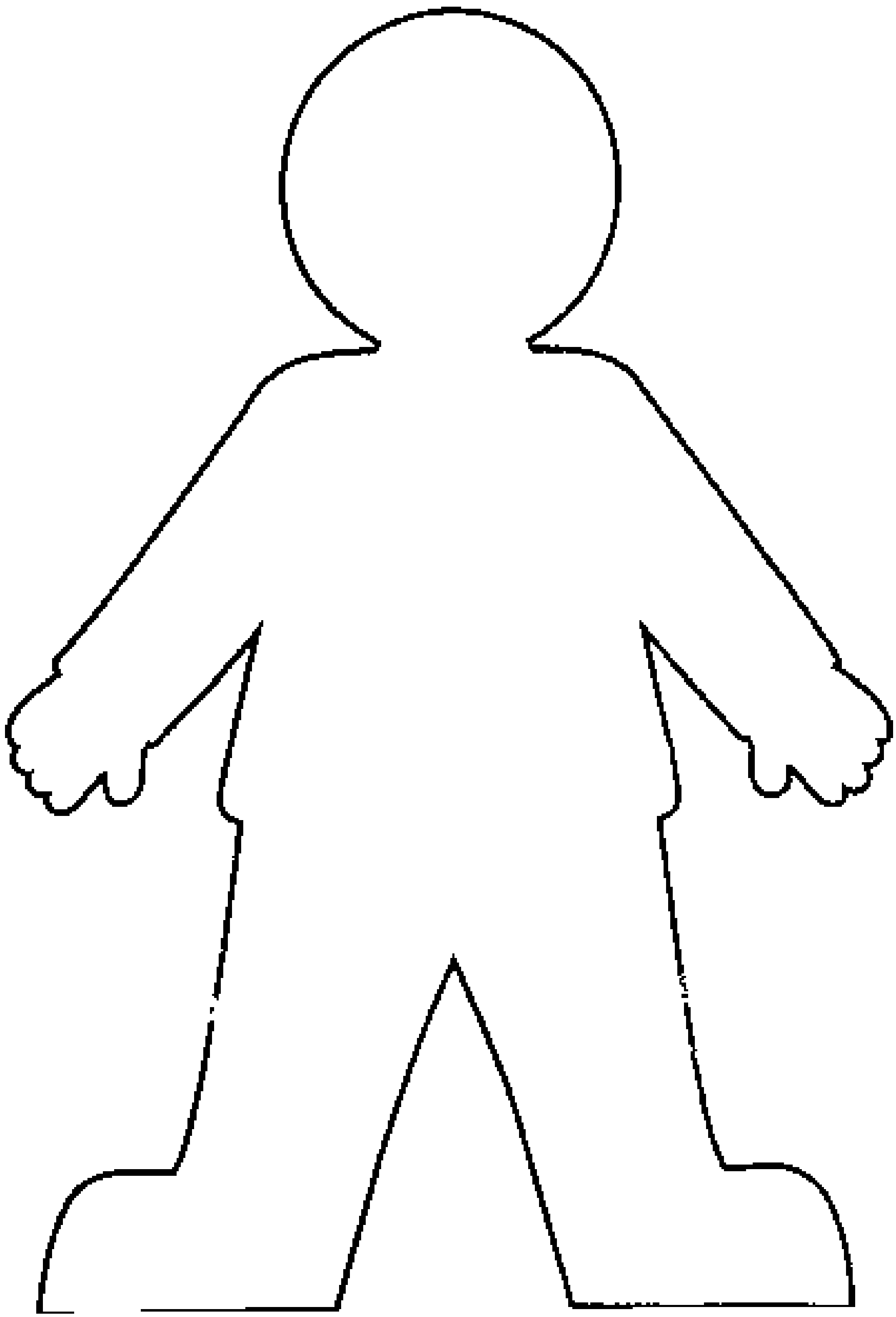
1 0	2 0	3 0	4 0
5 0	6 0	7 0	8 0

	9 0

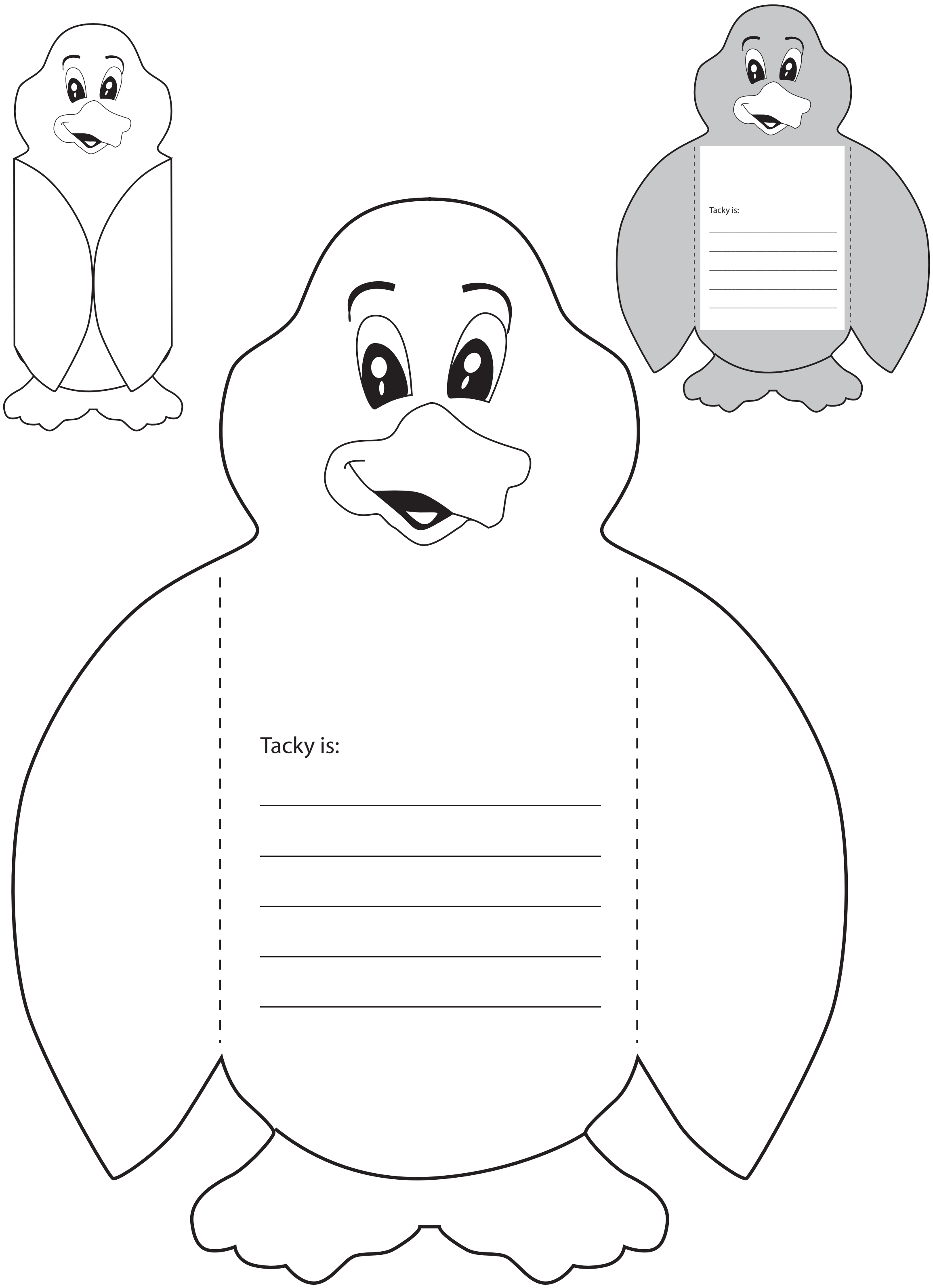
1 0 0	2 0 0	3 0 0
4 0 0	5 0 0	6 0 0

7 0 0	8 0 0
9 0 0	

My Kind of Friend



Tacky Penguin



Season Acrostic Poem

S ______________________

P ______________________

R ______________________

I ______________________

N ______________________

G ______________________

S______________________

U______________________

M ____________________

M ____________________

E______________________

R______________________

A ____________________

U ____________________

T ____________________

U ____________________

M ____________________

N ____________________

W ______________________________

I ______________________________

N ______________________________

T ______________________________

E ______________________________

R ______________________________

Name________________________________

Grids and Coordinates #1

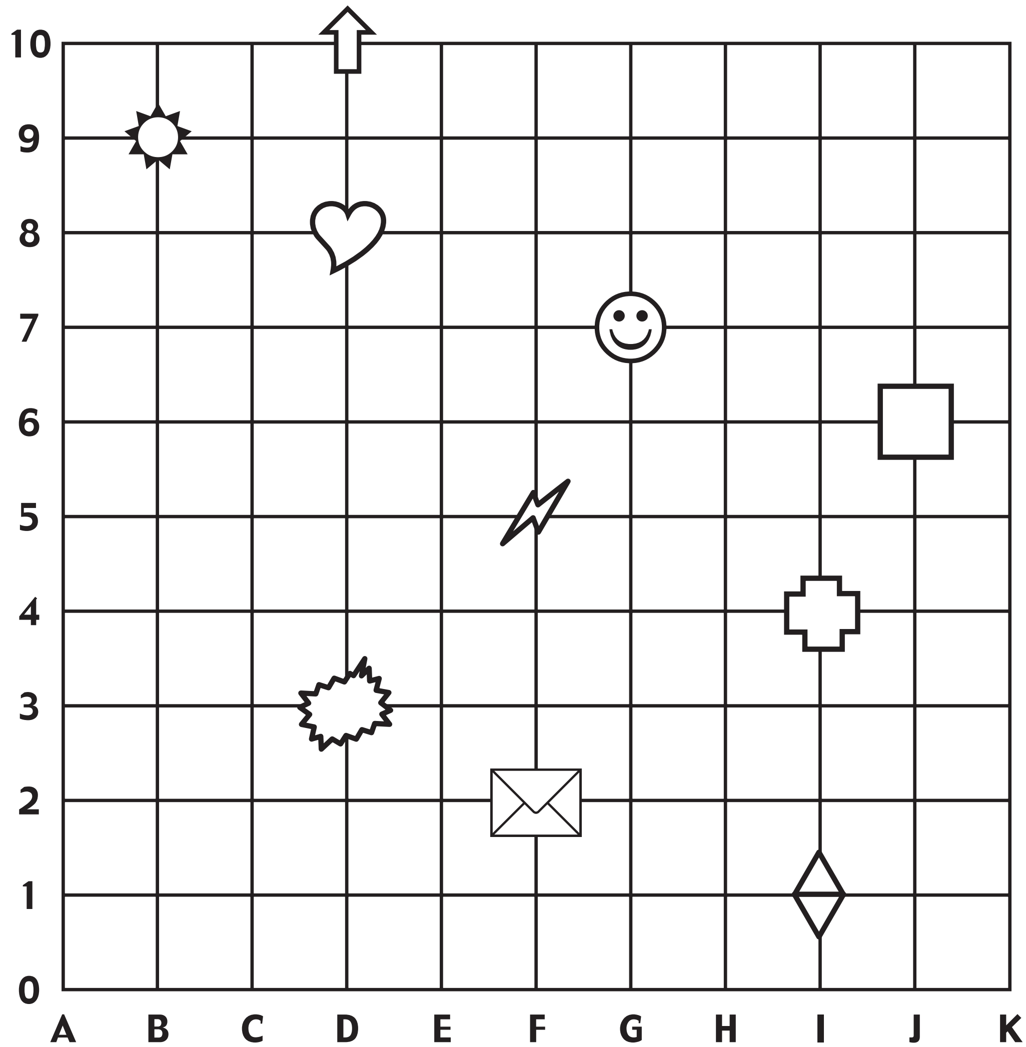
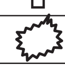


Figure	Across	Up
		
		
		
		
		
		
		
		
		
		

Name ______________________________

Grids and Coordinates #2

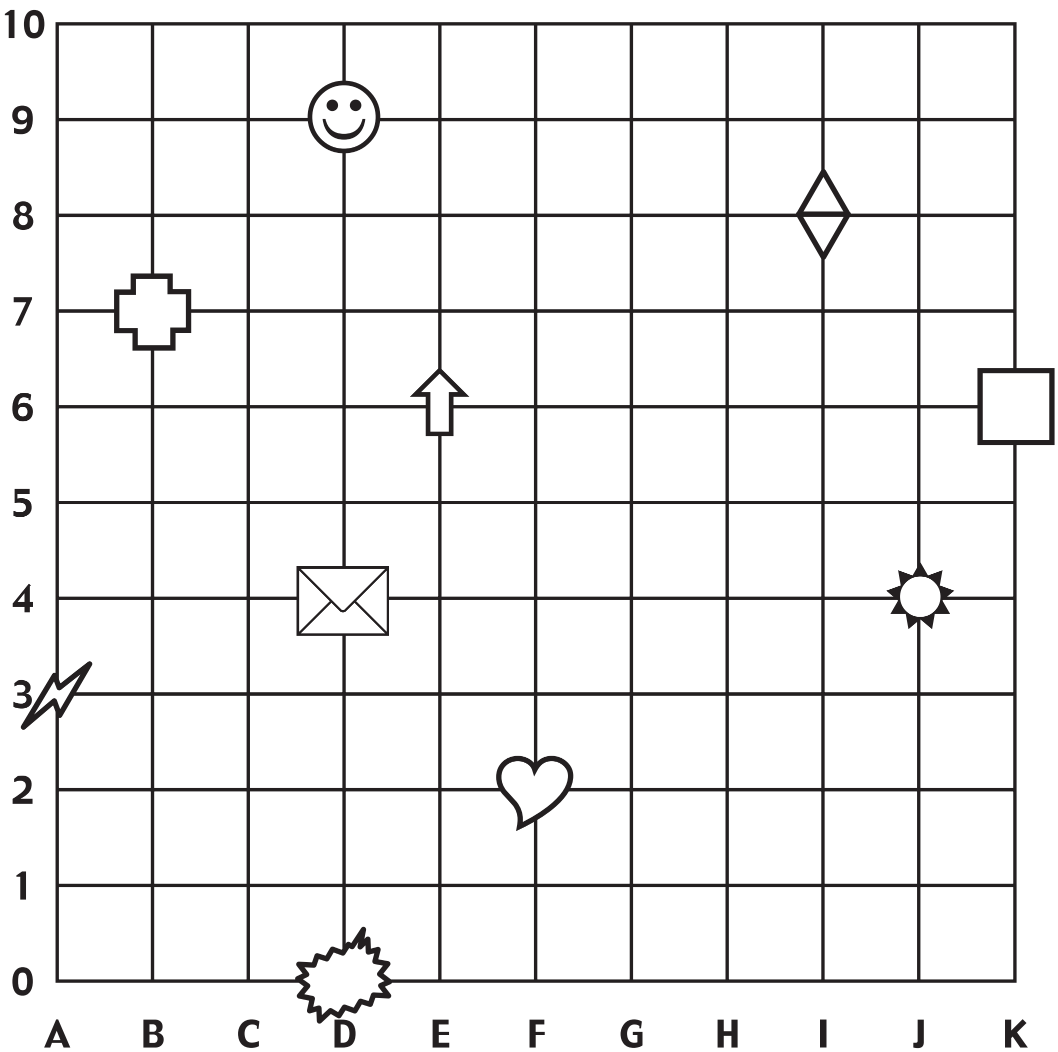


Figure	Across	Up
	E	6
		8
	A	3
	D	
	J	
	D	4
	F	2
		6

Name ___________________________________

Grids and Coordinates #3

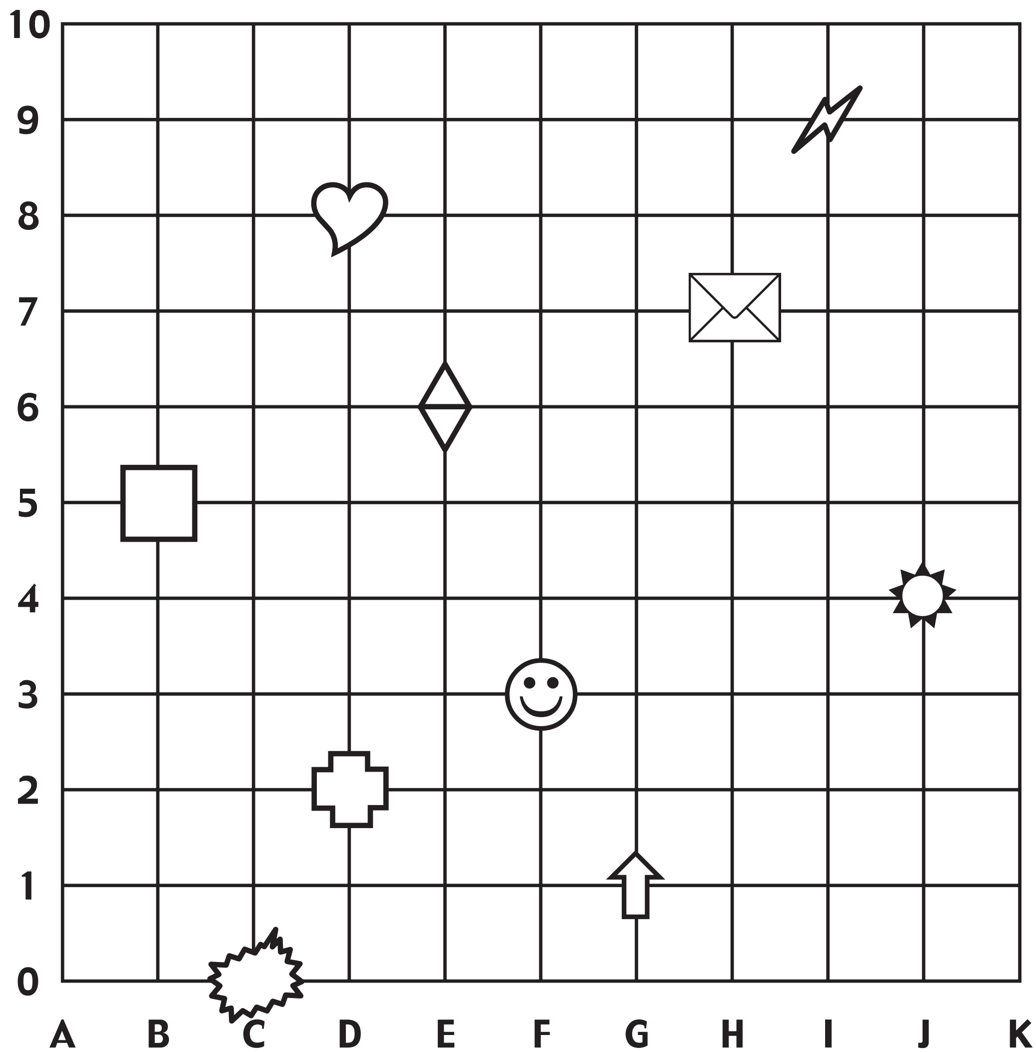
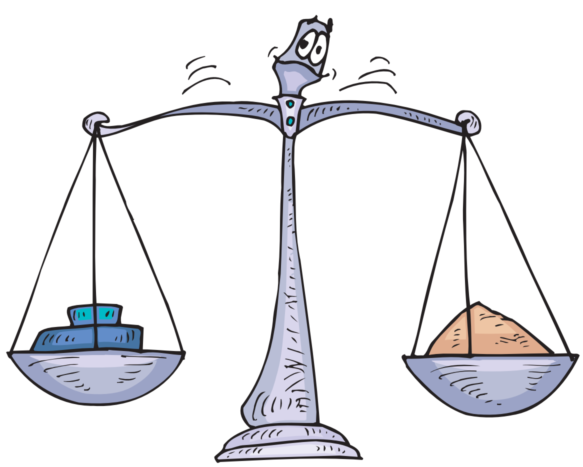


Figure	Across	Up
	E	6
	D	2
	B	5
	J	4
	H	7
	I	9
	C	0
	G	1
	D	8
	F	3

Rock Star Journal

Name______________________ Date__________

Center 1—Weight



My rock is as heavy as __________ teddy bears.

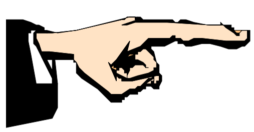
Center 2—Size and Shapes

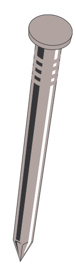
This string will fit around the widest part of my rock.
(Tape string here.)

This is what my rock looks like when I trace it.

Center 3—Hardness

Check each item that scratches your rock.





?

Fingernail ____ Penny ____ Nail ____ Nothing ____

Center 4—Texture

The surface of my rock feels like this.

Glue sandpaper here.

Center 5—Sink or Float

Predict what will happen to your rock when you place it in water.
(Color in the box.)

Sink	**Float**

What happened to your rock when you placed it in water?
(Color in the box.)

Sink	**Float**

Center 6—Shiny or Dull

The surface of my rock looks like this.

Glue paper here.

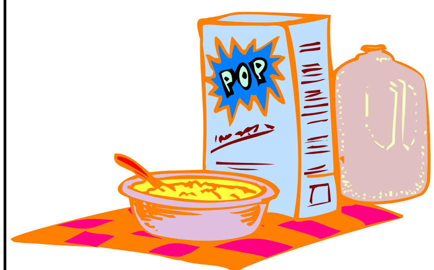
Center 7—Color

The color of my rock looks like this:

Be sure to draw any layers or multi-colored areas.

Sodium Content

Fill in the table with your group. Using information from the table, answer the questions.

Name	Cereal Name	Sodium Content
		

The cereal with the least amount of sodium is

____.

The cereal with the greatest amount of sodium is

____.

Names: ______________________________ Date: ____________

COUNT THE DOTS

Which answer do you predict will happen the most often?

5 6 7 8 9 10 11 12

Record the numbers for each counting on problem.

Tally the answer for each counting on problem.

5 ____________________ 9 ____________________

6 ____________________ 10 ____________________

7 ____________________ 11 ____________________

8 ____________________ 12 ____________________

Graph the answers for the counting on problems.

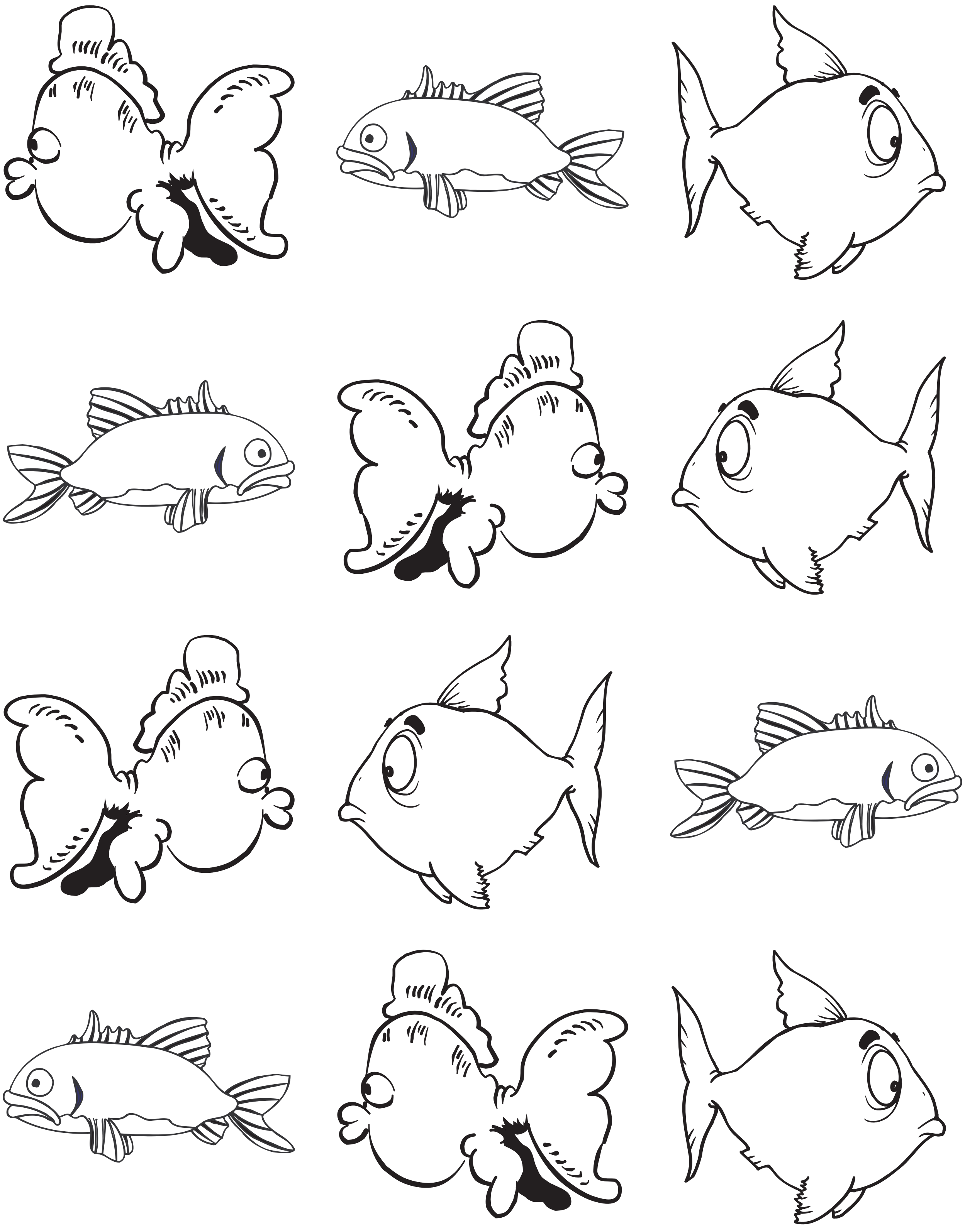
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			

Slap It Fast Team Board

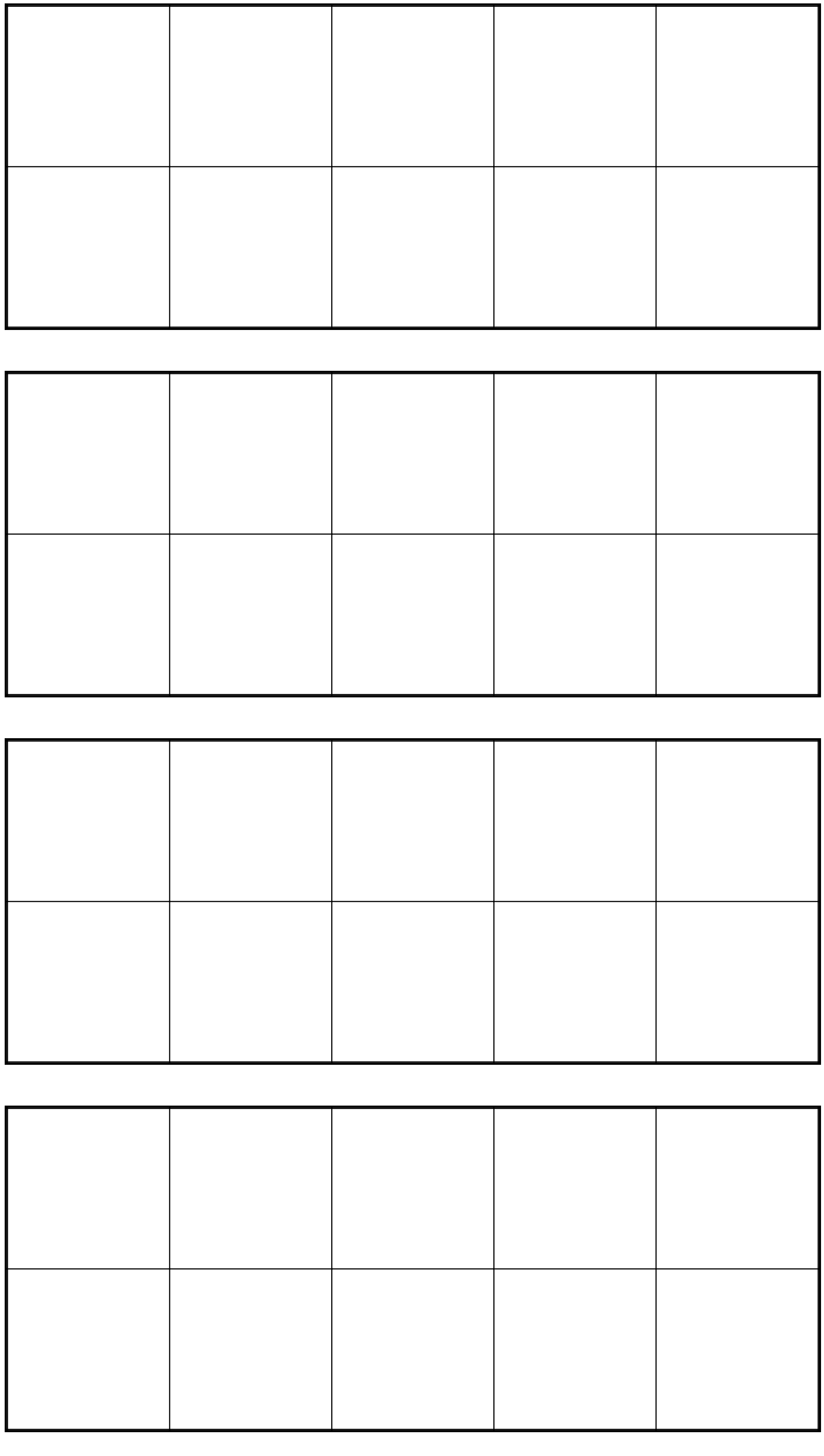
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

Name________________________________

Fishing For Tens



Ten-frames

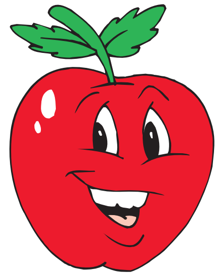


Measurement Mania Recording Sheets

Mine will be
_____ in line.

estimate _____

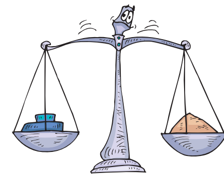
actual _____

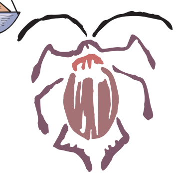


I can eat mine in
_______bites.

estimate _____

actual _____





How many bugs weigh the same?

estimate _____

actual _____

How many bugs wide?

estimate _____

actual _____

How many bugs tall?

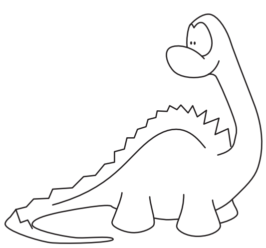
estimate _____

actual _____

How many bugs long?

estimate _____

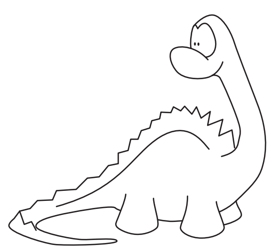
actual _____



How many animals long?

estimate _____

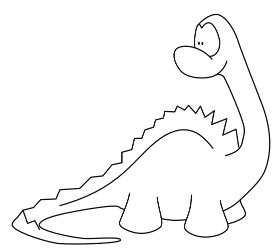
actual _____



How many animals tall?

estimate _____

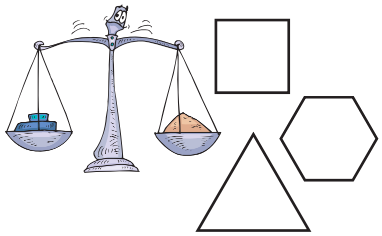
actual _____



How many animals wide?

estimate _____

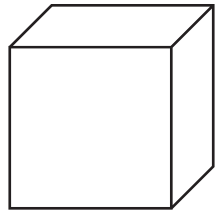
actual _____



How many pattern blocks weigh the same?

estimate ______

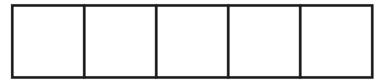
actual ______



How many cubes equal the same height?

estimate ______

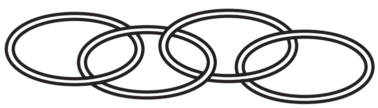
actual ______



How many tiles would be as long as this is around?

estimate ______

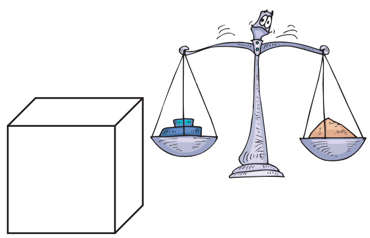
actual ______



How many links would it take to go around?

estimate ______

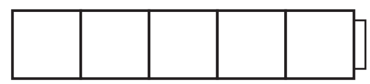
actual ______



How many blocks weigh the same?

estimate ______

actual ______



How many snap cubes would it take to make a cube about the same?

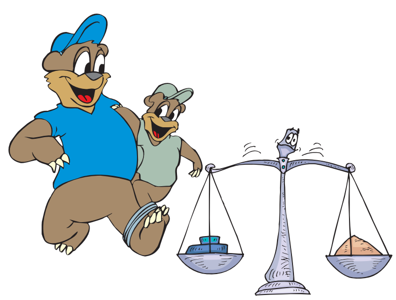
estimate ______

actual ______

How many beads would it take to go around?

estimate ______

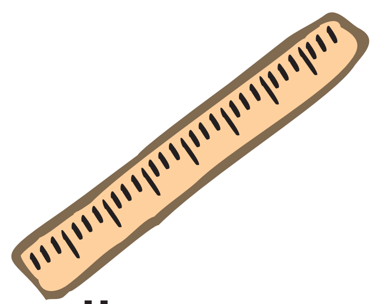
actual ______



How many bears weigh the same?

estimate ______

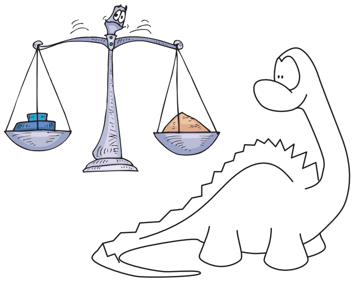
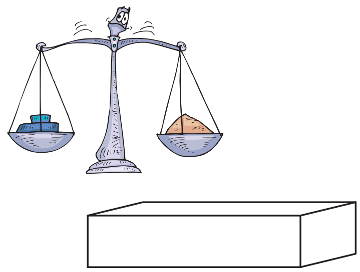
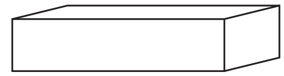
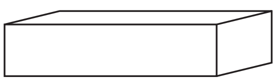
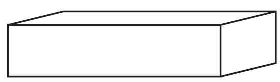
actual ______

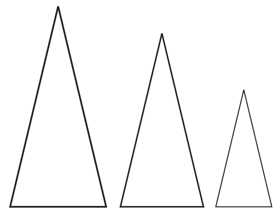
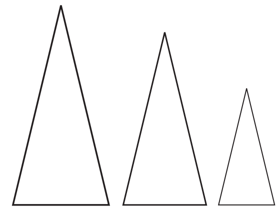
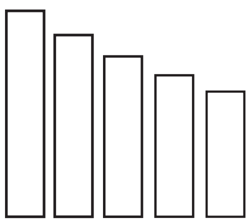
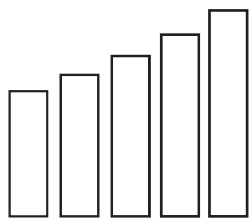
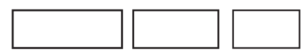


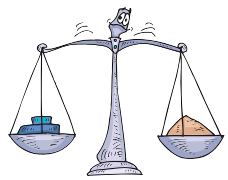
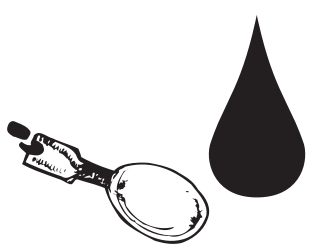
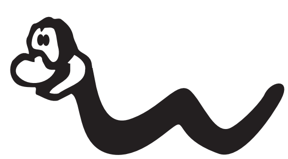
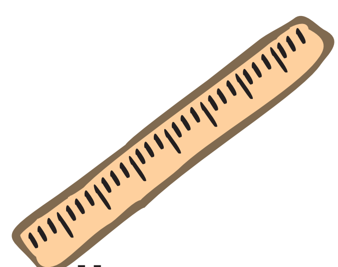
How many inches around?

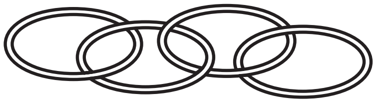
estimate ______

actual ______

 **How many animals weigh the same?** estimate _____ actual ______	 **How many erasers weigh the same?** estimate _____ actual ______	 **How many erasers wide?** estimate _____ actual ______
 **How many erasers tall?** estimate _____ actual ______	 **How many erasers long?** estimate _____ actual ______	**How many __________ wide?** estimate _____ actual ______
How many __________ long? estimate _____ actual ______	**How many ______________ weigh the same?** estimate _____ actual ______	**How many __________ tall?** estimate _____ actual ______

Mine is ________ than __________. True _____ False ______	 __________________ is the biggest. True _____ False ______	 __________________ is the smallest. True _____ False ______
 __________________ is the tallest. True _____ False ______	 __________________ is the shortest. True _____ False ______	 __________________ is the shortest. True _____ False ______
__________________ __________________ __________________ estimate _____ actual ______	__________________ __________________ __________________ True _____ False ______	How many __________________ will cover it? estimate _____ actual ______

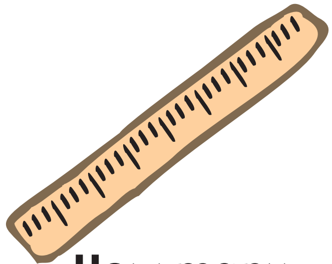
 **How many pounds does it weigh?** estimate _____ actual ______	 **How many cups of beans will it hold?** estimate _____ actual ______	 **How many cups of water will it hold?** estimate _____ actual ______
 **How many cups of rice will it hold?** estimate _____ actual ______	 **How many scoops of beans will it hold?** estimate _____ actual ______	 **How many scoops of rice will it hold?** estimate _____ actual ______
 **How many scoops of water will it hold?** estimate _____ actual ______	 **How many inchworms tall?** estimate _____ actual ______	 **How many inches wide?** estimate _____ actual ______



How many links tall?

estimate ______

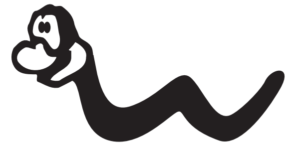
actual ______



How many inches tall?

estimate ______

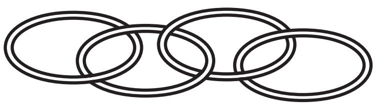
actual ______



How many inchworms wide?

estimate ______

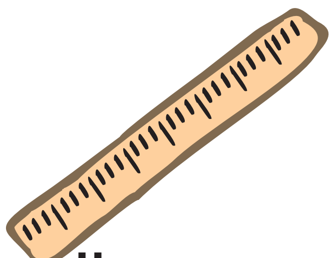
actual ______



How many links wide?

estimate ______

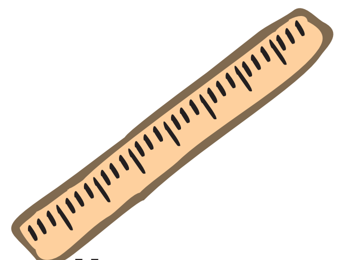
actual ______



How many feet tall?

estimate ______

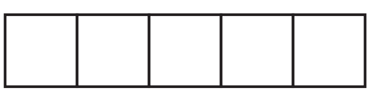
actual ______



How many feet wide?

estimate ______

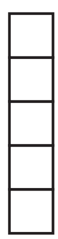
actual ______



How many tiles wide?

estimate ______

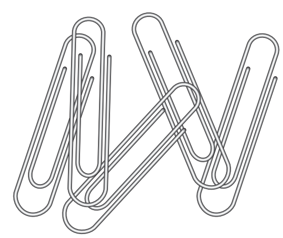
actual ______



How many tiles tall?

estimate ______

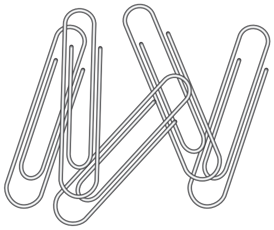
actual ______



How many paperclips tall?

estimate ______

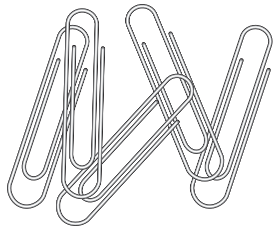
actual ______



How many paperclips wide?

estimate _____

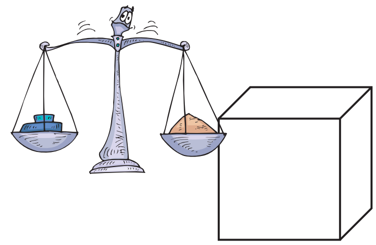
actual ______



How many paperclips long?

estimate _____

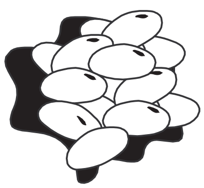
actual ______



How many cubes weigh the same?

estimate _____

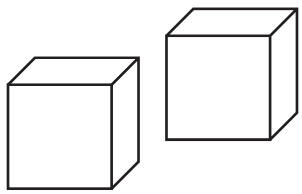
actual ______



How many beans will cover it?

estimate _____

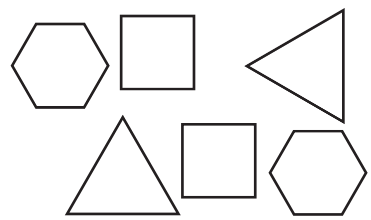
actual ______



How many cubes will cover it?

estimate _____

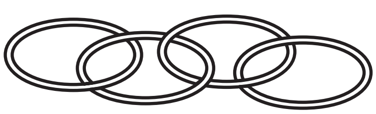
actual ______



How many pattern blocks will cover it?

estimate _____

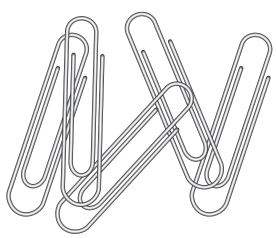
actual ______



How many links will go around it?

estimate _____

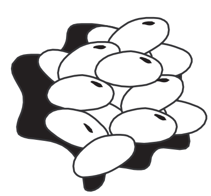
actual ______



How many paperclips will go around it?

estimate _____

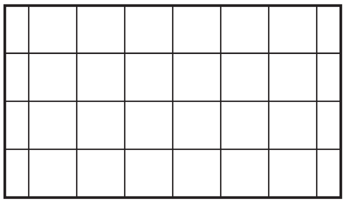
actual ______



How many beans will go around it?

estimate _____

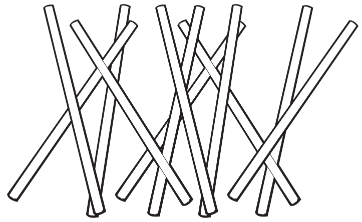
actual ______



How many graph paper squares will it touch?

estimate _____

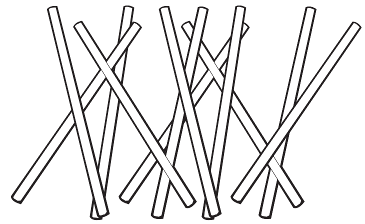
actual ______



How many straws tall?

estimate _____

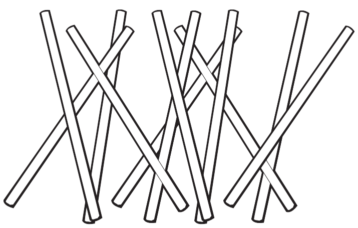
actual ______



How many straws wide?

estimate _____

actual ______



How many straws long?

estimate _____

actual ______

How many shoes wide?

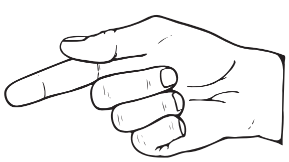
estimate _____

actual ______

How many shoes long?

estimate _____

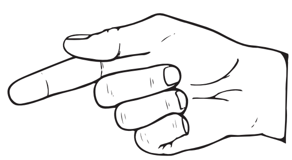
actual ______



How many fingers wide?

estimate _____

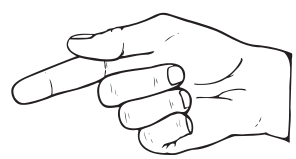
actual ______



How many fingers tall?

estimate _____

actual ______



How many fingers long?

estimate _____

actual ______

How many hand widths wide?

estimate _____

actual ______

How many hand widths tall?

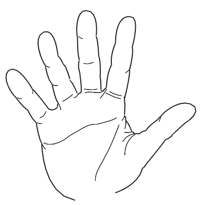
estimate _____

actual ______

How many hand widths long?

estimate _____

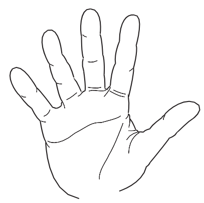
actual ______



How many finger spans wide?

estimate _____

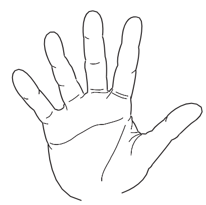
actual ______



How many finger spans long?

estimate _____

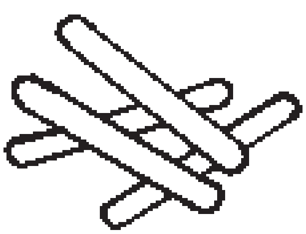
actual ______



How many finger spans tall?

estimate _____

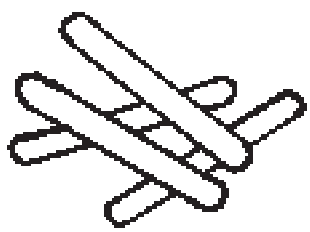
actual ______



How many craft sticks tall?

estimate _____

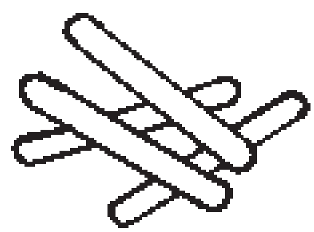
actual ______



How many craft sticks wide?

estimate _____

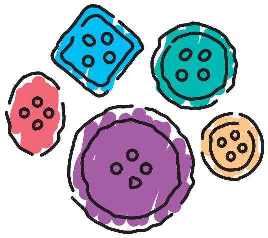
actual ______



How many craft sticks long?

estimate _____

actual ______



How many buttons will cover it?

estimate _____

actual _____

How many beads tall?

estimate _____

actual _____

How many beads wide?

estimate _____

actual _____

How many beads long?

estimate _____

actual _____

How many pennies will cover it?

estimate _____

actual _____

How many dimes will cover it?

estimate _____

actual _____

How many nickels will cover it?

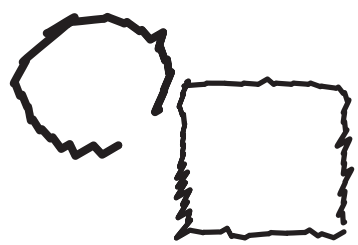
estimate _____

actual _____

How many quarters will cover it?

estimate _____

actual _____



How many pipe cleaners to outline it?

estimate _____

actual _____

Name_______________________________ #_________

Measurement Mania

1/2" Grid

–Notes–

–Notes–