Imagine Schools *ENCORE*

Mathematics Enrichment Program
for Grades K-2

Developing Character

Enriching Minds

Imagine Schools Presents

"Let's Play It Again!"

An Encore
Mathematics Enrichment Program
For Grades K – 2

"Let's Play It Again"

Table of Contents

"Let's Play It Again!"

An Encore Mathematics Enrichment Program for Grade K-2

Welcome to the Encore Mathematics Enrichment program, in which children will be encouraged to investigate basic math concepts, construct their own mathematical meaning, and communicate their mathematical ideas through playing games, collaborating on projects, and exploring manipulatives. As they experience active learning, they will have the opportunity to become confident problem solvers, develop mathematical thinking abilities, and assimilate concepts. This standards-based program is organized around the content strands of *Number Sense, Algebra, and Geometry.* The process skills of *Communication, Problem Solving, Reasoning and Proof,* and *Representations and Connections* are clearly integrated through the delivery model.

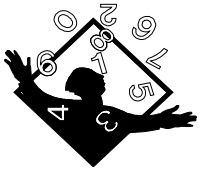
A week long mini-unit focuses on one of the content strands and culminates in a real world activity that connects the math concepts with their use in the real world. Teachers will have to make this program work for their own specific group of children. Decisions will need to be made as to how games and projects will be designed and implemented. Support for managing this program is offered in the appendix of this packet. There is no required order to the weekly units. Units can be sequenced to correspond to the lessons being taught during the core day, or teachers may want to focus on units that will reinforce areas in which students have shown academic weakness.

Several models for assessment have been included. As students work cooperatively, observation forms and rubrics will be appropriate forms of evaluation. Self-assessment as well as peer assessment will help students reflect on their own learning and encourage students to work well together.

Learning mathematical concepts and practicing them for mastery can be hard work for students. However, if they understand what it is that they are supposed to learn, and if much of the mastery practice is enjoyable, they can and will develop competence in and an appreciation for mathematics. If you can spark a child's interest in numbers, ignite a child's understanding of relationships and provoke a child's discussion of solution strategies, then the purpose of this Encore program will have been achieved.

An Encore Mathematics Pacing Guide
For the Primary Encore Hour

Think More! activities will start each art Encore lesson. They should take 10 to 15 minutes. During this time students will problem solve and think critically in groups or on their own.



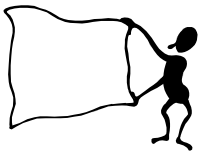
- Display the brainteaser on the overhead projector or document camera, interactive whiteboard, or chart. Have students work on the problems in their Number Notepads (see appendix).

  - Conduct a discussion about the problems using the following questions
    - How long did it take you to figure out this problem?
    - Could you figure it out on your own or did you need to collaborate with your classmates?
    - What strategy did you use to answer the problem? (See math background for problem solving strategies)

Solve More! activities make up the main lesson during the Encore program. They should take 30-40 minutes. During this time students will focus on one strand each week. The strands are:

- Geometry
- Algebra
- Number Sense
- Game Week

Explain More! activities end each math Encore lesson. They should take 10 to 15 minutes. During this time, students summarize the lesson in creative ways. A tone is set for the next day of math.



- Pick an activity or assessment to review the day's skills and provide a lesson link for the culminating project or math competition.
- Keep a student portfolio of student work.
- Use the appropriate assessment sheet to provide a profile of how your students are doing and the effectiveness of your lesson.

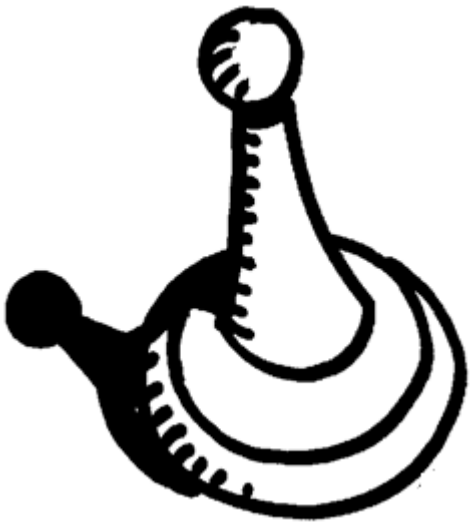
Math Masterminds! activities will culminate the end of each nine weeks. Students can invite friends and family members to view their work in Math Competition, Math Displays, or Math Demonstrations. Classes may want to team up with other classes to devise another way to show their mathematical knowledge.

"Let's Play It Again!"

Grade Level Themes and Selections (K-2)

	Kindergarten	First Grade	Second Grade
	Discovering Math	**The Structures of Math**	**Connecting Math to Our World**
Geometry: Construction Colony	A Shapely Village Discovering 2-D Shapes	The Geometry Junkyard: The Structures of Polygons	Castle Courtyard: 3-D Shapes
Algebra: Mystery Masterpieces	"A Fashion Show": Discovering the Pattern in Algebra	"Mystery Math Machines": The Structure of Functions and Equations	"Star Search": Connecting Patterns
Number Sense: "You Want a Piece of Me?"	"We All Scream for Ice Cream" Discovering Fractions	"Who Wants Pizza?" The Structure of Fractions	Fruity Fractions Connecting Parts of a Whole
Game Week	Math Manipulatives and Selected Critical Thinking and Problem Solving Games		

"Let's Play It Again!"

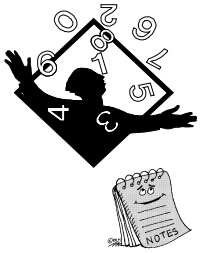


Kindergarteners Discover Math

Table of Contents

Introductory Procedures

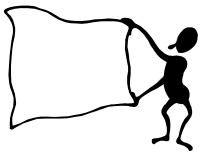
You and your students will need clear procedures to follow to make your time together productive and enjoyable. Each lesson has three distinct sections:



Think More is the opening

Number Notepads are used for brainstorming and reflecting on learning. Have a parent volunteer make a class set of Number Notepads (20 sheets of paper folded into a booklet with a construction paper cover). These can be put in the student's Art Portfolio.

Solve More is the project or activity



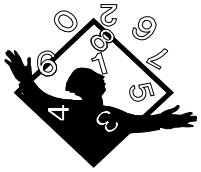
Explain More is the closing

Math Portfolio will house the work your students select as memorable in their Encore mathematics program. A piece of construction paper made into a folder will work well. Selected pieces (around 4) and teacher, student, and peer assessment forms should be kept in the portfolio).

Math Masterminds is the culminating activity for the class

Decide on clear procedural guidelines for the students to follow in each phase of the class—"lead" them to this list as you explain. Have "Think More, Solve More, Explain More" written on the board or chart. (This should be posted at all times during your Encore class.) Leave space for a short list of guidelines that the class will generate during this lesson.

Think More!



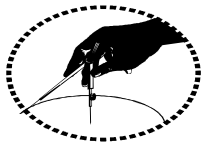
To describe the 'Think More" portion of class, say something like...

"During the first ten minutes of class every day we will be solving a brain teaser. Often you will write in your Number Notepad as you work out a solution to the problem. This part of class will be called "Think More!" Sometimes you will solve the problem quickly. And sometimes you won't be able to solve it at all. You will have a chance to express yourself in your Number Notepads. I think that you might be surprised by all the math you already know." Let the other children give it their best effort and try to form their own solutions before you try to solve

it as a group. (Think, Pair, Share) Sometimes the problems will make you want to smile, frown or say hmmmmm or huh????

"Can anyone think of a few guidelines that the class should follow during 'Think More!' (Summarize student answers into one or two positive directives and write them on the chart or board.)

Solve More!

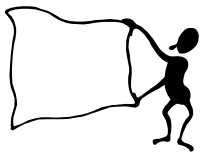


"The next part of the class will no doubt be your favorite—"Solve More." This is when we will be learning new math concepts. Sometimes we will be playing games, using manipulatives, or building projects to learn our math concepts and facts."

Discuss procedures for playing games, using manipulatives, and doing cooperative work.

"Can anyone raise their hand and tell me a few important guidelines for the "Solve More! part of class?" (Be sure to lead them to "never make fun of someone else's work or knowledge level) Have a student come up and write the summarized phrases on the board or chart.

Explain More!



"The last part of class will be 'Explain More' which will be a time to find out what was learned during the lesson. It might be a game, some questions, a display of your work or a demonstration. What if you are asked to share your learning for that day?

Let's think of some things to remember for 'Explain More.' (Lead students on how to give compliments to others during this sharing time) Teach them ways to say something nice. Pass out the peer and self-assessment forms. (See Assessment section of packet for the assessment forms). Talk about how you might complete each section. Act out a student hesitating on his/her math facts. Walk students though an acceptable way to talk about someone who might be struggling. Write their suggestions on the chart.

Leave the summaries of acceptable student behavior on the board to later transfer to a chart for continued review during the first week of class. Keep the chart available for this class throughout the year. You should review it when you see them again the following semester. If students have a problem during certain sections of the day, use the parent communication forms (found in the back of this packet) to let their parents know about their talents as well as areas in which they need improvement.

Practicing these procedures will provide students with the structure and framework necessary for you to have an orderly class. Many behavior problems arise because students do not know the expectations or what they are supposed to be doing. Keep directions clear and consistent. Make a clear distinction between procedures (knowing what to do and what is expected) and rules (i.e., hurting others). If students forget the procedures, review and practice them. If students break a rule, administer consequences.

Encore Kindergarten Math Materials and Resources

Non-consumables:

Imagine Schools Curriculum Guide
Core Math Program Manipulative Kits: dry erase boards, tangrams, blocks, geometric shapes, protractor, place value blocks,
Musical Instruments

Recommended Websites:

Fun Brain: www.funbrain.com/fract/index
A+ Math: www.aplusmath.com
Triple A Math: www.aaamath.com
Teacher Corner: http://www.theteahcercorner.net
Education World: http://www.educaton-world.com/
Houghton Mifflin Harcourt: Brain Teasers: http://eduplace.com

Consumables or Activity Specific:

NUMBER NOTE PADS

Unit 1 Geometry:

Sponges, Doritos, index cards or old holiday cards, yarn, graham crackers Pieces of yarn, large rope, dry erase boards and markers, index cards, balls and blocks, large circle and oval cut out of construction paper – or show on projector or write on overhead or projector, yarn the size of the circles radius, pieces of yarn for students, protractor for teacher, tangrams or sets of triangles, bags of Doritos, five bags with 5 triangle patterns (different sizes, different colors, different textures, different angles, different designs), sponges cut into various rectangles (small, tall, square), construction paper, paper strip headbands, cut outs of circles, rectangles (& squares) and triangles,

Unit 2 Algebra:

Wallpaper scraps, fabric scraps, buttons, pennies, string, cereal (Fruit Loops), and beads, blocks of different sizes or colors, musical instruments (optional) xylophone, boom whackers, maracas, objects of different sizes or colors, overhead projector or document camera, and colored markers, blocks, pennies, construction paper, hundreds chart transparency, hundreds charts for each child,

Unit 3 Number Sense:

Gallon zip-loc bags, pint zip-loc bags, ice, salt, sugar, milk, vanilla, chocolate, and strawberry syrup, cones, scooper, candy that is sectioned (Kit Kats), measuring cups and spoons, ordinal number cards, 8” by 11” paper, 5 scoop and cone tracers; tan, red/pink, white, and brown construction paper; mounting paper; crayons; and party decorations.

Kindergarten Booklist

Kindergarten Week 1

Animal Shapes by Brian Wildsmith

But Where is the Green Parrot by T. and W. Zacharias

Changes, Changes by Pat Hutchens

Shapes by Jan Pienkowski

Shapes, Shapes, Shapes by Tona Hoban

The Wing on a Flea: A Book about Shapes by Ed Emberley

The Shapes Game by Paul Rogers

Kindergarten Week 2

Dots, Spots, Speckles, and Stripes by Tana Hoban

Eight Hands Round: A Patchwork Alphabet by Ann Whitford Paul

Know About Patterns by Henry Pluckrose

Kindergarten Week 3

Eating Fractions by Bruce McMillan

Fractions are Parts by Richard J. Dennis

Sharing by Taro Gomi

Kindergarten
Geometry Unit
Discovering a Shapely Village

Standards: Students understand the properties of shapes by giving a description of the shape and its function (round-roll, flat-stack).
Students compare shapes.
Students combine shapes.

Objective: At week's end, students will be able to identify a circle, triangle, square, and rectangle; describe each shape's functional and descriptive attributes; compare and contrast shapes; create new shapes by combining shapes and communicate an understanding of plane figures.

Literature Connections:
Animal Shapes by Brian Wildsmith
But Where is the Green Parrot by T. and W. Zacharias
Changes, Changes by Pat Hutchens
Shapes by Jan Pienkowski
Shapes, Shapes, Shapes by Tona Hoban
The Wing on a Flea: A Book about Shapes by Ed Emberley
The Shapes Game by Paul Rogers

Teacher Resources: Imagine Schools Curriculum Guide

Materials: Parent Letter: sponges, Doritos, index cards or old holiday cards, yarn, graham crackers

Background: Geometry is the part of mathematics that includes points, lines, surfaces, and solids. The word geometry derives from the Greek words for earth and measure. Geometry is divided into two different categories; plane and solid. Plane geometry refers to two-dimensional shapes in one plane. Solid geometry refers to three-dimensional shapes.

The earliest accounts of geometric shapes have been found in artifacts dating buildings and pottery. The Egyptians used geometry to solve problems that arose after the annual flooding of the Nile River. There was a need to replenish the soil due to the flood, so they used a form of geometry known as surveying. Also, the ancient pyramids were built using a variety of geometric principles.

There were several people who contributed to the development of geometry. Around the year 300 B.C., a man by the name of Euclid wrote a collection of books entitled The Elements. In these books, he systematized the development of plane and solid geometry.

Culminating Project:
A Shapely Village

Principles of Geometry
-Day One-

Materials: Pieces of yarn, large rope, dry erase boards and markers, index cards

Vocabulary:
Line: straight path that never ends
Horizontal: across. Vertical: up and down
Plane Figure: a flat shape on a flat surface
Open Figure: a figure that is not closed
Closed Figure: a figure with all sides connected
2-dimension: extending in 2 directions

Think More: Perform a 2-dimensional demonstration to form connections:

1. Have five children line up one behind the other.
2. Provide a piece of handwriting paper.
3. Let children brainstorm what these two things have in common. (They both have a line.) Can you think of other ways we use lines or a phrase about lines? ("Get in line," "Shopping line," on-line on the computer) What is a line?

Solve More:

Activity 1: Working with Lines

1. Pass out yarn and have children make lines. Compare their lines with their neighbors. Chart the comments on chart paper: Some are straight; some are wavy, curvy, zig zag. Some go across, some go up and down. Lead students to these insights. Teach the terms "horizontal" and "vertical."
2. Have children demonstrate a horizontal line with their yarn and a vertical line with their yarn.
3. Find lines in the classroom. Discuss if they are horizontal or vertical.

Activity 2: Making Closed and Open Figures (may want to go outside for this)

1. Have students stand in a large circle (call students up by the color of their strings).
    a. When holding hands, it is a closed figure.
    b. When two people drop hands, it is an open figure (to let someone in)
    c. Play Duck, Duck, Goose. It is a closed circle when the person is walking around the group. It becomes an open figure when he/she picks a goose and the player must leave the circle to pursue the one who goosed him/her.
    d. Alternate activity: Students make closed and open figures with their yarn.

Activity 3: Identifying plane figures

1. Show a construction paper circle and a ball.
2. Show a construction paper rectangle and a shoebox or cereal box.
3. Show a construction paper triangle and a pyramid.
4. Have students compare and contrast the similarities and difference. (e.g. one sticks out, the other is flat; one is kind of "plane.")
5. We say that the flat (or plane) figures are two-dimensional (2-D) and the shapes that stick out (or solid) are three-dimensional (3-D).
6. A plane figure has two dimensions (or ways to go: horizontally/across or vertically/up and down) and a three dimensional shape has three ways to go: up (height), across (length), and out (width).
7. Have students draw the plane figures: a circle, rectangle, and triangle in their Number Notepads and make them not so "plane," but a little more fancy…color in designs.

Explain More: Groups will share their plane figures with the class and define the type of lines they see in them. Did anyone notice all the plane figures were "closed" figures? What kinds of shapes are open figures? (Hey, what about the letters of the alphabet?)

Properties of a Circle (Functional and Descriptive Attributes)
-Day Two-

Materials: Balls and blocks, large circle and oval cut out of construction paper – or write on overhead or project, yarn the size of the circles radius, pieces of yarn for students, protractor for teacher

Vocabulary: Circle: A round figure bound by a single curved line where each point is equally distant from the center.

Think More:

Prepare a 2-column chart on the board with a block on one side and a ball on the other. Have students try to roll the block and stack the balls. Discuss what happened. Record answers under the shape. Talk about what "attributes" help the shape do its job. Possible answers: curved sides help balls roll, straight sides help boxes stack Have students draw pictures of silly situations: bikes with square wheels, a round piano etc.

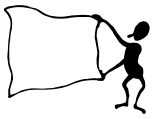
Solve More:

Activity One: Compare a circle with an oval

1. Gain insight into students' background information about circles, by playing "I'm thinking of a circle in the classroom.
2. Describe the shape using functional and descriptive terms: It has a curved line, it is a circle, it is white, it is big, it tells time – a clock. The student who guesses correctly then picks another circle in the room to describe
3. Write the objects chosen on the board. Students draw the objects in their number note pad.
4. Draw a circle on the board and put its attributes inside it: round, curved side.
5. Draw a point in the middle of the circle and give the precut yarn to a student.
    a. Ask him/her to hold one end of the yarn on the point with one hand and the other end of the yarn to a spot on the outside edge.
    b. Mark the spot.
    c. Repeat with a few more students.

6. Ask them what they discover. *That the edge of the circle is the same distance from the center, no matter where you put the string.*
7. Repeat with an oval. Help them discover the similarities and differences between an oval and a circle.
8. Have them try this with the shapes they drew in their Number Notepads. Show students how to hold the yarn steady in the center while moving the yarn about the circle's edge.
9. Color in shapes that are circles (or identify them in some way).
10. Cooperative groups will be given five different items. Two of these items will not be able to be shaped into a circle (example: Popsicle sticks, crayons, tooth picks, Q-tips). The other three items will be able to be shaped into a circle (example: dental floss, string, yarn, rope).
11. Groups will be given a large chart in order to complete activity. The chart will be divided into two parts. One part will be labeled with the following words: *Things that do not make a circle***.** The other part will be labeled with the following words: *Things that make a circle.* This part will have three circles drawn on it.
12. Groups will take each item out of the bag. If the item makes a circle, the students will glue it on the circle pattern. If the item does not make a circle, the students will glue the item on the other side of the chart.

Explain More: Groups will share their charts with the class. Encourage students to share with the class the circles they found and why they consider them circles. Evaluation will consist of participation, following directions, and completion of group chart and number note pads entries.



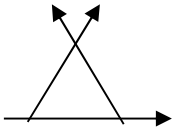
Properties of a Triangle
-Day Three-

Materials: tangrams or sets of triangles, bags of Doritos, five bags with 5 triangle patterns (different sizes, different colors, different textures, different angles, different designs)

Vocabulary: Triangle: a plane figure having three angles and three sides. "Tri" means three. Tricycles have three wheels. Tripods have three legs. Can you think of another "tri" word?

Think More:

Pass out Doritos. Talk about their shape (lines that would cross if they kept going – show on the board). Introduce sides and corners (angles). Lay the Doritos side by side to make new shapes.

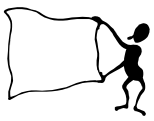


Solve More:

Activity One: Tangrams and Triangles

1. Prior to the lesson, teacher places triangle tangrams into a shopping bag.
2. Teacher allows students to feel the triangle in the bag without seeing it.
3. After everyone has felt it, the teacher asks students to tell about the object in the bag.
4. After the discussion, teacher shows the triangle from the bag and the class discusses the elements while teachers records on the board (or chart).
5. Teacher displays various sizes of triangles and discusses how the sides do not have to be equal (put tangrams on the overhead or project with document camera).
6. In cooperative groups, students are given a pattern of triangles and they work to extend the pattern with given pieces. Suggestion: Make some patterns change in color while others change in size. Vary the patterns among the groups and have students rotate through all groups if time allows. Use a variety of materials for your triangles (wallpaper samples, felt, fur, cardboard, etc.)
7. Students make triangles out of Q-tips in the Number Notepads.

Explain More: Questions: Compare your triangle to your neighbor's. How is it alike? How is it different? What was something you already knew today about triangles? What was something new you learned about triangles?



Evaluation will consist of participation, following directions, encouraging dialogue among groups, and completion of Number Notepads page.

Properties of a Rectangle (Functional and descriptive attributes)

Materials: Dry erase boards or chalkboards, markers or chalk, and index cards, sponges cut into various rectangles (small, tall, square), construction paper, paper strip headbands, cut outs of circles, rectangles (& squares) and triangles

Vocabulary: Rectangle: A plane figure with 4 sides and 4 square corners

Think More: Have children make sponge paintings with different sizes of rectangles. Save these paintings for tomorrow.

Solve More:

Activity One: Understanding the attributes of a rectangle

1. Have children draw rectangles similar to those of the on their dry erase or chalk board (or paper).
2. Pass out greeting cards (or index cards).
3. Can you fit the corner of the card (review what a corner is) into one of the corners of your shape?
4. Try all the corners (angles). If you can fit the corner of your card into all the corners of your shape, it is a rectangle.

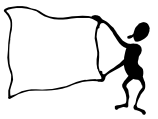
Activity Two: Compare a rectangle with a triangle

1. Erase the rectangles and try a bunch of Doritos. Repeat activity and questions.
2. Since you cannot fit the greeting card into the corner of your Doritos, is it a rectangle? No, it's a triangle.

Activity Three: Comparing rectangles with squares

1. Pass out one graham cracker and one saltine to each student. Have them check with the card if these are rectangles. Yes, because they have 4 square corners. But are they the same shape? Why not? That's right, there is something different about the saltine. Lead students to look at the sides. The square's sides are all the same. So we give this rectangle a special name…it is a square.

Explain More: Which shapes do you like the best? A circle, a rectangle, or a triangle? Why? Make a shape headband of your favorite shape. Have bowls of cutouts of each shape. Students stand up when their favorite shape is called and select that shape to glue on their headband (strip of construction paper or sentence strip).



-Day Four-

Construct Village by Combining Shapes
-Day Five-

Materials: Construction paper, glue, scissors, yarn, pre-made shape headband

Vocabulary: Review this week's vocabulary.

Think More:

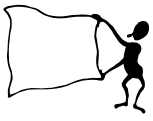
Read the Story: The Village of Round and Square Houses by Ann Grifalconi
Discuss: If you could live in a house of any shape, what would it be? Why?

Solve More:

Activity One: Creating a Shapely Village

1. Have students retrieve their rectangle paintings and carefully cut them out.
2. Have students cut out circles, triangles, rectangles, and squares. Review how each shape looks (can use tracers).
3. Position the shapes on top of, beside, behind, each other to create buildings, houses, huts. What shape looks the best as a roof? (triangle – why?) What shape is the house, the windows, the doors? Why wouldn't a triangle work for a door? Do we have circles on our homes (door knobs)? Why wouldn't a square be a good doorknob? Review functions.

Explain More: Rubric for evaluating their shapes. Oral sharing of the components. Groups will share their villages with the class, explaining which shapes make their buildings.



(Share villages and song with parents or neighboring classes)

Math Masterminds

Sing: “The Shapes in my Village” to the tune of “The Farmer in the Dell”

The Shapes in my Village, the shapes in my village, heigh-ho, the derry-o, The Shapes in my Village.
The circle in the door, The circle in the door, heigh-ho the derry-o, the circle in the Door.
The Square in the window, the square in the window. Heigh-ho, the derry-o, the square in the window,
The triangle on the roof, the triangle on the roof. Heigh-ho, the derry-o, the triangle on the roof.
The rectangle stands alone, the rectangle stands alone, heigh-ho, the derry-o the rectangle stands alone.

Also can recite nursery rhyme: “Little Jack Horner” (identify shapes – corner, plum)
Little Jack Horner, sat in a corner, eating his Christmas pie. He stuck in his thumb and pulled out a plum, and said, “What a good boy am I.”

Kindergarten
Algebra Unit
Discovering Patterns

Standards: Students recognize, understand and extend patterns.
Students analyze change.

Objective: At week's end, students will be able to sort, classify and order objects according to specific attributes. They will be able to recognize and create simple patterns of sounds, physical movements and concrete objects.

Literature Connections: Dots, Spots, Speckles, and Stripes by Tana Hoban
Eight Hands Round: A Patchwork Alphabet by Ann Whitford Paul
Know About Patterns by Henry Pluckrose

Teacher Resources: Imagine Schools Curriculum Guide

Materials: Parent Letter: wallpaper scraps, fabric scraps, buttons, pennies, string, cereal (Fruit Loops), and beads

Background: Recognizing and using patterns are important problem-solving strategies fundamental to mathematics. Children need practice using concrete objects to reproduce, create, and extend patterns. From concrete practice, they can readily move to pictorial and abstract representations of patterns. A pattern is when something happens over and over. Patterns are found in music, art, science, and math. Thinking about patterns and about how numbers work is called algebraic thinking.

Algebra makes it easier to say exactly how two changing things are related. Our English word *algebra* comes from two Arabic words: *al* (the) and *jabara* (to reunite). We can think of this as a way of tying together many ideas in math. Sometimes reading math problems is like reading a paragraph that says so many things that it is hard to follow. Algebra is our mathematical tool for stating, simplifying, and picturing relationships.

Culminating Project:
"A Fashion Show"

Pattern Types
-Days One and Two-

Materials: Blocks of different sizes or colors, xylophone, boom whackers, maracas, objects of different sizes or colors, projector, and colored markers

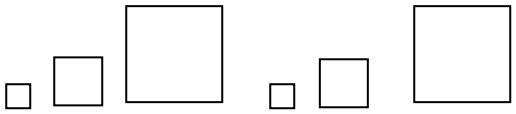
Vocabulary: Pattern: Something that changes in a regular way

Think More: Brainteaser: People Patterns

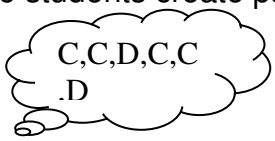
Create patterns according to the attributes of your students. Line up a few students in a pattern based on gender, and let classmates join the group as they identify the pattern. Increase the challenge by choosing other attributes for patterning such as type of shoes, hair color, or clothes.

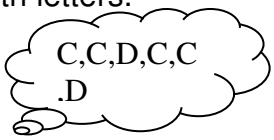
Solve More: Activity One: A pattern can be a group of items that repeats over and over in a row.

1. Have students create patterns with blocks of different sizes.



2. Have students create patterns with letters.





3. Have students create patterns with sounds (boom whackers or xylophone) or rhythms (claps, stamps and snaps or rhythm sticks, maracas). Connect visual and auditory patterns. Display several different color square patterns on the projector. Create a sound pattern to accompany one of the visual patterns. For example, a green, blue, yellow pattern could be sounded out as snap, clap, stamp (and repeat) or with instruments.

Explain More: Ask students to explain their patterns to their neighbors and to the class. As you circulate the room, complete a checklist of the students who are creating patterns and those who are not. Ask questions like:

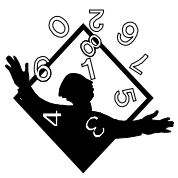
1. Tell me about your pattern.
2. What is next?
3. Why is this a pattern?
4. How does your pattern compare to your neighbors?

Grow a Pattern
-Day Three-

Materials: Blocks, pennies, construction paper, hundreds chart transparency, hundreds charts for each child

Vocabulary: Pattern: Something that changes in a regular way

Think More: Brainteaser: Using the hundreds chart

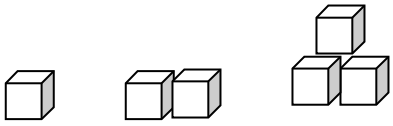


- Have the class count out loud by twos while the teacher places a counter over each number on a transparency of the Hundreds Chart. Discuss the pattern. Ask students to close their eyes while you remove one or more counter(s). See if children can tell you which numbers need to be covered to complete the pattern. Repeat for multiples of three, four, and five. Then pass out the children's hundreds chart and counters and have students repeat the activity working in small groups.

Solve More:

Activity One: A pattern can grow.

1. Start a growing pattern with blocks. Have children sit in a circle as you build a pattern in the center of the carpet. Ask a child to continue the growing patterns. Ask children how this is a pattern.



2. Grow a number pattern. Use manipulatives on the projector to build a growing pattern with shapes and numbers. Ask students to describe the pattern, encouraging them to give specific numerical descriptions of changes from one stage to the next. For example: There are three more pennies, then five more, then seven more. The pattern grows by two each time. Have students extend the pattern by adding manipulatives to those displayed.
3. Take this activity from the concrete to the pictorial level by having students complete a picture chart. Let groups or pairs of students make their own growing patterns with counters, pennies, blocks, or tiles and then draw the patterns on their paper.

Example: Extend each pattern two times

Pattern	1	2	3	4	5
Number of ☆				☆☆☆☆	☆☆☆☆☆
Number of ♥	♥	♥♥ ♥♥	♥♥♥ ♥♥♥ ♥♥♥		

Explain More:

Ask students to explain their patterns to their neighbors and to the class. As you circulate the room, complete a checklist of the students who are creating patterns and those who are not. Ask questions like:

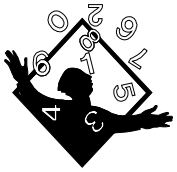
1. Tell me about your pattern.
2. What is next?
3. Why is this a pattern?
4. How does your pattern compare to your neighbors?

Create a Pattern
-Days Four & Five-

Materials: Fabric pieces, wallpaper scraps, construction paper shapes, string, beads, cereal (Fruit Loops), construction paper cone hats, construction paper headbands

Vocabulary: Pattern: Something that changes in a regular way

Think More: Brainteaser: Look at fabric and discuss the pattern. Look at students' clothes and discuss the pattern. Tell students that they are going to create new designs and produce a "Fashion Show".



Solve More:

Activity One: Necklaces

1. Students may select string and beads or string and cereal to create their necklaces. Cut the string to fit around the child's neck. Place beads and/or cereal in a bowl in the center of the table.

Activity Two: Ties

2. Students may create ties with patterns to wear around their neck. Trace a tie pattern. Select fabric or wallpaper scraps or construction paper to create a pattern. Glue them on. String the tie around the student's neck.

Activity Three: Hats or Headbands

3. Create hats from a cone shape or headband from a long rectangle. Let students decorate with a pattern from fabric scraps, wall paper scraps, or construction paper. Staple into the hat shape or headband after the students have glued on their patterns.

Explain More: Students review their learning. Share their knowledge of new vocabulary with a "hangman" game.

Math Masterminds! Students conduct a "Fashion Show" for invited guests. A narrator describes the patterns on the children while they walk down the runway. Take pictures for their portfolio.

"Scoop a Fraction"
Ice Cream Party Parts

Kindergarten
Fractions – Number Sense Unit

Kindergarten
Number Sense Unit

"Scoop a Fraction"

Standards: Students understand different representation of numbers, the relationship between/among numbers, and number systems.

Objective: At week's end, students will be able to understand representations of whole numbers and commonly used fractions, such as one half and one fourth.

Literature Connections: Eating Fractions by Bruce McMillan
Fractions are Parts by Richard J. Dennis
Sharing by Taro Gomi

Teacher Resources: Imagine Schools Curriculum Guide

Materials: Parent Letter: Gallon zip-loc bags, pint zip-loc bags, ice, salt, sugar, milk, vanilla, chocolate, and strawberry syrup, cones, scooper, candy that is sectioned (Kit Kats), measuring cups and spoons

Background: Children come to school with some knowledge of fractions; they can most likely recognize halves and perhaps fourths and thirds. However, because they have been allowed to work with imperfect models, they often have misconceived ideas about fractional numbers. To a young child, taking one half of a cookie may mean nothing more than not to take all of that cookie; he or she may, in fact, ask for the big half.

One of the first instructional tasks is to teach fractional congruence. For example, if a cookie is cut into two halves, then each half must be the same size and shape as the other. This concept should, in turn, be followed by comparing fractional values. For example, one half is greater than one fourth, but two fourths equal one half. When students understand these ideas in relation to both the concept of a fraction of one (whole) and the concept of a fraction of a group, they will be ready to begin operations on fractions.

Knowledge of fractions extends children's understanding of numbers and helps them accurately describe numerical situations. Just as children need to see models of whole numbers to understand them, they must see models of fractions in order to understand them.

Culminating Project:
"Ice Cream Cones"

Discovering Parts of a Whole
-Day One-

Materials: Number Notepads

Vocabulary: Fraction: A way to describe a part of a whole or group.
Numerator: In a fraction, the total number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the total number of equal parts or groups. The bottom number in a fraction.

Think More: Brainteasers: Meant to encourage problem solving and critical thinking, not skill review.

Pick a "Number Sense" brainteaser in the Math Mazes Addendum or pick a brainteaser of your own.

- Encourage wild ideas.
- Withhold judgment.
- Piggyback on the ideas of others.
- There might be more than one right answer.
- There are definitely many ways to find the answer.

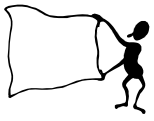
Solve More: Activity One: People Parts

1. Have students model fractional parts of a set by working with children's attributes.
2. Bring sets of children who have a common attribute (gender, hair color) to the front of the class. Identify the total number of students in this set. Write that on the board and label it denominator. Then select an attribute that only one or a few students in this group share (eyeglasses, color of shirt). Write that number above the denominator and explain that this number represents a PART of the group or WHOLE. Divide the two numbers with a line. (3/6) Tell students that this is called a fraction.
3. Have students practice writing these fractions in their Number Notepads.
4. Continue with more examples.

Activity Two:

1. Divide the class into equal groups, giving instructions according to the total number of students in each group. For example, if there are six students in each group, give commands such as these:
   - 1/6 of you stand
   - 2/6 of you take a step back
   - 5/6 of you turn around.

Explain More: Complete a checklist to determine whether students can write fractions correctly.
Question students' ability to identify the parts of a fraction.



Candy Parts
-Day Two-

Materials: Sharing by Taro Gomi
Kit Kat™ candy bars, construction paper and drawing supplies

Vocabulary: Fraction: A way to describe a part of a whole or a group.
Numerator: In a fraction, the total number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the total number of equal parts or groups. The bottom number in a fraction.

Think More:

Brainteasers: are meant to encourage problem solving and critical thinking, not skill review.
Pick a "Number Sense" brainteaser in the Math Mazes Addendum or pick a brainteaser of your own.

- Encourage wild ideas.
- Withhold judgment.
- Piggyback on the ideas of others.
- There might be more than one right answer.
- There are definitely many ways to find the answer.

Solve More:

Activity One:

1. Read the story Sharing by Taro Gomi. Tell students that we are going to learn about fractions by sharing.

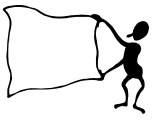
Activity Two:

1. Demonstrate fractional parts of a whole by using Kit Kat™ candy bars. Give each group of two or four students a candy bar to share. Discuss ways to divide the candy bars fairly. They can be easily divided.
2. Have students give a fractional name to the part they receive and draw a picture showing how the candy bar was divided.

Activity Three:

1. Write a math story about sharing food with a friend. Describe how you decided on a fair share for each of you. Draw a picture showing how you divided the food.

Explain More:



Keep an anecdotal record of how well students were able to share. Who became the leader at the table? Who was the mediator?

How well were the students able to express the mathematical learning? Did they illustrate the fractional pieces correctly? Did their stories reflect these mathematical concepts?

The Haves (Halves) and the Have (Half) Nots
-Day Three-

Materials: Ordinal number cards (1st –10th), 8”x11” paper.

Vocabulary:
Fraction: A way to describe a part of a whole or a group.
Numerator: In a fraction, the total number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the total number of equal parts or groups. The bottom number in a fraction.
Halves: The parts you get when you divide something into 2 equal parts.
Fourths: The parts you get when you divide something into 4 equal parts
Ordinal Number: A whole number that names the position of an object in sequence.

Think More:

Brainteasers are meant to encourage problem solving and critical thinking, not skill review.
Pick a “Number Sense” brainteaser in the Math Mazes Addendum or pick a brainteaser of your own.

- Encourage wild ideas.
- Withhold judgment.
- Piggyback on the ideas of others.
- There might be more than one right answer.
- There are definitely many ways to find the answer.

Solve More:

Activity One: Ordinal Numbers

1. Review ordinal numbers by having students line up and count off. I’m first, I’m second, and I’m third.
2. Five students 10 ordinal numbers (1st – 10th) and ask them to line up.
3. Have students read the ordinal numbers.

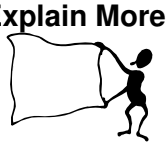
Activity Two: Fraction Folds

1. Pass out a 8x11 piece of paper.
2. Label the top “Fraction Fun”
3. Fold the paper in HALF. Ask students what in HALF means, lead them to express that there are two equal parts.
4. Have them fold the paper in half again and open it up.
5. Ask how many parts there are now. Four parts. Tell students that these parts are called fourths. Continue until you have eight parts, which are called eighths.

Activity Three: Fraction Fun

1. Each table receives a tray full of multi-colored manipulatives.
2. They count their set and record the number at the bottom of each section on their paper. This is the denominator.
3. They sort the items by color, draw and color the item, and write the color word at the top of each section on their paper (they may not use all the sections.)
4. They count each colored set and record it in the section with its corresponding color.
5. They divide the denominator and numerator with a line.

Explain More:



Are students reading ordinal numbers comfortably? Could they identify the ordinal numbers? How well could they follow the folding directions? Were they able to record the correct fractions in the correct spaces?

Ice Cream Wishes
-Day Four-

Materials: 5 scoop and cone tracers; tan, red/pink, white, and brown construction paper; mounting paper; crayons; party decorations

Vocabulary: Fraction: A way to describe a part of a whole or a group.
Numerator: In a fraction, the total number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the total number of equal parts or groups. The bottom number in a fraction.

Think More:

Brainteasers are meant to encourage problem solving and critical thinking, not skill review.
Pick a "Number Sense" brainteaser in the Math Mazes Addendum or pick a brainteaser of your own.

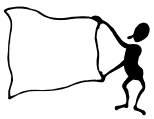
- Encourage wild ideas
- Withhold judgment
- Piggyback on the ideas of others
- There might be more than one right answer
- There are definitely many way to find the answer

Solve More:

Activity One: Sorting and Counting

1. Students will sort ice cream scoops by color or flavor and write fractional parts to represent each flavor they will have on their ice cream cone.
2. Give each table the scoop and cone tracers. Students will make an ice cream cone, that reflects what they want to eat during the ice cream party.
3. Each table will have tan paper for the cone and red/pink, white, and brown paper for the flavors.
4. Students trace and cut out the cones and two to five scoops (whatever they predict). Show how to cut more than one scoop at a time.
5. Students will also need a 8'x11" piece of paper on which to mount their ice cream cones on.
6. Allow students to predict what the colors stand for (red = strawberry ice cream).
7. After students have mounted their scoops on their cones, have them create a key that reflects the fractions of each of their flavors. I have three scoops of ice cream on my cone. 1/3 = strawberry, 1/3 = vanilla, 1/3 = chocolate.
8. Save displays for a Yummy Bulletin Board.

Explain More: Were students able to write the fractions for each of their scoops correctly? Did students share the tracers?



Ice Cream Party
-Day Five-

Materials: Gallon zip-loc bags, pint size zip-loc bags, ice, salt, milk, chocolate and strawberry syrup, cones, sprinkles (optional), measuring cups and spoons, vanilla, sugar

Vocabulary: Fraction: A way to describe a part of a whole or a group.
Numerator: In a fraction, the total number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the total number of equal parts or groups. The bottom number in a fraction.

Think More:

Brainteasers are meant to encourage problem solving and critical thinking, not skill review.
Pick a "Number Sense" brainteaser in the Math Mazes Addendum or pick a brainteaser of your own.

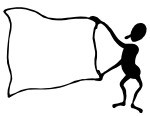
- Encourage wild ideas
- Withhold judgment
- Piggyback on the ideas of others
- There might be more than one right answer
- There are definitely many ways to find the answer

Solve More:

Activity One: Making Ice Cream

1. Have students fill a gallon size, heavy-duty freezer bag **half** full of iced cubes.
2. Then put 6 tablespoons of salt into the bag of ice. Set aside this bag for later. It is like our refrigerator. (Can do a science connection here. What changes a liquid into a solid? Temperature (cold)
3. In the pint storage bag, put:
   a) ½ cup milk (chocolate milk may be used, but leave out the sugar in step c)
   b) ¼ teaspoon vanilla
   c) 1 tablespoon sugar
   d) Chocolate or strawberry syrup may be added to 1/3 of the bags. Do this as part of the lesson.
4. Squeeze out the air and seal the pint size bag carefully.
5. Put the bag of ingredients into the large bag of ice and salt. Squeeze out as much air as possible and seal the big bag.
6. Shake or roll the bags carefully until the mixture gets thick like ice cream.
7. When you take the bag of ice cream out of the larger bag, be sure to rinse off the salt on the outside.
8. Have tables sort their ice cream by colors. Chart the fractions on the board.
9. Collect the ice cream bags and call tables to come up for their cones and ice cream. Each student can get the scoops that they drew in yesterday's lesson.
10. Enjoy!!!

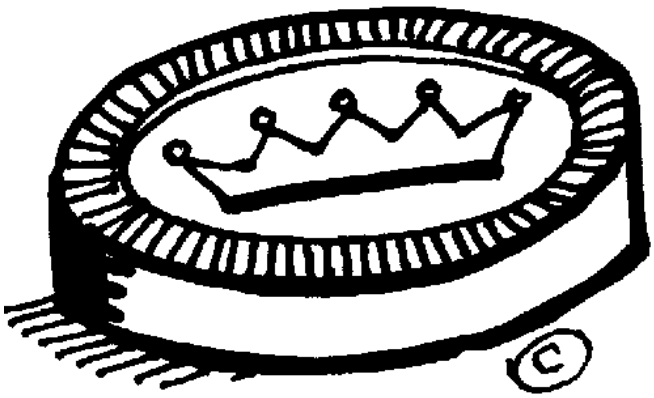
Explain More: Were students aware of all the fractions used while cooking? Were they able to talk using fractional terms as they made ice cream? Were students able to see how math is used in real world situations?



Math Masterminds

Invite guests to your ice cream party. Give a presentation with your ice cream fractions. Students can wear costumes of each scoop and present a poem about their fraction cones.

"Let's Play It Again!"



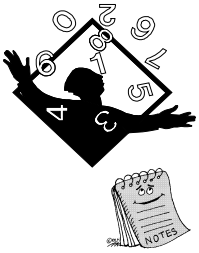
First Graders
Learn the Structure of Math

Table of Contents

Introduction to First Grade Encore Math

Introductory Procedures

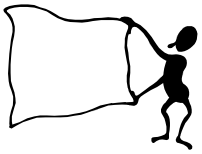
You and your students will need clear procedures to follow to make your time together productive and enjoyable. Each lesson has three distinct sections:



Think More is the opening

Number Notepads will be used in this section for brainstorming and analyzing Have a parent volunteer make a class set of Number Notepads (20 sheets of paper folded into a booklet with a construction paper cover) These will be used all summer and put in the student's Art Portfolio.

Solve More is the project or activity



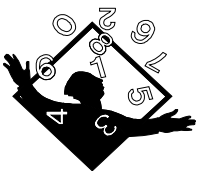
Explain More is the closing

Math Portfolio will house the work your students select as memorable in their Encore mathematics program. A piece of construction paper made into a folder will work well. Selected pieces (around 4) and teacher, student, and peer assessment forms should be kept in the portfolio).

Math Masterminds is the culminating activity for the class that is with you on the ninth week of the grading period.

Decide on clear procedural guidelines for the students to follow in each phase of the class—"lead" them to this list as you explain. Have "Think More, Solve More, Explain More" written on the board or chart. (This should be posted at all times during your Encore class.) Leave space for a short list of guidelines that the class will generate during this lesson.

<u>Think More!</u>



To describe the 'Think More" portion of class, teacher can say something like...

"During the first ten minutes of class every day we will be solving a brain teaser. Often you will write in your Number Notepad as you work out a solution to the problem. This part of class will be called "Think More!" Sometimes you will solve the problem quickly. And sometimes you won't be able to solve it at all. You will have a chance to express yourself in your Number Notepads. I think that you might be surprised by all the math you already know." Let the other children give it their best effort and try to form their own solutions before you try to solve it as a group. (Think, Pair,

Share) Sometimes the problems will make you want to smile, frown or say hmmmmm or huh????

"Can anyone think of a few guidelines that the class should follow during 'Think More!' (Summarize student answers into one or two positive directives and write them on the chart or board.)

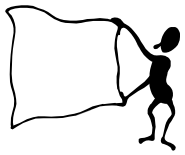
Solve More!

"The next part of the class will no doubt be your favorite—"Solve More." This is when we will be learning new math concepts. Sometimes we will be playing games, using manipulatives, or building projects to learn our math concepts and facts."

Discuss procedures for playing games, using manipulatives, and doing cooperative work.

"Can anyone raise their hand and tell me a few important guidelines for the "Solve More! part of class?" (Be sure to lead them to "never make fun of someone else's work or knowledge level) Have a student come up and write the summarized phrases on the board or chart.

Explain More!



"The last part of class will be 'Explain More' which will be a time to find out what was learned during the lesson. It might be a game, some questions, a display of your work or a demonstration. What if you are asked to share your learning for that day?

Let's think of some things to remember for 'Explain More.' (Lead students on how to give compliments to others during this sharing time) Teach students a few ways to say something positive. Pass out the peer and self-assessment forms. (See Assessment section of packet for the assessment forms). Talk about how you might complete each section. Act out a student hesitating on his/her math facts. Walk students though an acceptable way to talk about someone who might be struggling. Write their suggestions on the chart.

Leave the summaries of acceptable student behavior on the board to later transfer to a chart for continued review during the first week of class. Keep the chart available for this class throughout the year. You should review it when you see them again the following semester. If students have a problem during certain sections of the day, use the parent communication forms (found in the back of this packet) to let their parents know about their talents as well as areas in which they need improvement.

Practicing these procedures will provide students with the structure and framework necessary for you to have an orderly class. Many behavior problems arise because students do not know the expectations or what they are supposed to be doing. Keep directions clear and consistent. Make a clear distinction between procedures (knowing what to do and what is expected) and rules (i.e., hurting others). If students forget the procedures, review and practice them. If students break a rule, administer consequences.

Encore First Grade Math Materials and Resources

Non-consumables:

Imagine Schools Curriculum Guide
Core Math Program Manipulative Kits:

Games:

- Bean Bag Toss
- Concentration Game Board (on poster board or 3 sided project board)
- Dominoes

Recommended Websites:

- Fun Brain: www.funbrain.com/fract/index
- A+ Math: www.aplusmath.com
- Triple A Math: www.aaamath.com
- Teacher Corner: http://www.theteahcercorner.net
- Education World: http://www.educaton-world.com/
- Houghton Mifflin Harcourt: Brain Teasers: http://eduplace.com

Consumables or Activity Specific:

NUMBER NOTE PADS

Unit 1 Geometry:

Projector, document camera, or interactive whiteboard, pattern blocks or shapes, 5 sets of colored index cards, nuts and bolts with polygon shapes, geoboards, rubber bands, paper bag (with dot shapes optional), concentration card game board, clips, index cards, junk, masking tape, markers, trays, yarn

Unit 2 Algebra:

Boxes, sentence strips, markers, construction paper, index cards, and dice

Unit 3 Number Sense:

Construction paper, Dixie cups, two-color counters or pennies, tally chart, projector, bulletin board paper cut into 12" circles (or the cardboard from real pizza), scissors, markers, crayons, construction paper, coupons or grocery ads, cooking magazines, glue, English muffins, vegetables, cheese, tomato sauce, pepperoni, food cutting utensils (plastic knifes or dull butter knives), measuring spoons, cookie sheet, wax or baking paper.

First Grade Booklist

First Grade Week 1

Brian Wildsmith 1 2 3 by Brian Wildsmith

Changes, Changes by Pat Hutchins

Danny's Dilemma by John Tarlton

The Quilt by Ann Jonas

Puzzle Maps by Nancy Clouse

Round Trip by Ann Jonas

The Shape of Things by Dayle Ann Dodds

First Grade Week 2

Number Ideas Through Pictures by Mannis Charosh

Hey! Get Off Our Train by John Burningham

Have You Seen My Ducklings? By Nancy Tafuri

First Grade Week 3

Eating Fractions by Bruce McMillan

Fractions are Parts by Richard J. Dennis

How Pizza Came to Queens by Dayal Kaur Khalsa

First Grade
Geometry Unit
Junkyard Geometry

Standards: Students understand properties of polygons.
Students identify attributes of shapes; such as vertices, edges, curves and faces.
Students combine shapes.

Objective: At week's end, students will be able to identify many polygons, compare and contrast shapes, create new shapes by combining shapes, and communicate about shapes effectively

Literature Connections:
Brian Wildsmith 1 2 3 by Brian Wildsmith
Changes, Changes by Pat Hutchins
Danny's Dilemma by John Tarlton
The Quilt by Ann Jonas
Puzzle Maps by Nancy Clouse
Round Trip by Ann Jonas
The Shape of Things by Dayle Ann Dodds

Teacher Resources: Imagine Schools Curriculum Guide

Materials: Parent letter: brads, cardboard strips, shape crackers

Background: Geometry is the part of mathematics that includes points, lines, surfaces, and solids. The word geometry derives from the Greek words for earth and measure. Geometry is divided into two different categories plane and solid. Plane geometry refers to two-dimensional shapes in one plane. Solid geometry refers to three-dimensional shapes.

The earliest accounts of geometric shapes have been found in artifacts dating buildings and pottery. The Egyptians used geometry to solve problems that arose after the annual flooding of the Nile River. There was a need to replenish the soil due to the flood, so they used a form of geometry known as surveying. Also, the ancient pyramids were built using a variety of geometric principles.

There were several people who contributed to the development of geometry. Around the year 300 BC, a man by the name of Euclid wrote a collection of books entitled The Elements. In these books, he systematized the development of plane and solid geometry.

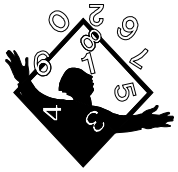
Culminating Project:
Junkyard Blues Masterpieces

Classifying Shapes
-Day One-

Materials: Projector, document camera, or interactive whiteboard, pattern blocks or shapes, 5 sets of colored index cards

Vocabulary:
Polygon: A closed figure formed from line segments that meet only at their endpoints (can have any number of sides and any sized corners.
Quadrilateral: A polygon. It has four sides that are line segments. Its sides and corners may vary in size.
Parallelogram: A quadrilateral with two pairs of parallel and congruent sides
Rectangle: A parallelogram with square corners
Square: A rectangle with equal sized sides.
Congruent: Having exactly the same size and shape.
Line Segment: Part of a line defined by endpoints.
Parallel Lines: Lines that are always the same distance apart.
Two Dimensional: Extending in two ways (length and height)

Think More:



Let's make some shadow shapes on the wall. The images we are projecting are flat. Squares, triangles, and other plane figures are flat, too. They are called plane figures because they lie in a single plane. In geometry, a plane is a 2-dimensional surface that is perfectly flat and infinitely large. Plane figures are useful even in our 3-dimensional world. Think about city maps, diagrams of basketball plays, and computer games.

Solve More:

Classifying Shapes: Plane figures come in a variety of shapes and sizes. We name them according to the number, size, and position of their sides and angles (corners). They are two-dimensional. That is, they extend in two directions. (Across=length and up/down=height)

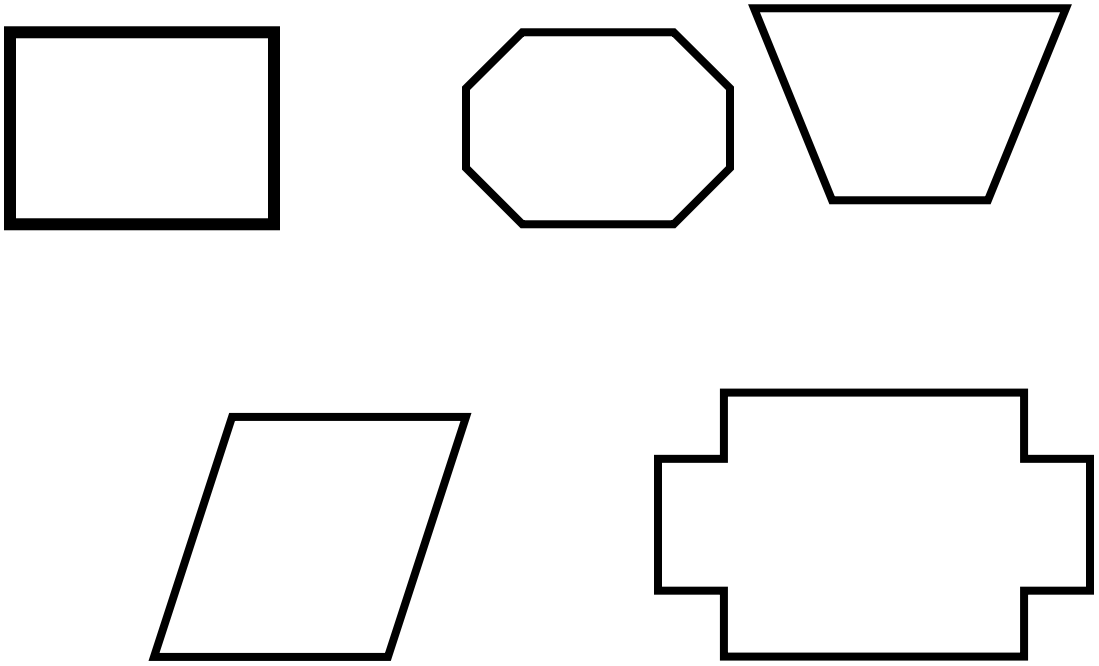
Activity One: Working with terms

1. Show shadows of polygons on the projector Have students draw and label the shapes in their number note pads.
2. Show shapes that are not a polygon.
3. Tell students that polygons can have three sides, like a triangle, or many sides. Tell students that they will be learning about these other shapes the rest of the week.
4. Show quadrilaterals Ask students to brainstorm how these are different than some of the polygons. (They all have four sides.)
5. Show a parallelogram on the projector. Compare it to the quadrilaterals. What do the children observe (that a parallelogram is in the quadrilateral group. How is it different than the others? Its sides are congruent (same length) and parallel to each other. Identify which quadrilaterals are not parallelograms. Lead students to the conclusion that all parallelograms are quadrilaterals and polygons, but not all polygons or quadrilaterals are parallelograms. Draw a parallelogram in their number note pad.

6. Show a rectangle on the projector. Repeat #5. Lead students to the conclusion that a rectangle is a parallelogram and a quadrilateral and a polygon.
7. Ask students if they can think of a shape that would be a rectangle. Have them draw it on an index card and hold it up. (A square would be a rectangle, because it has four square corners.
8. What major shape are we not talking about today (circle). Why not (it is not made with line segments). What is it made with? (Curved line)
9. Display the huge bull's-eye entitled "Narrowing in on Shapes"
10. Give students five index cards (5 different colors).
    a. On the blue index card make a polygon (any number of sides and any size corners – just has to be a closed figure)
    b. On the green index card make a quadrilateral (must have four sides, but sides and corners can be any size
    c. On the yellow card make a parallelogram (must match opposite sides- direction and size)
    d. On the white index card make a rectangle (four sides, square corners).
    e. On the pink index card make a square (four equal sides and corners).
11. Have students come up and put their card in the correct place in the bull's-eye. Lead them to the conclusion that they have classified shapes and that shapes may be in more than one group. Relate this to a family tree. Dan is Susan's husband. He's also Sandy's father and Randy's grandfather. Dan is just one person in the family, but there are many family names for him. Many quadrilaterals can be described using more than one name. We will be exploring more names tomorrow.

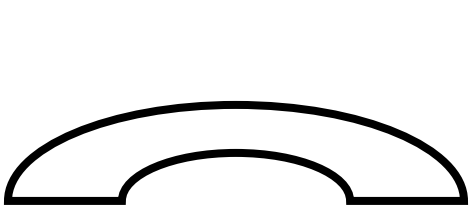
Explain More: Play Darts (Beanbag toss) with the Bull's-eye. Students stand on a square (carpet square or tile on floor) and throw a beanbag at the bull's-eye. They must say the shape's name and the category(ies) to which it may belong. Example: triangle = polygon (only)

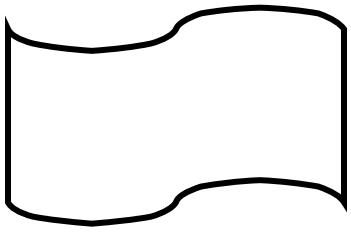
Polygons



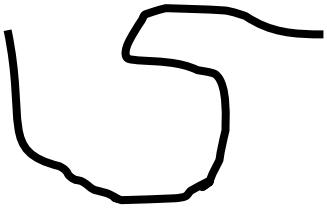
--

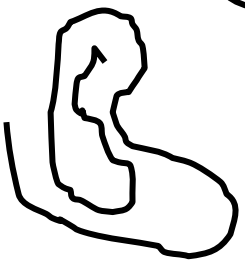
Not Polygons

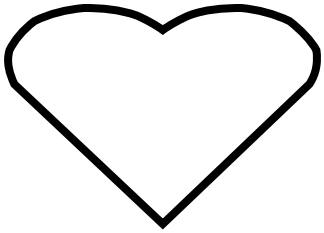




(not line segments)

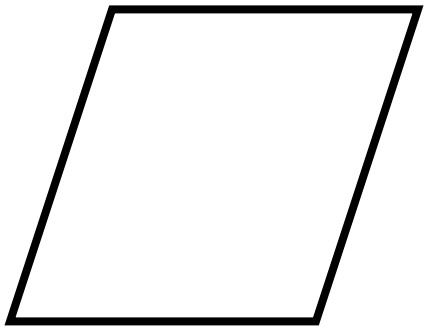


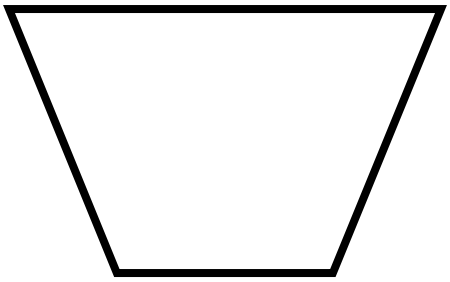




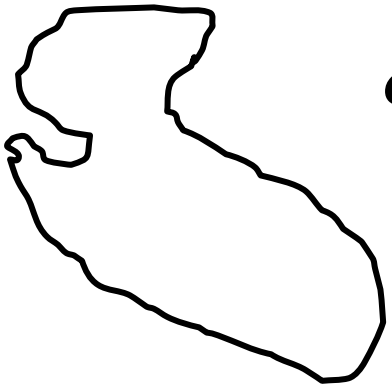
(not a closed figure)

Quadrilaterals

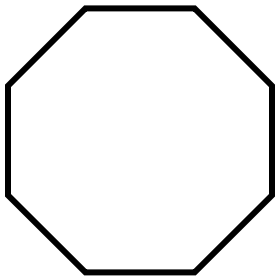




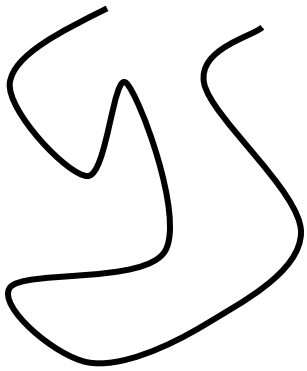
Not Quadrilaterals



(Not a line segment)



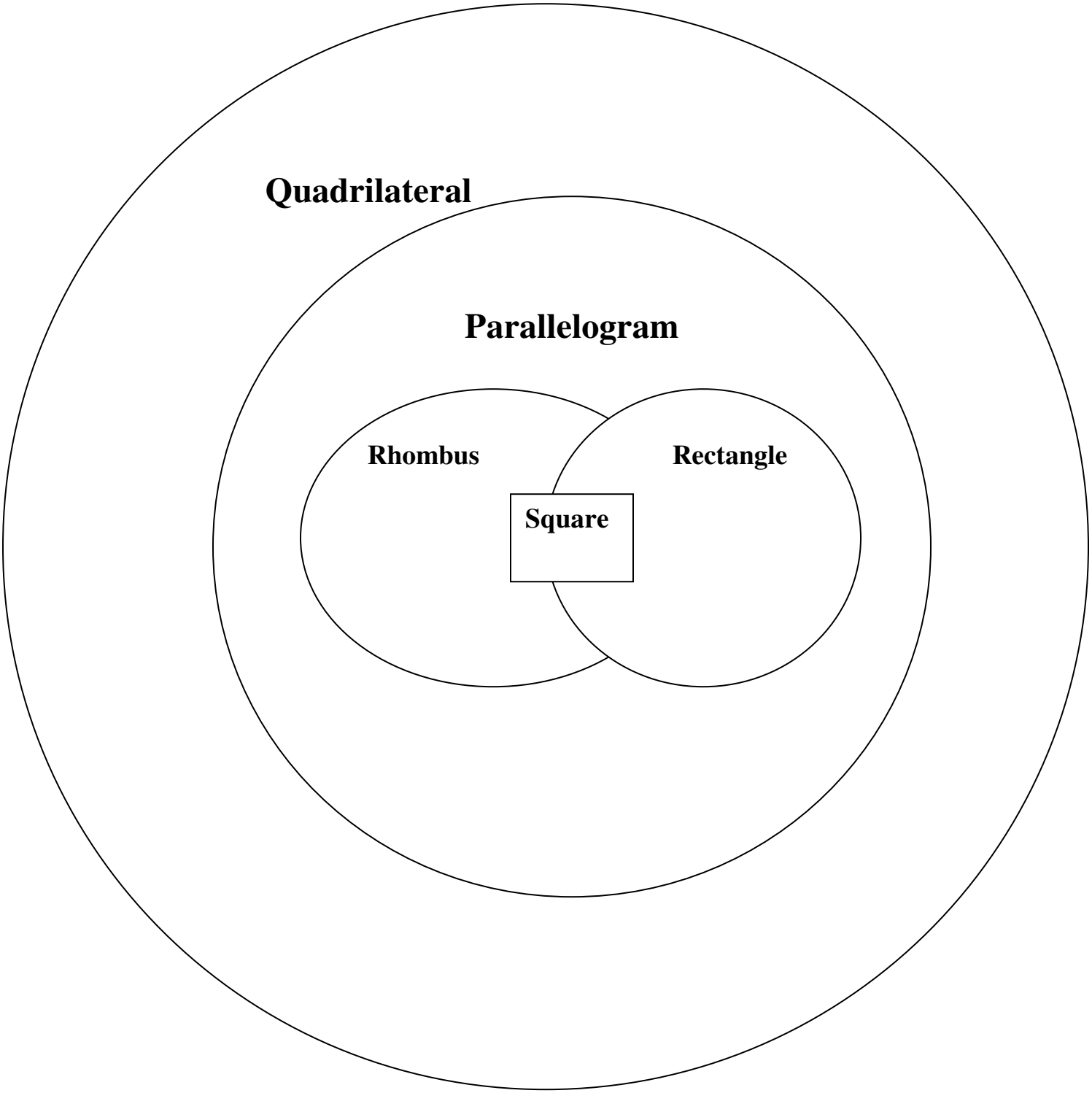
(Too many sides)



(Not a closed figure)

Bull's Eye

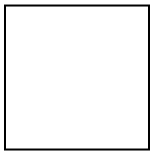
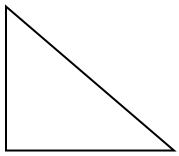
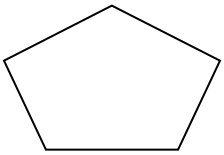
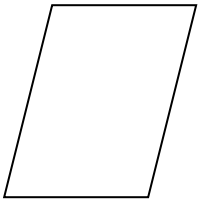
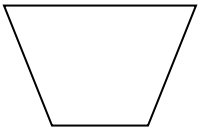
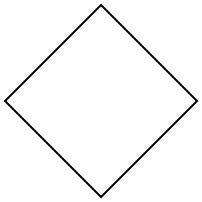
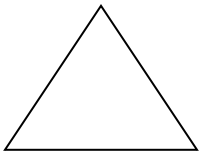
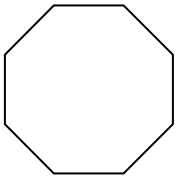
(How would you show polygon?)



Grid Board

10										
9										
8										
7										
6										
5										
4										
3										
2										
1										
0	1	2	3	4	5	6	7	8	9	10

Concentration Cards

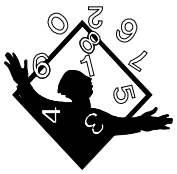
	**Square**		**Isosceles Triangle**
	**Pentagon**		**Parallelogram**
	**Trapezoid**		**Square**
	**Equilateral Triangle**		**Octagon**

Classify Polygons
-Day Two-

Materials: Junk from the tool box (nuts and bolts with polygon shapes) geoboards, rubber bands, dot paper bag.

Vocabulary:
Trapezoid: A quadrilateral with only two parallel sides and corners can vary.
Rhombus: A parallelogram with four equal sides but corners that are not necessarily square (can be a square)
Equilateral triangle: A polygon with three equal sides and angles.
Square: A polygon with four equal sides and angles.
Pentagon: A polygon with five equal sides and angles.
Hexagon: A polygon with six equal sides and angles.
Octagon: A polygon with eight equal sides and angles.

Think More: **Junk box**



Conduct a cooperative group activity to determine students' background knowledge: One student takes the bag and feels one shape in it. He/She must describe the shape by the total number of sides and type of angles. Example: It has eight equal sides and eight obtuse angles. The rest of the table tries to guess the shape. They give the shape to the person that guessed it correctly. They pass the bag to the right.

Solve More: Activity One: Identifying Polygons

1. Ask students if they knew the names of the shapes. Ask how they knew the names and how they have been able to remember the names.
2. Pass out geoboards and tell students that they are going to make many polygons (review – polygons – shapes connected by straight line segments).
3. Review rules for the rubber bands.
4. First make a triangle – list attributes (3 line segments (sides), 3 angles).
5. Next make a square – list attributes (4 equal sides and 4 square corners).
6. Now change this into a rectangle – lengthen two sides.
7. Change it back to a square,
8. Now change it to a rhombus (4 equal sides, but not square corners)
9. Next make a pentagon. Continue this process with a hexagon and octagon.
10. Allow time for them to make shapes with more than one rubber band by combining shapes.
11. Instruct them to make a building. Talk about the shape for a roof. Suggest they include at least three different shapes in their building.
12. Have them transfer this shape onto their dot paper and label the shapes.

Explain More: Individuals will share their buildings and define the shapes by proving their labels.

Constructing Shapes
-Day Three-

Materials: Materials: 250 (10 per student) brad fasteners, construction paper strips. You will need 50 long pieces (12") and 50 short pieces (6") 25 (8") Punch small holes in the end prior to the lesson or show students how to carefully do it with their pencil tips.

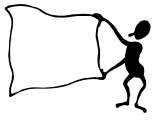
Vocabulary: Review vocabulary from days 1 and 2.

Think More: Draw a bulls-eye on the board or bulletin board paper. Put a polygon shape (or name only) in each circle. Play the Bulls-Eye Game. Students throw the beanbag at the bulls-eye. They must retrieve the shape from the tray that matches the one their beanbag hit.

Solve More: Activity One: Constructing polygons

1. Have cardboard strips and brad fasteners in a baggie for each table. Allow students to see how many different two-dimensional shapes they can construct and name. They will no doubt come up with several from the past few days. Punch holes is the ends of the paper strips. Connect the strips with fasteners. 3 strips = triangle. 4 strips = square, rhombus, or rectangle.
2. After a time the students will probably notice that the triangle is firm and cannot change at the corners. The other shapes can be manipulated.
3. Have the students make a square. Have them push the framework to make a rhombus.
4. Have the students make a rectangle. Have them push the framework to make a parallelogram.
5. Take the parallelogram apart and rearrange the sides to make a trapezoid
6. Instruct students to make a pentagon. Continue with other shapes that they know.

Explain More: Have students share what they have learned about shapes this week. Did you prefer making shapes on the geoboard or with the strips? Why? What was different about the two ways we tried constructing our shapes? What was the same?



Evaluation will consist of participation, following directions, encouraging dialogue among groups and completion of Number Notepads. Use Math Rubric.

Claim Day
-Day Four-

Materials: Concentration Card Game (put in a sentence strip pocket chart or prepare a game board with a poster board (or science fair board) and paper clips), index cards.

Vocabulary: Culminating activity with this week's vocabulary

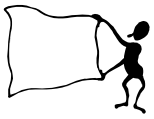
Think More: Read <u>The Greedy Triangle</u> by Marilyn Burns

Discuss the different shapes in the story. Sequence the shapes that he wanted to become in the order that he changed. List the things that were the shape he became. For example: He became a quadrilateral because he liked being pages in a book.

Solve More: Activity One: Identifying Polygons

1. Play Concentration (Memory).
2. Students make game or index cards.
3. Each table works as a team.
4. Pick one card and then try to match it to its illustration or definition. If correct, keep the cards and go again (pick two more cards). If incorrect, turn the cards back over, keeping them in exactly the same place (so it won't interfere with anyone's concentration.
5. Play continues around the room from table to table.

Explain More: Which shape is the easiest for you to remember? Which shape is the hardest? Why? Make a note of this in your Number Notepads.



Construct Junkyard Sculptures
-Day Five-

Materials: Junk, masking tape, markers, trays, index card, yarn

Vocabulary: Review week's vocabulary

Think More: Read the story Danny's Dilemma by John Tarlton. Danny uses junk in his yard to build a variety of vehicles. Compare this book with Changes, Changes by Pat Hutchins

Solve More: **Constructing a Junkyard Sculpture**

(30 minutes)
Activity One:

1. Identify the junk on the trays.
2. Select a group of items that they wish to use in constructing their masterpieces.
3. Compose a description of their sculpture by identifying the shapes they are using. (Example: This piece was constructed by using three squares, two parallelograms, and four pentagons.)

Activity Two:

1. Put shape together with tape.
2. Prop description at its base or hang it around the sculpture with yarn.

Explain More: Sing "Rhombus Connected to the Rectangle" to the tune of "Dem Bones" after each student shares his/her sculpture. (Rubric Scoring)

https://www.youtube.com/watch?v=e54m6XOpRgU

Math Masterminds Culminating Event: Display of Sculptures. **Junkyard Claim Day**. Students walk past each sculpture and keep a claim list of all the shapes that they see in each sculpture. Each sculpture should have an item list attached to it and an item number for easy reference.

Guess My Shape

What You Need:

- paper
- a pencil
- a geometry vocabulary list
- index cards

1. Students write their own set of clues for any three of the figures below.

2. Trade your clues with a partner's. Test each other's clues.

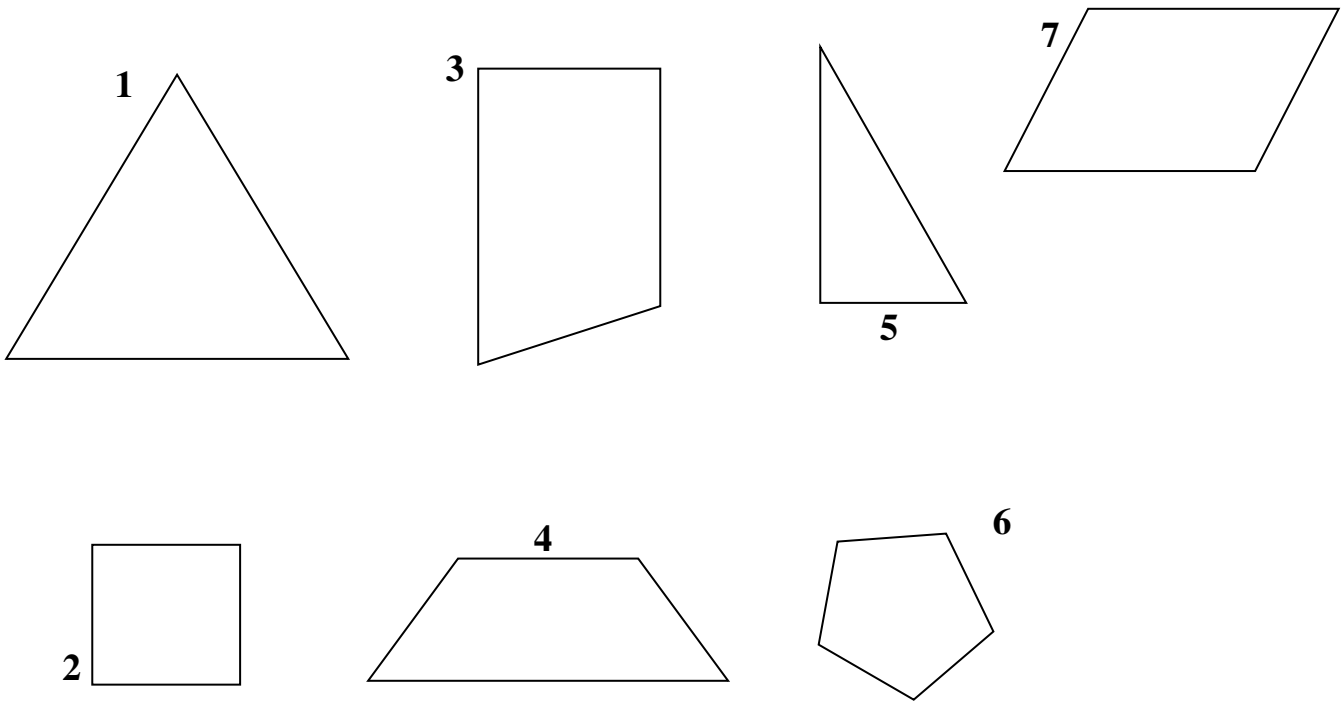
3. Identify the "give-away" clue in each set. Explain why that clue was key to recognizing the figure.

*Pattern blocks can be substituted for the shapes.

Helpful Hints:

All these names describe the polygons below. Some names describe the shapes more precisely than others.

1. triangle
2. square
3. trapezoid
4. quadrilateral
5. right triangle
6. pentagon
7. parallelogram



First Grade
Algebra Unit
The Structure of Functions

Standards: Students utilize symbols and mathematical expressions to represent mathematical situations.
Students use mathematical models to represent mathematical relationships.
Students analyze change.

Objective: At week's end, students will be able to use objects, pictures, or symbols to create and solve simple number sentences involving addition and subtraction. Students will be able to solve addition and subtraction sentences in which an unknown or missing number is involved.

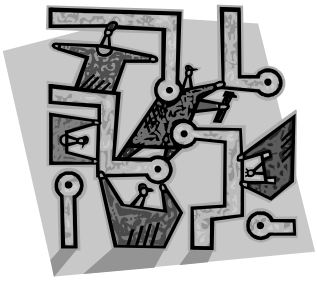
Literature Connections: Number Ideas Through Pictures by Mannis Charosh
Hey! Get Off Our Train by John Burningham
Have You Seen My Ducklings? By Nancy Tafuri

Teacher Resources: Imagine Schools Curriculum Guide

Materials: Parent Letter: boxes

Background: Recognizing and using patterns are important problem-solving strategies fundamental to mathematics. Children need practice using concrete objects to reproduce, create and extend patterns. From concrete practice, they can readily move to pictorial and abstract representations of patterns. A pattern is when something happens over and over. Patterns are found in music, art, science, and math. Thinking about patterns and about how numbers work is called algebraic thinking.

Algebra makes it easier to say exactly how two changing things are related. Our English word *algebra* comes from two Arabic words: *al* (the) and *jabara* (to reunite). We can think of this as a way of tying together many ideas in math. Sometimes reading math problems is like reading a paragraph that says so many things that it is hard to follow. Algebra is our mathematical tool for stating, simplifying, and picturing relationships.



Culminating Project:
"Mystery Math Machines"

Function Machines
-Days One & Two-

Materials: Boxes, sentence strips, markers, construction paper, index cards, dice

Vocabulary: Function: Pairs of numbers that follow a rule. In a function, there is only one "Out" number for an "In" number.
Pattern: Something that changes in a regular way.
Equation: A number sentence with an equal sign. The amount on one side of the equal sign has the same value as the amount on the other side.
Table: A way to organize data using rows and columns.

Think More: Brainteasers

Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a "Think, Pair, Share" strategy will work best. First students "think" on their own, then "pair" with a friend and finally "share" their ideas with the class.

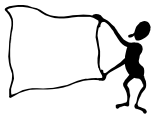
Solve More: Activity One: Construct Function Machines

1. Have students work in pairs or cooperative groups.
2. Each group receives a box and covers it with construction paper (measuring each side will work best).
3. An adult will cut a slit in the top and on the right side.
4. Each group will be assigned a "Rule", Teacher has rules on index cards and students pick one for their group, such as +2, +3, +4, + 5, –1, -2, -3, -4, and so on.
5. Students glue that rule on the front face of their box.

Activity Two: Play the Function Game

1. Students will slide a sentence strip through the two slits of their function machine, leaving only a bit at the side slit.
2. Students will select a colored marker for each function.
3. They will roll a dice and put that number on the sentence strip that is going "IN" the top of their function machine.
4. Using the "Rule," they will decide what number will come "OUT" of their function machine.
5. Students will write this number on the strip coming out of the side of their box.
6. Students will pull the strip a bit, so that the number on the top of their box is now in the box and not showing.
7. Now the process can be repeated with a new number. (Students should use a new color of marker for each set).

Explain More: Ask students to look at their sentence strips. Do they see a pattern? Ask them why it is a pattern (see vocabulary). See if students can guess the RULE if they know the two numbers (on sentence strips). Create some missing addend problems. Such as $3 + \square = 7$.

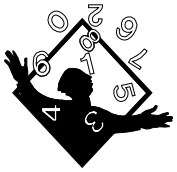


The Inside Story
-Day Three-

Materials: Markers, construction paper, (colored dots – optional)

Vocabulary:
Function: Pairs of numbers that follow a rule. In a function, there is only one "Out" number for an "In" number.
Pattern: Something that changes in a regular way.
Equation: A number sentence with an equal sign. The amount on one side of the equal sign has the same value as the amount on the other side.
Table: A way to organize data using rows and columns.
Addend: A number you can add.

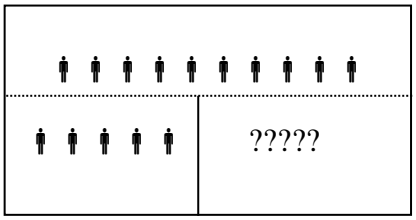
Think More: Brainteasers



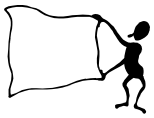
Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a "Think, Pair, Share" strategy will work best. First students "think" on their own, then "pair" with a friend and finally "share" their ideas with the class.

Solve More: Activity One: Make a Flip Book

1. Pass out 8 x 11" colored construction paper
2. Children fold it in half (hotdog fold – long and thin)
3. Children fold it in half (hamburger fold – short and fat)
4. Children reopen that last fold.
5. Have children cut on the fold only to the center.
6. Using colored dots or by drawing their favorite shape, students select their favorite number to illustrate on the cover (side without the cut). This represents the "whole".
7. Have students open the fold and on the left side, illustrate a number that is "less than" the number they illustrated on their cover.
8. Have them ask a partner what should go on the right side of their paper to discover the "inside story" and solve the mystery.



Explain More: Have students make up stories in their Number Notepads that go with the flip book illustration. Keep the mystery theme going.



Example:
10 strangers were walking in the parking lot.
5 were wearing trench coats.
How many were not wearing trench coats?

- Use facts that you know
- Think 5 plus *what* equals 10.
- You can add up to find the mystery number.
- Or, you can subtract to find the mystery number.

Mystery Numbers
-Day Four-

Materials: Dominoes, dice

Vocabulary: Function: Pairs of numbers that follow a rule. In a function, there is only one "Out" number for an "In" number.
Pattern: Something that changes in a regular way.
Equation: A number sentence with an equal sign. The amount on one side of the equal sign has the same value as the amount on the other side.
Table: A way to organize data using rows and columns.
Addend: A number you can add.

Think More: Brainteasers

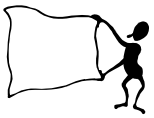
Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a "Think, Pair, Share" strategy will work best. First students "think" on their own, then "pair" with a friend and finally "share" their ideas with the class.

Solve More: Activity One: R.A.P. (Roll, Add, Place)

1. A small group of children use one set of dominoes and a pair of dice.
2. Children each take four dominoes from the set, which is turned facedown on the playing area.
3. They place their dominoes face up for their hand.
4. One domino from the playing area is turned face up as the starter.
5. The first player rolls the dice, and then tries to pair one face of a domino from his or her hand with one face of the starter so that the sum of the faces equals the number rolled.
6. If this is possible, the player puts his or her domino next to the starter and picks a domino from the playing area.
7. If this is not possible, the player simply picks a domino from the playing area.
8. The next player follows the same procedure.
10. Play continues even when there are no dominoes left to pick.
11. The winner is the player who runs out of dominoes first.
12. If no one runs out, and no more matches can be made, the player with the least number of pips (dots on the domino) on his or her remaining dominoes wins.

Explain More: Key question for discussion or response in Number Notepads:

How did you decide which domino to put down on your turn?



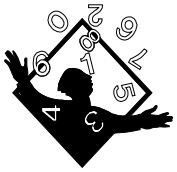
Some children may need to count up from the total number of pips on the domino face to reach the sum. Other children may need help in finding the missing addend by subtracting the other addend from the number rolled. The more experienced child may realize that there is an advantage to playing greater-value dominoes toward the end of the game.

Mystery Number Challenge
-Day Five-

Materials: Boxes, sentence strips, markers

Vocabulary:
Function: Pairs of numbers that follow a rule. In a function, there is only one "Out" number for an "In" number.
Pattern: Something that changes in a regular way.
Equation: A number sentence with an equal sign. The amount on one side of the equal sign has the same value as the amount on the other side.
Table: A way to organize data using rows and columns.
Addend: A number you can add.

Think More: Brainteasers



Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a "Think, Pair, Share" strategy will work best. First students "think" on their own, then "pair" with a friend and finally "share" their ideas with the class.

Solve More: Activity One: Big Box Challenge.

1. Either use the boxes from day one in this competition or make big Function Machines with U-Haul Boxes.
2. One team takes their box in front of the room and shows the competing team the sentence strip numbers as they slide through the back of the box (do not show the front where the rule is displayed.
3. The opposing team must guess the "rule". If they guess the rule they get a point.
4. Play goes to the next team.
5. New sentence strips may need to be made as the game goes on.

* *

2	3	4	5	Rule on the box	7	8	9	10

Explain More: Record in an anecdotal record how each child is figuring out these answers. What strategy is he/she using?

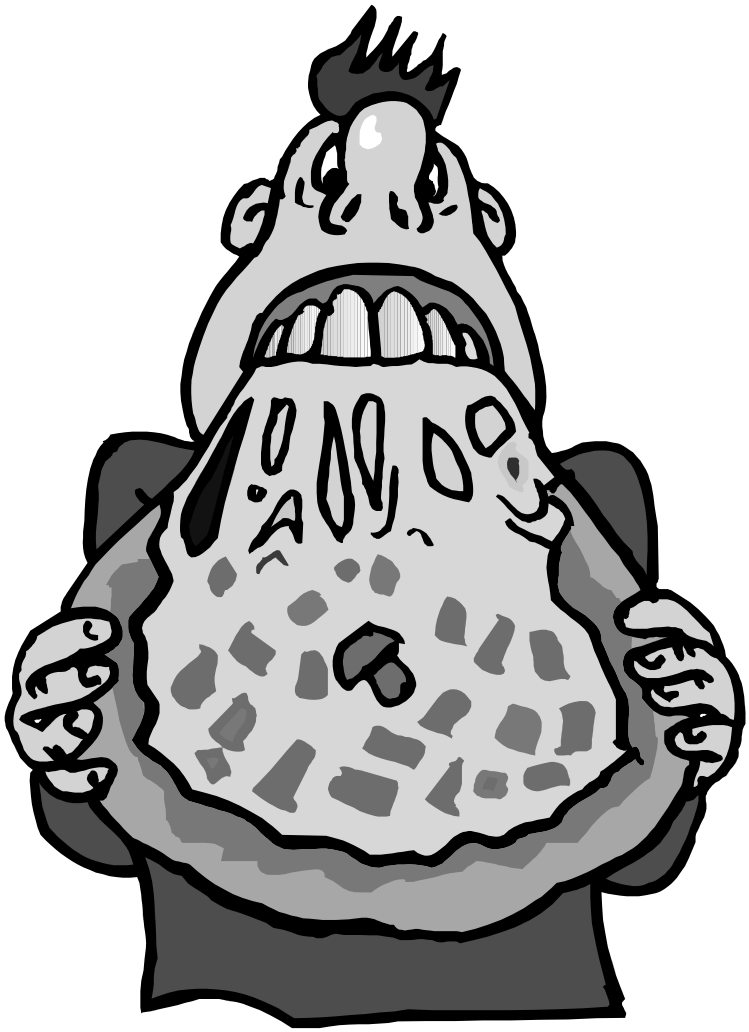
- Adding up
- Subtracting

Math Masterminds

Show your function machines to neighboring classes. Have them put a number in and you have the answer come out. Make sound effects for your machines. Decorate them with other parts (like in Willy Wonka and the Chocolate Factory). A variation could be having tennis balls roll through a paper towel roll "tube."

"Who Wants Pizza?"

Fractions



First Grade Fractions –
Number Sense Unit
"Who Wants Pizza?"

Standards: Students understand different representations of numbers, the relationship between/among numbers and number systems.

Objective: At week's end, students will understand that the total of fractional parts is a whole and will understand commonly used fractions.

Literature Connections: Eating Fractions by Bruce McMillan
Fractions are Parts by Richard J. Dennis
How Pizza Came to Queens by Dayal Kaur Khalsa

Teacher Resources: Imagine Schools Curriculum Guide

Materials: Parent Letter: English muffins, tomato sauce, vegetables, cheese, pepperoni, cutting utensils, measuring spoons, paper plates, napkins

Background: Children come to school with some knowledge of fractions; they can most likely recognize halves and perhaps fourths and thirds. However, because they have been allowed to work with imperfect models, they often have misconceived ideas about fractional numbers. To a young child, taking one-half a cooked may mean nothing more than not to take all of that cookie; he or she may, in fact, ask for the big half.

One of the first instructional tasks is to teach fractional congruence. For example, if a cookie is cut into two halves, then each half must be the same size and shape as the other. This concept should, in turn be followed by comparing fractional values. For example, one half is greater than one-fourth, but two-fourths equal one-half. When students understand these ideas in relation to both the concept of a fraction of one=whole and the concept of a fraction of a group, they will be ready to begin operations on fractions.

Knowledge of fractions extends children's understanding of numbers and helps them accurately describe numerical situations. Just as children need to see models of whole numbers to understand them, they must see models of fractions in order to understand them.

Culminating Project:
"Pizza Party"

"What's in a Name?"
-Day One-

Materials: Construction paper

Vocabulary: Fraction: A way to describe a part of a whole or a group.
Numerator: In a fraction, the total number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the total number of equal parts or groups. The bottom number in a fraction.

Think More: Brainteasers

Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a "Think, Pair, Share" strategy will work best. First students "think" on their own, then "pair" with a friend, and finally "share" their ideas with the class.

Solve More: Activity One:

1. Pass out construction paper to make name tents. Have students fold the rectangle in half. Talk about how the paper now has 2 parts, and we call each part ½ because it is part of the whole. We do not have 2 wholes so we cannot say the whole number 2.
2. Have students write their name by using 2 markers, one for vowels and one for consonants.
3. Display your name card and ask this question. If there are ____letters in my name and ____ are consonants, how many are vowels?
4. Have students write this kind of question about their name to their neighbors.
5. Decorate name card.

Explain More: Were students able to write fractions for their names? Did they use mathematical language with their partner?

Toss the Parts
-Day Two-

Materials: Dixie cups, two-color counters or pennies, tally chart, overhead projector or document camera, tally sheet (transparency if using overhead projector).

Vocabulary: Fraction: A way to describe a part of a whole or a group.
Numerator: Ina fraction, the total number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the total number of equal parts or groups. The bottom number in a fraction.

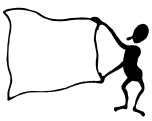
Think More: Brainteasers

Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a "Think, Pair, Share" strategy will work best. First students "think" on their own, then "pair" with a friend and finally "share" their ideas with the class.

Solve More: Activity One:

1. Each table is a group and needs four pennies or two-colored counters, a cup and a tally sheet.
2. Students put counters in the cup, cover the top, and shake it up.
3. They toss the counters on their desk (or give them a construction paper mat to keep them from tossing carelessly).
4. Students will then identify the fraction that is red or heads.
5. They record the denominator as the total number of counters in all and the numerator as the part that is red or heads or yellow or tails.
6. Each student at the table gets a chance to shake the counters and toss a fraction.
7. A recorder at the table will complete the tally sheet (a T chart that students have made.)
8. For each fraction a tally should be marked under the correct column on the tally chart. (Show with projector)

Explain More: Students discuss their tally sheets with the class and compare their answers. Was there a pattern to the tosses? Were students able to identify the fractions correctly? Make a note of students who are unclear about the denominator being the total number of counters in all. Some students put the numerator as the one part (red) and the denominator as the other part (yellow). Remind them that fractions are parts of a whole. You must record the whole as the denominator. Each part will have a different fraction.



Toss a Part and Tally

How many of the counters came up red?
or
How many of the pennies came up heads?

	Tally
0/4	
1/4	
2/4	
3/4	
4/4	

Flip a Fraction
-Day Three-

Materials: Step books made out of construction paper or newsprint, scissors, markers

Vocabulary: Fraction: A way to describe a part of a whole or a group.
Numerator: In a fraction, the total number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the total number of equal parts or groups. The bottom number in a fraction.

Think More:

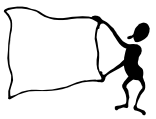
Brainteasers
Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a "Think, Pair, Share" strategy will work best. First students "think" on their own, then "pair" with a friend and finally "share" their ideas with the class.

Solve More:

Activity One:

1. Construct step books before lesson.
2. Students write 1 Whole on the first step.
3. Students fold entire book in half the long way (hot dog fold).
4. They cut up the fold and stop before they get to the whole.
5. They label the parts on the second step ½ and ½. Talk about how the two PARTS make the WHOLE.
6. Now they fold the paper in half again. They label the 4 parts on the third step ¼, ¼, ¼, ¼
7. Repeat one more time fold in half again. So that the fourth step now has eight parts. See if the students can figure out the pattern.
8. Introduce comparing fractions. What is bigger ½ or ¼ , why?
9. What is the same size as ½ fold up the parts that match it.
10. Let students ask their classmates similar questions.

Explain More: Did students cut their fraction step book correctly? How well did they follow directions? Did they come up with interesting comparisons during the discussion phased of the lesson? Make sure you have individually assessed each student's ability to say and write fractions correctly.



Pizza Party
-Day Four-

Materials: Book How Pizza Came to Queens, bulletin board paper cut into 12" circles (or the cardboard from real pizza), scissors, crayons, construction paper, coupons or grocery ads, cooking magazines, glue.

Vocabulary: Fraction: A way to describe a part of a whole or a group.
Numerator: In a fraction, the total number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the total number of equal parts or groups. The bottom number in a fraction.

Think More: Brainteasers

Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a "Think, Pair, Share" strategy will work best. First students "think" on their own, then "pair" with a friend and finally "share" their ideas with the class.

Solve More: Activity One:

1. Read, How Pizza Came to Queens. The story shows how a whole is divided into parts.
2. Pass out the 12" circles to groups of 2, 4 and 6. (It is important to have different size groups.
3. Have students color or cut out pizza toppings and glue them to the circles.
4. After pizzas are made, challenge students to fold them into equal sections that total the number in their group.
5. Have students groups cut their pizzas on the fold and pass out the parts.
6. They must label the parts that they receive.
7. Lead a class discussion on the fractional parts of the pizzas in the groups.
8. For example, which group got the largest pieces? Why?
9. Which group got the smallest piece? Why?
10. Help students come to a conclusion about the denominator of a fraction and how it differs from the meaning of a whole number. (The larger the denominator the smaller the piece.)

Explain More: Did students come to the conclusion that the more people you have to share with (the denominator), the smaller the piece of pizza you receive?

Pizza Party
-Day Five-

Materials: English muffins, vegetables, cheese, tomato sauce, pepperoni, plastic knifes or dull butter knives (may want parent assistance today), measuring spoons, cookie sheet, wax or baking paper (names written on the baking paper for pizza placement when cooking) Notify the kitchen or borrow a toaster oven for the hour.

Vocabulary: Fraction: A way to describe a part of a whole or a group.
Numerator: In a fraction, the total number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the total number of equal parts or groups. The bottom number in a fraction.

Think More: Brainteasers

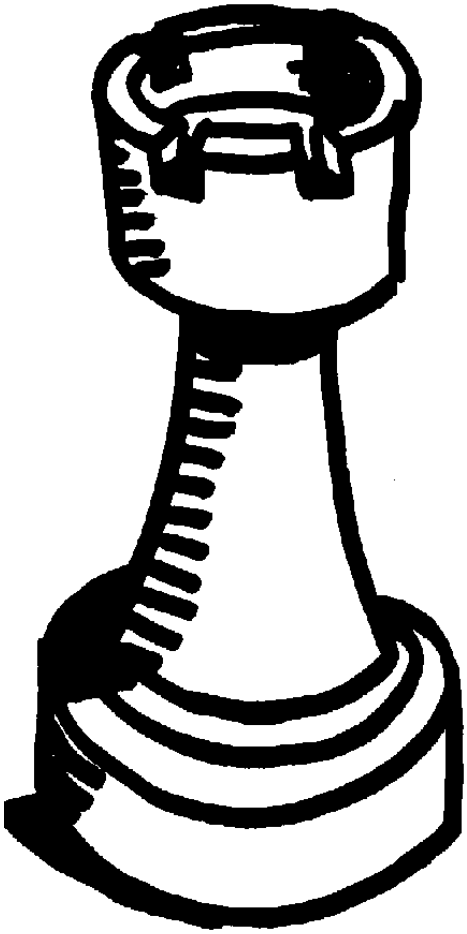
Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a "Think, Pair, Share" strategy will work best. First students "think" on their own, then "pair" with a friend and finally "share" their ideas with the class.

Solve More: Activity One:

1. Have students work in teams at their table. Let one table be in charge of the green peppers, another be in charge of the mushrooms, another be in charge of the pepperoni (or whatever items your class has selected). Have students cut their item into fractions. One person at the table records the denominator for their item (if they cut 20 slices of pepperoni they would write /20
2. The remaining tables will put the tomato sauce on the muffins (use measuring spoons.
3. After all items are prepared, have a discussion about the amounts. Have class decide how to "divide" the toppings equally.
4. Students receive one muffin (with tomato sauce on it) and proceed to the toppings' tables of their choice.
5. They top the pizzas off at the cheese table and set their muffin down on the wax paper cookie sheet on the spot on which their name is written.
6. Cook until cheese is melted and vegetables are soft.
7. Compare the students' pizzas. What fraction of the class had pepperoni? What fraction had mushrooms? etc. Have student's record these answers in their Number Notepads.
8. Enjoy!

Explain More: Were students using mathematical language as they prepared the pizzas? How well did they create fractions of the class pizzas?

"Let's Play It Again!"

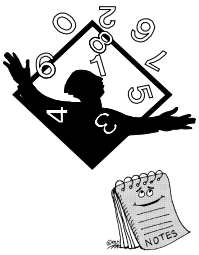


Second Graders Make Math Connections

Table of Contents

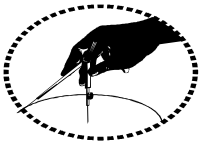
Introductory Procedures

You and your students will need clear procedures to follow to make your time together productive and enjoyable. Each lesson has three distinct sections:

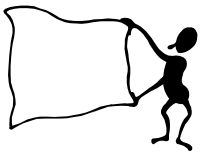


Think More is the opening

Number Notepads will be used in this section for brainstorming and analyzing Have a parent volunteer make a class set of Number Notepads (20 sheets of paper folded into a booklet with a construction paper cover) These will be used all summer and put in the student's Art Portfolio.



Solve More is the project or activity



Explain More is the closing

Math Portfolio will house the work your students select as memorable in their Encore mathematics program. A piece of construction paper made into a folder will work well. Selected pieces (around 4) and teacher, student, and peer assessment forms should be kept in the portfolio).

Math Masterminds is the culminating activity for the class that is with you on the ninth week of the grading period.

Decide on clear procedural guidelines for the students to follow in each phase of the class—"lead" them to this list as you explain. Have "Think More, Solve More, Explain More" written on the board or chart. (This should be posted at all times during your Encore class.) Leave space for a short list of guidelines that the class will generate during this lesson.

<u>Think More!</u>

To describe the 'Think More" portion of class, say something like...

"During the first ten minutes of class every day we will be solving a brain teaser. Often you will write in your Number Notepad as you work out a solution to the problem. This part of class will be called "Think More!" Sometimes you will solve the problem quickly. And sometimes you won't be able to solve it at all. You will have a chance to express yourself in your Number Notepads. I think that you might be surprised by all the math you already know." Let the other children give it their best effort and try to form their own solutions before you try to solve it as a group. (Think, Pair, Share) Sometimes the problems will make you want to smile, frown or say hmmmmm or huh????

"Can anyone think of a few guidelines that the class should follow during 'Think More!' (Summarize student answers into one or two positive directives and write them on the chart or board.)

Solve More!

"The next part of the class will no doubt be your favorite—"Solve More." This is when we will be learning new math concepts. Sometimes we will be playing games, using manipulatives, or building projects to learn our math concepts and facts."
Discuss procedures for playing games, using manipulatives, and doing cooperative work.

"Can anyone raise their hand and tell me a few important guidelines for the "Solve More! part of class?" (Be sure to lead them to "never make fun of someone else's work or knowledge level) Have a student come up and write the summarized phrases on the board or chart.

Explain More!

"The last part of class will be 'Explain More' which will be a time to find out what was learned during the lesson. It might be a game, some questions, a display of your work or a demonstration. What if you are asked to share your learning for that day?

Let's think of some things to remember for 'Explain More.' (Lead students on how to give compliments to others during this sharing time) Teach them ways to say something nice. Pass out the peer and self-assessment forms. (See Assessment section of packet for the assessment forms). Talk about how you might complete each section. Act out a student hesitating on his/her math facts. Walk students though an acceptable way to talk about someone who might be struggling. Write their suggestions on the chart.

Leave the summaries of acceptable student behavior on the board to later transfer to a chart for continued review during the first week of class. Keep the chart available for this class throughout the year. You should review it when you see them again the following semester. If students have a problem during certain sections of the day, use the parent communication forms (found in the back of this packet) to let their parents know about their talents as well as areas in which they need improvement.

Practicing these procedures will provide students with the structure and framework necessary for you to have an orderly class. Many behavior problems arise because students do not know the expectations or what they are supposed to be doing. Keep directions clear and consistent. Make a clear distinction between procedures (knowing what to do and what is expected) and rules (i.e., hurting others). If students forget the procedures, review and practice them. If students break a rule, administer consequences.

Encore Second Grade Math Materials and Resources

Non-consumables:

Imagine Schools Curriculum Guide
Core Math Program Manipulative Kits:
Projector (Overhead or document camera)
Dry erase boards
Pull down map, desk maps, city maps
Cooking utensils and pans and measuring spoons

Games:

Battleship

Recommended Websites:

Fun Brain: www.funbrain.com/fract/index
A+ Math: www.aplusmath.com
Triple A Math: www.aaamath.com
Teacher Corner: http://www.theteahcercorner.net
Education World: http://www.educaton-world.com/
Houghton Mifflin Harcourt: Brain Teasers: http://eduplace.com
Nets for Shapes: http://www.senteacher.org/worksheet/12/NetsPolyhedra.html
Illuminations: https://illuminations.nctm.org/Activity.aspx?id=3521

Consumables or Activity Specific:

NUMBER NOTE PADS

Unit 1 Geometry:

Aluminum foil, boxes and cylinders (cereal boxes, juice boxes, toilet paper rolls, oatmeal boxes, party hats, water dispense cups, soup can w/labels, cookie tins, clay/play dough, straws, Straw and clay (or pipe cleaners, toothpicks or craft sticks). Mini-marshmallows can be substituted for the clay, if toothpicks are used, One or two rolls of aluminum foil, 3-D shapes, sentence strip hat, index cards with shapes on them from yesterday, tin foil shapes from yesterday, cardboard bases, tape, glue, pictures of castles, decorating materials, costumes

Unit 2 Algebra:

Boxes, star stickers, refrigerator box, flashlights, tent or canvas, stickers, file folders, masking tape, post-it notes, big number card (on construction paper 8”x11”), cardboard, 1” graphing/grid paper (or use handout in lesson), stickers, black paper, white chalk, silver stars stickers (optional – ask for this in parent letter). pictures of constellations or the night sky, rulers, construction paper cut-outs of the constellations (Orion, Dipper, Bear), refrigerator box, tent or canvas

Unit 3 Number Sense:

Citrus fruit: lemon, lime, orange, grapefruit, English muffins, cream cheese, fruit jelly, various fruits (not citrus) banana, strawberries, peaches, canned mandarin oranges, grapes or cantaloupe are good, cutting utensils, paper plates, napkins, measuring spoons, paper plates, yarn, buttons, cotton balls, other decorative odds and ends, drawing paper, crayons or markers, pattern blocks, cubes, 1-cm graph paper, crayons or markers, construction paper , English muffins, various fruit (not citrus, canned mandarin oranges, bananas, peaches,

strawberries, grapes), cream cheese, orange marmalade or other jelly plastic knifes or dull butter knives (may want parent assistance today), measuring spoons, cookie sheet, wax or baking paper (names written on the paper for pizza placement)

Second Grade Booklist

Week 1

Angles Are Easy as Pie by Robert Froman

Changes, Changes by Pat Hutchings

Grandfather Tang's Story by Ann Tompert

If You Look Around by Fulvio Testa

My Cat Likes to Hide in Boxes by Eric Sutton

My Tower by Beverly Randell

Week 2

Puzzle Maps, U.S.A. by Nancy Clouse

Socrates and the Three Pigs by Tuyosi Mori

Week 3

Eating Fractions by Bruce McMillan

The Half-Birthday Party by Charlotte Pomerantz

How Pizza Came to Queens by Dayal Kaur Khalsa

Second Grade
Geometry Unit

Standards: Students construct 2D and 3D shapes.
Students describe 2-D and 3-D shapes.
Students identify shapes that can be combined or separated to make other shapes.
Students identify symmetry.
Students identify congruency.
Students identify shapes in the environment.
Students recognize shapes from different perspectives.

Objective: At week's end, students will be able to construct 3D shapes correctly and identify the attributes that make them special.

Literature Connections:
Angles Are Easy as Pie by Robert Froman
Changes, Changes by Pat Hutchings
Grandfather Tang's Story by Ann Tompert
If You Look Around by Fulvio Testa
My Cat Likes to Hide in Boxes by Eric Sutton
My Tower by Beverly Randell

Teacher Resources: Imagine Schools Curriculum Guide
Drawings and Geometry by Cathi Sanders: A Math Forum website project

Materials: Parent Letter: Aluminum foil, boxes and cylinders (cereal boxes, juice boxes, toilet paper rolls, oatmeal boxes, party hats, water dispense cups, soup can w/labels, cookie tins, clay/play dough, straws

Background: Geometry is the part of mathematics that includes points, lines, surfaces, and solids. The word geometry derives from the Greek words for earth and measure. Geometry is divided into two different categories plane and solid. Plane geometry refers to two-dimensional shapes in one plane. Solid geometry refers to three-dimensional shapes.

The earliest accounts of geometric shapes have been found in artifacts dating buildings and pottery. The Egyptians used geometry to solve problems that arose after the annual flooding of the Nile River. There was a need to replenish the soil due to the flood, so they used a form of geometry known as surveying. Also, the ancient pyramids were built using a variety of geometric principles.

There were several people who contributed to the development of geometry. Around the year 300 BC, a man by the name of Euclid wrote a collection of books entitled, The Elements. In these books, he systematized the development of plane and solid geometry.

Culminating Project:

Compare 2-D and 3-D Shapes
-Day One & Two-

Materials: Straw and clay (or pipe cleaners, toothpicks or craft sticks). Mini-marshmallows can be substituted for the clay, if toothpicks are used.

Vocabulary:
Dimension: Extension in one direction
Two-Dimension: Extending in two directions
Three-Dimension: Extending in three directions
Sides: A line segment connected to other segments to form a polygon.
Polygon: A closed plane figure formed from line segments that meet only at their endpoints
Line Segment: A part of a line defined by two endpoints.
Angle: (Corners) Point where two lines meet.
Vertex: A corner point where three or more faces meet.
Base: A special face. There may be 2.
Edges: The line segment where two faces of a solid figure meet.
Faces: A plane figure that serves as one side of a solid figure.
Polyhedron: A three-dimensional figure in which all the surfaces are polygons.

Think More:

Brainteaser
1. Joke: If you buy a ticket for a plane ride, don't do it in geometry class.
2. Review plane figures and ask students what solid figures they know. Can they find some in the room? Pass out index cards and have them draw as many shapes as they can identify by sides and corners. Save for later in the week.

Solve More:

Activity One: Identifying solid figures (2 days)

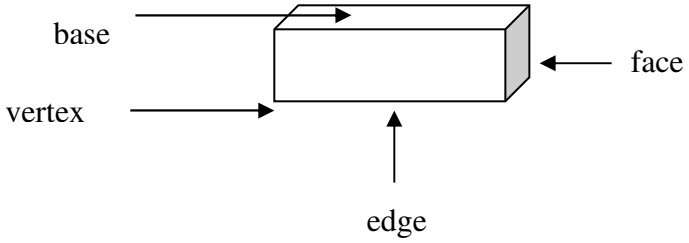
Whenever we look, we see three-dimensional shapes. Buildings furniture, plants, even people themselves: all are solid objects. Whenever we look at the world around us, we see it in three dimensions: length, width, and height. Drawings that are created to represent the idea of these three dimensions are often called "3-D drawings. One of the great architects of our time, Frank Lloyd Wright, used geometry brilliantly in his designs.

1. Draw a square on the board (or project). Review that it is a polygon, which is a 2 dimensional shape because it only extends in two ways – length/out and height/up. We say it is flat.
2. Tell students that we live in a 3-Dimensional world, not a flat one, solids are important. Solids in geometry class mean a shape with 3 dimensions or three ways to extend. Solids are also called polyhedrons.
3. Draw a cube on the board (or project). Have students identify the 3 ways that the shape extends: height, length, width (see how knowing this will help them with calculations later)
4. Have students get materials: straws and clay/play dough for their table. Have students make a square. Review the definition of a square – 4 equal sides and corner/angles. Review that it is a 2-D shape because it only has two ways to extend – up (vertical/height) and (out-horizontal/length).

5. Now have them make this into a cube. Let them try this on their own…do not show them how to do it. (You can leave the cube on the board or give each group a connecting cube).
6. Continue this procedure by encouraging them to think of other plane figures to create (triangle, rectangle) and extending them into solid figures. Make sure you have children make different pyramids both square-based and triangle-based. Save shapes for the next lesson.

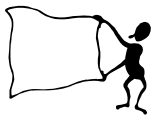
Activity 2: Identify the attributes of solid figures

1. Pass out bags with 3-dimensional goodies inside (see materials list). Students pull out items and name them. Complete a KWL on the board. Have each student take a rectangular prism. Identify the parts of this 3D shape.



2. Go through the other objects and identify their parts.
3. Spend time on the bases. Some shapes have two identical bases. A prism has two identical parallel bases and faces that are polygons. The base will determine if the shape is a square pyramid or triangular pyramid.

Explain More: Play name that shape with riddle for the shapes.



1. I have no faces, edges or corners. Who am I? (sphere)
2. I have one curved surface and only have one face. Who am I? (Remember a face is flat.) (cone)
3. I have 6 square faces. Who am I? (square)
4. I have 2 faces that are circles. Who am I? (cylinder)
5. I have 4 faces that are triangles. I have 1 face that is square. Who am I? (square pyramid)
6. I have 4 faces that are long rectangles. I have two faces that are square. Who am I? (rectangular prism)
7. I have 4 triangles. Who am I? (triangular pyramid)

Properties of Polyhedrons
-Day Three and Four-

Materials: One or two rolls of aluminum foil, 3-D shapes, sentence strip hat, index cards with shapes on them from yesterday.

Vocabulary: Polyhedron:: A 3-D figure in which all the surfaces are polygons.
Cube: A solid figure with six square faces,
Rectangular Prism: A quadrilateral with two pairs of congruent, parallel sides and four right angles.
Sphere: A three-dimensional figure made up of all points that are equally distant from a point called the center.
Cylinder: A 3-D figure with two parallel and congruent circles as bases, one curved surface (which if unrolled makes a rectangle), two curved edges, and no vertices. Triangular Pyramid: A pyramid with a triangular base.
Rectangular Pyramid: A pyramid with a rectangular base.
Square Pyramid: A pyramid with a square for a base.
Cone: A 3-D figure with one curved surface, one flat surface (usually circular), one curved edge, and one vertex.

Think More:

Play Guess My Shape:
Teacher wears a sentence strip headband with a shape on it. The students have to give clues for her to guess what shape she is wearing.

Example: Student 1: It is a polyhedron. Student 2: It has 2 bases that are circles. Teacher: Is it a cylinder? Yes. Continue (students may use definitions for their clues – see above)

Solve More:

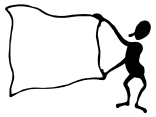
Activity One: Make polyhedrons out of tin foil "nets" (unfolded figure)

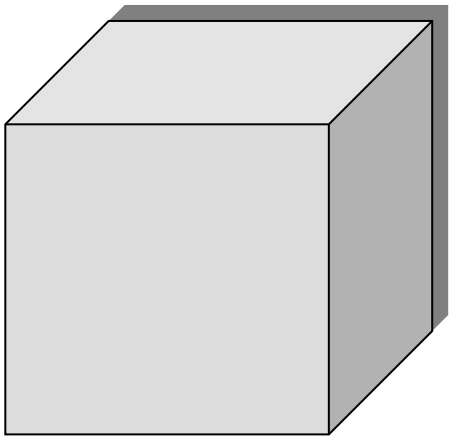
1. Have the students cover a three-dimensional shape with aluminum foil and carefully crease the foil along each of the figure's edges.
2. Remove the foil and cut the pattern out with scissors; be certain to leave the adjoining pattern faces attached to the base.
3. Lay the pattern flat on a desk and examine it.
4. Identify the shape of each of the faces, notice the size of each face in relation to the others, and discuss any likenesses or differences.
5. Refold the aluminum foil pattern again to make the original shape and see if there is a relationship between the total number of faces, edges, and vertices.
6. Repeat with other shapes. Save shapes for culminating activity.

Alternative Activity:

1. Have students carefully cut open the boxes into their "net" shape.
2. Compare the total number of faces of the boxes and cylinders.
3. Trace these shapes on the tin foil.

Explain More: Students reflect on which shape is their favorite and why it is their favorite in their Number Notepads. Teacher may assess with an observation checklist. Did students create structures carefully and neatly and in the right dimensions? Were students able to talk about their shapes using geometric terminology?



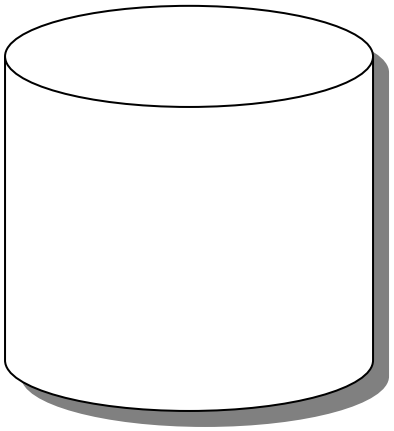


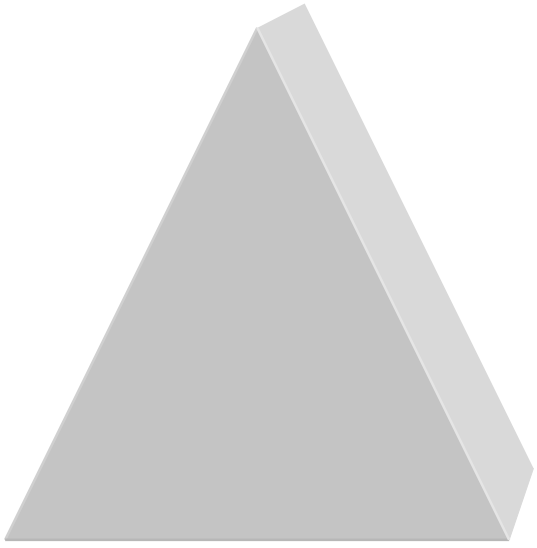
Materials

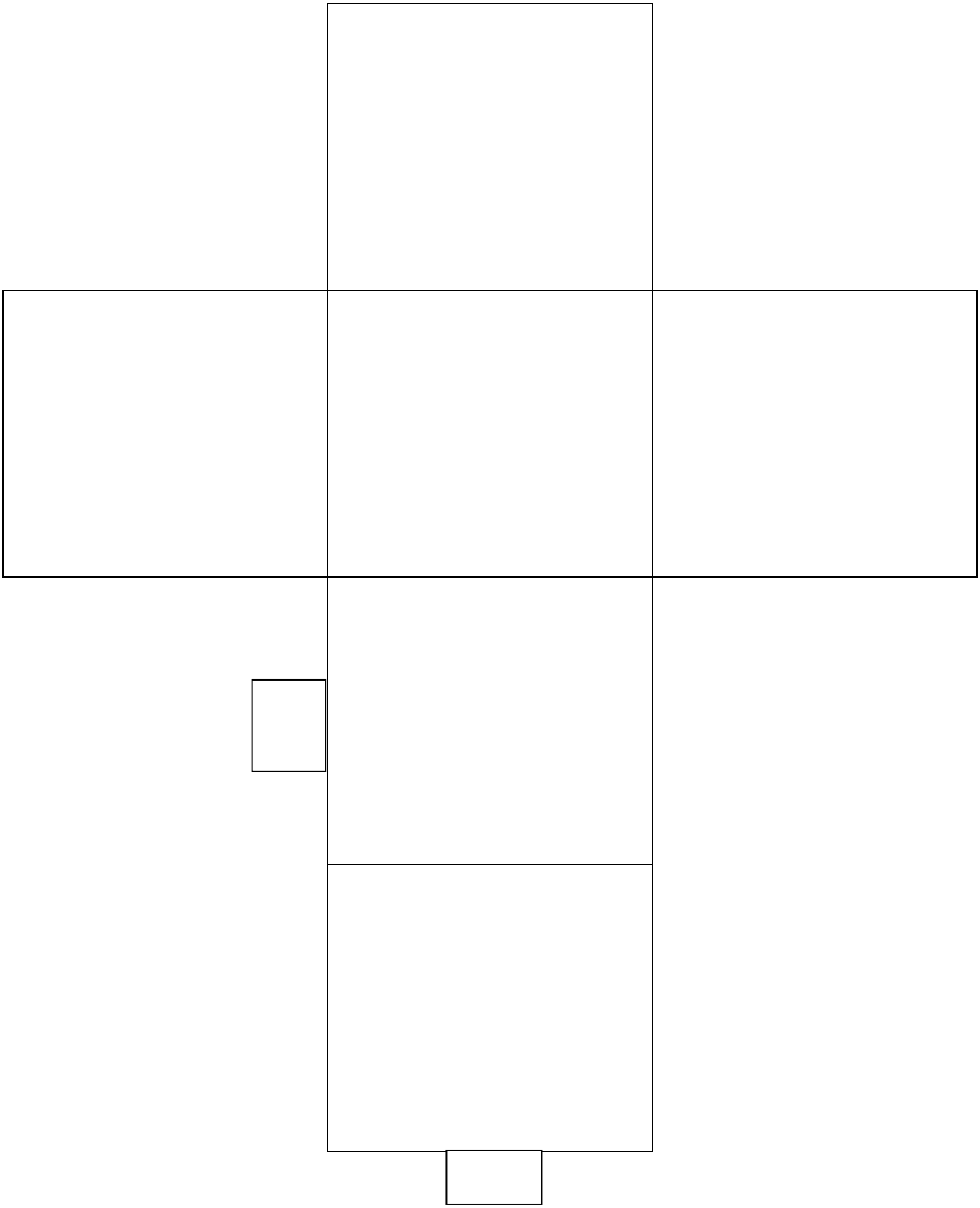
- 2-Dimensional Shapes
- Geometric Solids
- Paper
- Scissors
- Shape Patterns Masters
- Word Cards (one set per group)
- Glue or Tape
- Website for nets:
  http://www.senteacher.org/worksheet/12/NetsPolyhedra.html

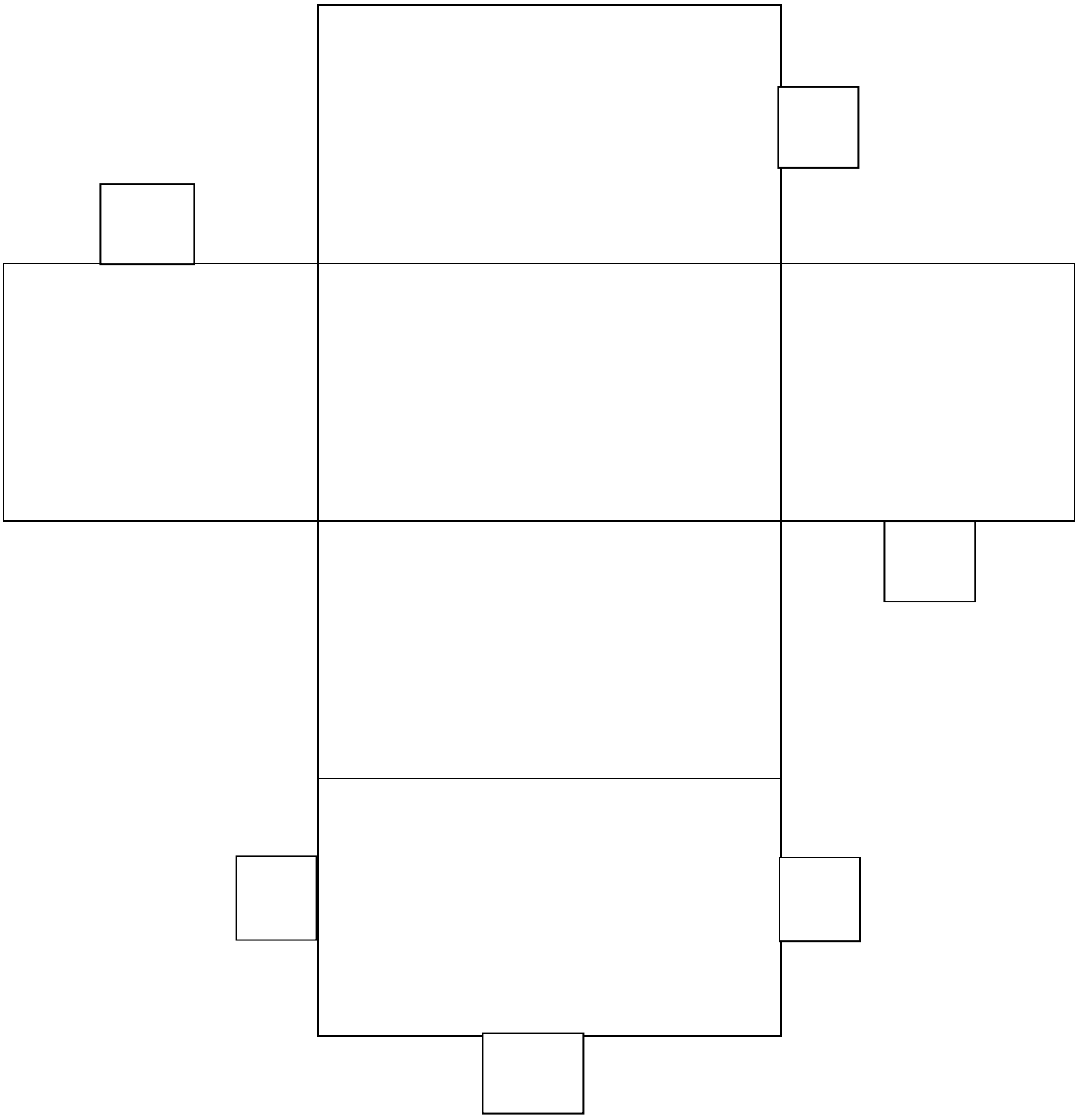
Procedures

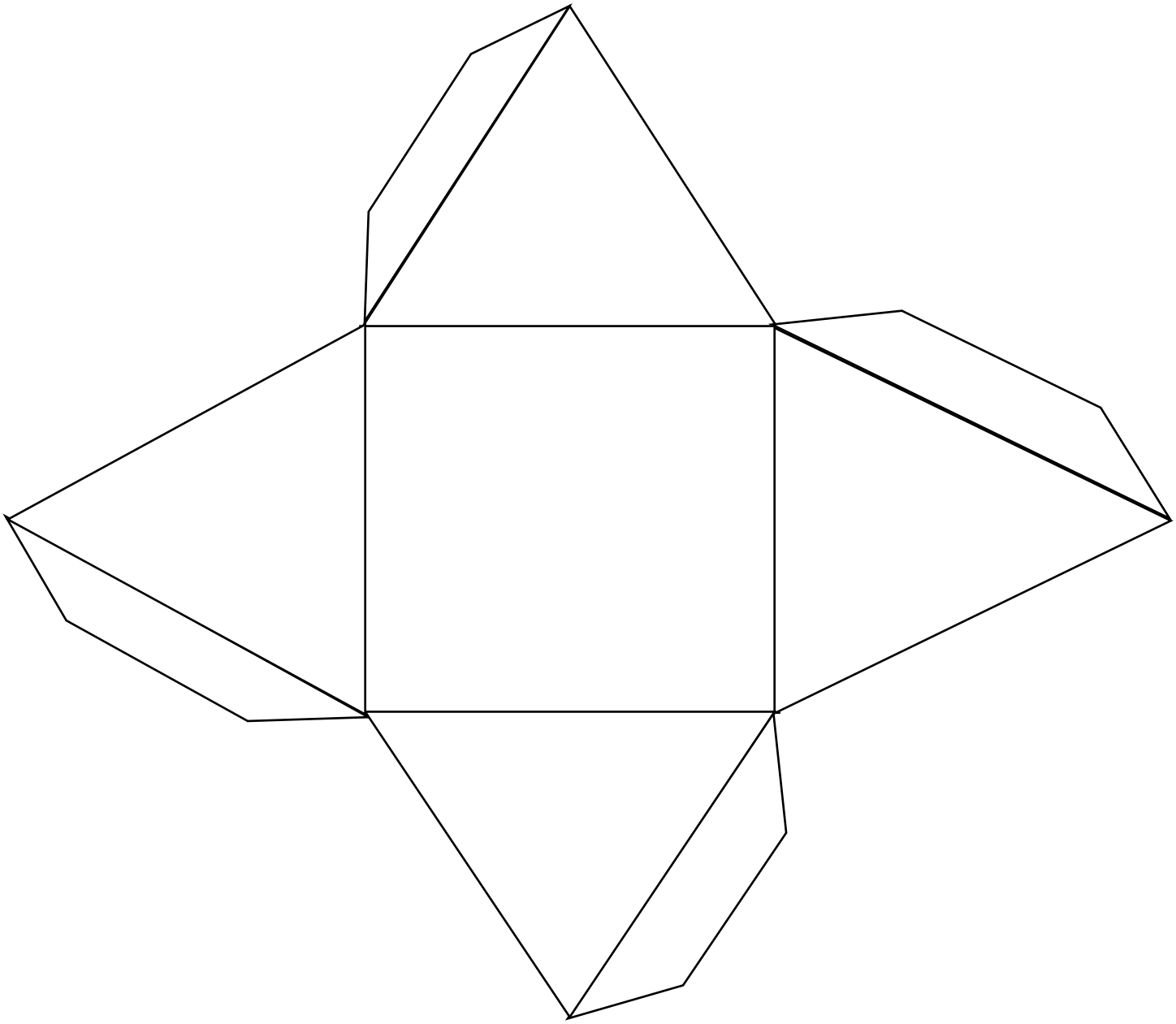
- Students cut out and assemble shapes
- Students label each assembled shape
- Students complete the Constructing Solids Table



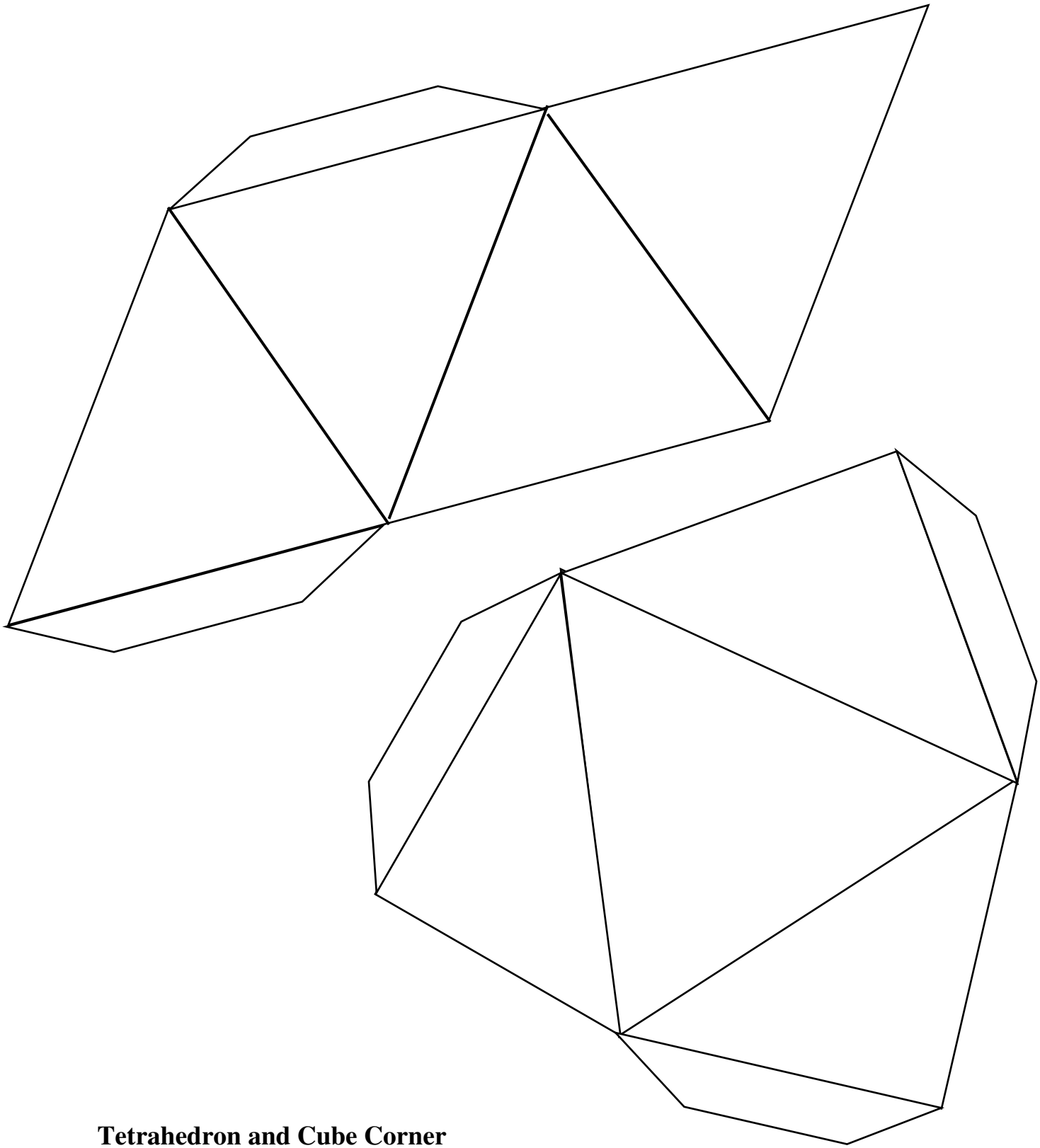








Pyramid



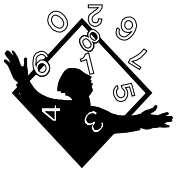
Tetrahedron and Cube Corner

A Castle Connections
-Day Five-

Materials: Tin foil shapes from yesterday, cardboard bases, tape, glue, pictures of castles, decorating materials, costumes

Vocabulary: Review the week's vocabulary

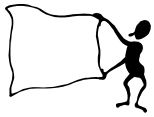
Think More: Show pictures of buildings (www.greatbuildings.com) and castles (http://www.greatbuildings.com/buildngs/Himeji_Castle.html)
Have students find the geometric shapes in the buildings.



Solve More: Activity One: Connecting polyhedrons

1. Students retrieve their polyhedrons from yesterday.
2. They experiment with connecting the shapes to create castles.
3. They may add other shapes from the geometric grab bags.
4. They may want to add walls and people if time allows.

Explain More: Students are able to talk about the parts of their castles in geometric terms. Teacher will use a rubric to score the project.



Math Masterminds: Students set up their medieval village during the ninth week. They conduct a Renaissance Fair dressed as kings and queens. Assign each student snacks to bring: grape juice for wine, cheese and crackers. Have them escort their visitors around the room to view their fabulously designed castles.

Second Grade
Algebra Unit
"Star Search"
Connecting the Dots

Standards: Students use mathematical models to represent math relationships.

Objective: At week's end, students will be able to use informal methods, such as physical models and graphs, to solve real-world problems.

Literature Connections: Puzzle Maps, U.S.A. by Nancy Clouse
Socrates and the Three Pigs by Tuyosi Mori

Teacher Resources: Imagine Schools Curriculum Guide

Materials: Parent Letter: boxes, star stickers, refrigerator box, flashlights, tent or canvas, stickers, file folders

Background: Recognizing and using patterns are important problem-solving strategies fundamental to mathematics. Children need practice using concrete objects to reproduce, create and extend patterns. From concrete practice, they can readily move to pictorial and abstract representations of patterns. A pattern is when something happens over and over. Patterns are found in music, art, science, and math. Thinking about patterns and about how numbers work is called algebraic thinking.

Algebra makes it easier to say exactly how two changing things are related. Our English word *algebra* comes from two Arabic words: *al* (the) and *jabara* (to reunite). We can think of this as a way of tying together many ideas in math. Sometimes reading math problems is like reading a paragraph that says so many things that it is hard to follow. Algebra is our mathematical tool for stating, simplifying, and picturing relationships.

Culminating Project:
" Star Search"

Connecting Coordinates
-Day One-

Materials: Masking tape, post-it notes, big number card (on construction paper 8”x11”)

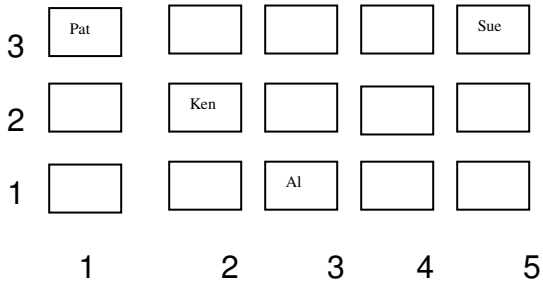
Vocabulary: Coordinates: An ordered pair of numbers that give the location of a point in a coordinate grid.
Coordinate Grid: A 2-dimensional system in which distances from two intersecting, perpendicular, straight lines describe a locatiom..
Axis: A reference line from which distances or angles are measured on a coordinate grid.
Coordinate Graph: A graph used to show ordered pairs of numbers.
Ordered Pairs: Two numbers that tell where a point is.

Think More: Brainteaser

Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a “Think, Pair, Share” strategy will work best. First students “think” on their own, then “pair” with a friend and finally “share” their ideas with the class.

Solve More: Activity One: Class Connections

1. Make a grid on the board using masking tape, labeling the horizontal and vertical axes from 1 –10. Use the grid to make a map of students’ seats in the class. Write students’ names on post-it notes and place at the points that correspond to their seats. Then, have students quiz each other on the ordered pairs that tell the location of individual seats.



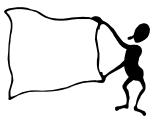
Solve More:

2. (1,3) = Pat; (2,2)= Ken; (5,3) = Sue. Remind students of the correct "order" for the "ordered pair". The horizontal axis is recorded first, followed by the vertical axis. *A bird must walk before it can fly. (across, then up)*
3. Have students record all the ordered pairs in their Number Notepads. Check for accuracy.
4. Play a guessing game for other items in the room. Give a clue for the item (color, shape, function) and have students tell its location using ordered pairs.

Solve More: Activity Two:

1. Set up the entire classroom as a coordinate grid plan. To do so, tape number cards to the walls and have students search for hidden clue cards that are located according to coordinates. Students search for each card but do not take the card or give its location away because others are trying to find it.
2. For example, tell the students that clue 1 is located at (3,2). Searching in that locality they will find a clue card taped to the bottom of a desk that reads, "You found me now go to (9,0) for the next clue!"
3. At (9,0) the second clue card is found (perhaps in the chalk try, under an eraser, and it says, "Good – now try to find the next clue at (2,9)."
4. Play proceeds in this manner until the last card located says something like, "Wow, your search is finished; take a short recess, but don't tell the others where I am."

Explain More: Have students repeat the rules for using ordered pairs. Make sure all have the direction correct as they record answers.



Ask:

When do we use ordered pairs? *We use them in mapping locations*

How does the relationship between the two numbers help us? *It helps us locate points*

Why is this geometry as well as algebra? *This activity was about using space as well as understanding the relationship between numbers.*

Mapping Mysteries
-Day Two-

Materials: Pull down map, desk maps, city maps

Vocabulary: Coordinates: An ordered pair of numbers that give the location of a point in a coordinate grid.
Coordinate Grid: A 2-dimensional system in which distances from two intersecting, perpendicular, straight lines describe a location.
Axis: A reference line from which distances or angles are measured on a coordinate grid.
Coordinate Graph: A graph used to show ordered pairs of numbers.
Ordered Pairs: Two numbers that tell where a point is.

Think More:

Brainteasers:
Each table looks at city maps. How do people find locations? What on the map helps them find the correct points for their destination?

Solve More:

Activity One: Map Math

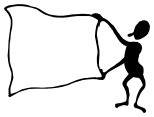
1. Pass out desk maps of your state (borrow from 4th grade teacher or use the set for your grade level if it has labeled axes [not just the longitude and latitude numbers]).
2. Give students coordinates for different counties. Make it into a game (front against back, boys against girls, east against west). Keep points for the right answers. Have students come up with some coordinates as they win. Following is an example using counties in Florida.

(I, 6) = Dade	(G, 4) = Manatee	(C, 1) = Okaloosa
(F, 1) = Madison	(I, 5) = Palm Beach	(H, 3) = Orange
(G, 2) = Levy	(H, 1) = Duval	(D, 1) = Washington
(H, 4) = Highlands	(I, 5) = Broward	(I, 3) = Brevard
(E, 1) = Wakulla	(G, 1) = Columbia	(H, 5) = Henry

Activity Two: Cartographer Connections

1. Be a ship captain. Use the longitudinal and latitudinal lines on the map to locate points.

Explain More: Make an observational survey of the students' consistency with using ordered pairs correctly. How are they remembering in which direction to go first? Have them share their techniques with the class.



Battleship™
-Day Three and Four-

Materials: Battleship game, cardboard, 1" graphing/grid paper, stickers

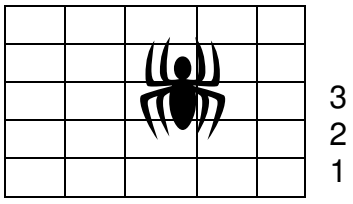
Vocabulary: Coordinates: An ordered pair of numbers that give the location of a point in a coordinate grid.
Coordinate Grid: A 2-dimensional system in which distances from two intersecting, perpendicular, straight lines describe a location.
Axis: A reference line from which distances or angles are measured on a coordinate grid.
Coordinate Graph: A graph used to show ordered pairs of numbers.
Ordered Pairs: Two numbers that tell where a point is.

Think More: Brainteaser

Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a "Think, Pair, Share" strategy will work best. First students "think" on their own, then "pair" with a friend, and finally "share" their ideas with the class.

Activity One: Operation Point-Down

1. Students make their own Battleship game boards. Take a filing folder and glue a sheet of 1" graphing paper to each side. (cut the paper smaller if you do not want the students having so many numbers going across each axis).
2. Label the axes, starting at the bottom left hand corner. (You can have the students label each line, so the ordered pair would indicate the intersection of the two lines, or you can have them label each space, so the ordered pair would indicate the box).



3. Have student put their stickers (3 or 4) on the coordinate grid on the left side of their filing folder (either overlapping boxes or intersections).
4. Have students record their guesses of the other player's locations on the coordinate grid on the right side of the folder.
5. The first player calls out a coordinate point such as (3,2) that "hits" a sticker.
6. Player 2 must say, "hit" and player 1, after recording an x at that coordinate point on her/her record-keeping sheet, is then allowed

another turn.

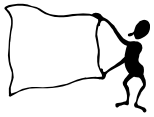
Solve More:

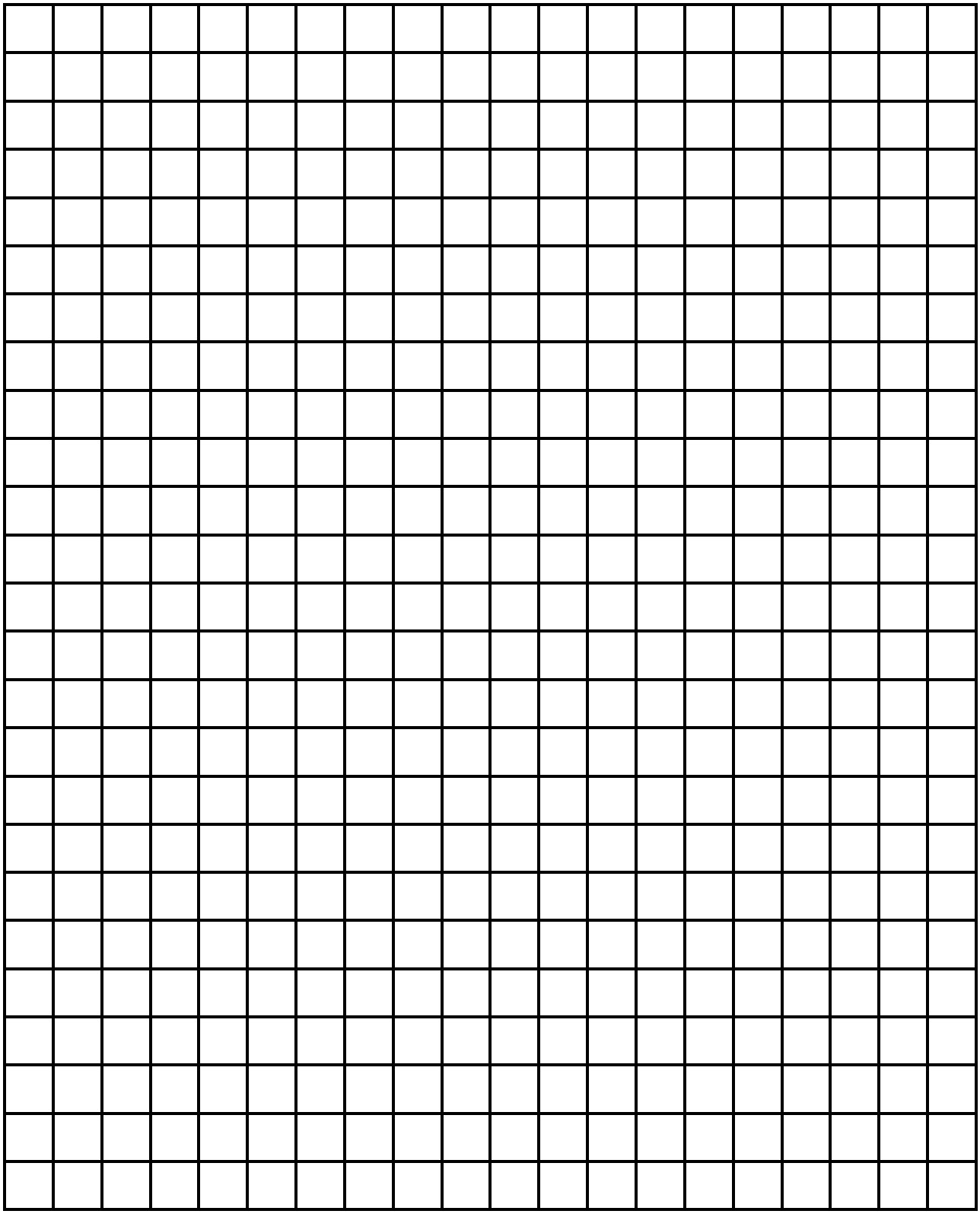
7. On this turn Player 1 might try (3,1) and Player 2 will say “miss.”
8. Player 1 then records a “0” at that location on his/her record sheet so that she/he will not try that coordinate point again.
9. Play proceeds to Player 2 who will now try to “hit” a sticker shape located on the hidden game board of Player 1.
10. Play continues in this manner until a player has captured all their opponents’ stickers (by “hitting” each point upon which the sticker is situated).

Activity Two: Battleship™

1. Two students pair up and play the Battleship™ game.
2. Follow the directions on the box.
3. Make sure students clean up so that pieces do not get lost. This is a school-shared game.

Explain More: Have students explain why they put their stickers where they did. Did their location fool their opponents? Have students explain how they were able to locate their opponent’s stickers.





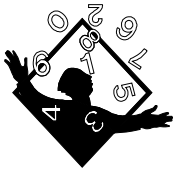
LABEL _____

Connecting Stars
-Day Five-

Materials: Black paper, white chalk, silver stars stickers (optional – ask for this in parent letter). Pictures of constellations or the night sky, rulers, construction paper cut-outs of the constellations (Orion, Dipper, Bear), refrigerator box, tent or canvas

Vocabulary: Coordinates: An ordered pair of numbers that give the location of a point in a coordinate grid.
Coordinate Grid: A 2-dimensional system in which its distances from two intersecting, perpendicular, straight lines describe a location.
Axis: A reference line from which distances or angles are measured on a coordinate grid.
Coordinate Graph: A graph used to show ordered pairs of numbers.
Ordered Pairs: Two numbers that tell where a point is.

Think More: Brainteaser



Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a "Think, Pair, Share" strategy will work best. First students "think" on their own, then "pair" with a friend and finally "share" their ideas with the class.

Solve More: Activity One:

1. Show pictures of constellations in the night sky. Ask how this might relate to what we have been studying this week. Who might need to locate stars in the sky? (Astronomers)
2. Give students black paper. Have them make a grid using a pencil and a ruler.
3. Teach students how to make slash marks across the x-axis for each inch or centimeter (depending on how small you want your grid) and then slash marks up the y-axis. Then students can lay their ruler down and trace along its edge at each slash mark, starting at the left and working their way over. Then, students can start at the bottom and work their way up.
4. When they have completed their grids, have them lay the constellations down on their grid and mark off the coordinates. When they remove the cutouts, they need to put the stars in the locations they plotted.
5. See if their neighbors can guess which constellation they have created.

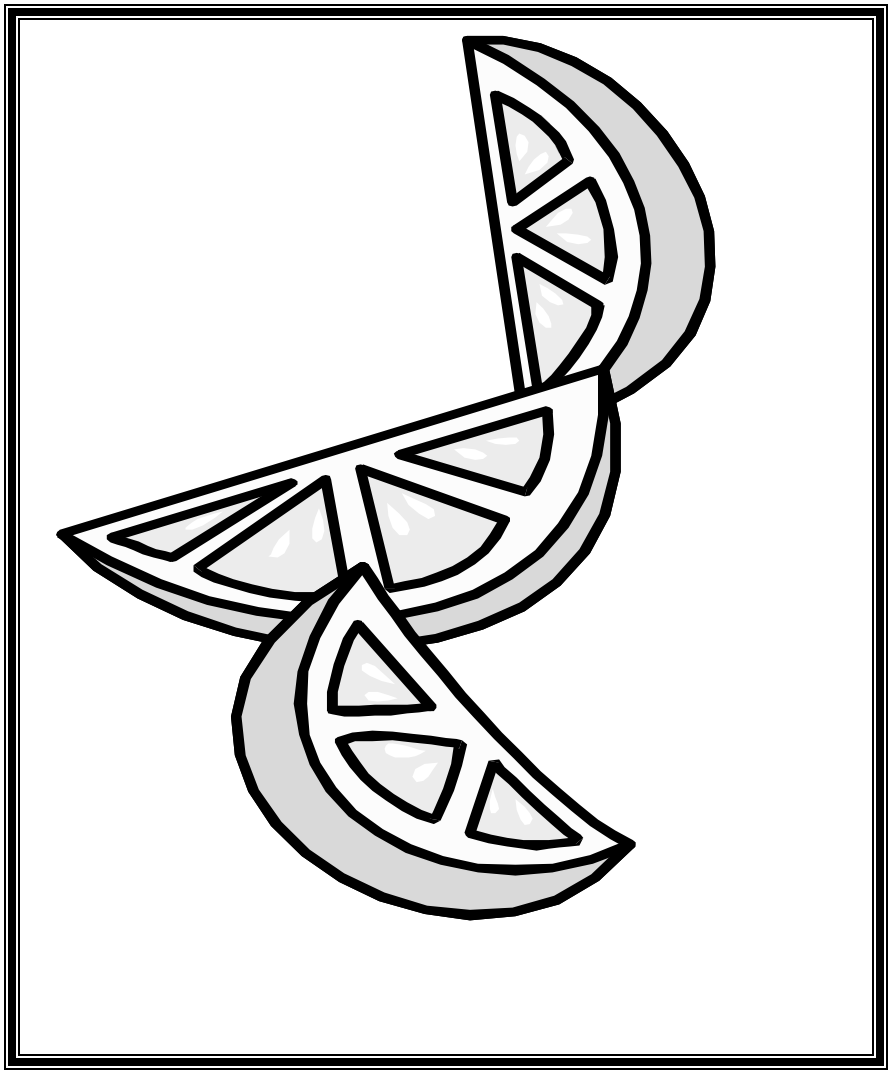
Explain More: Review learning for the week. Have students fill out a self-assessment.

Math Masterminds

Culminating Event: Prepare during the 9th week.

Star Search: Display constellations inside a refrigerator box, or create a dark area with a tent or canvas and pin up the constellations. Let visitors enter and view constellations with a flashlight or draw the constellation with the fluorescent markers or paint, so that they will glow in the dark.

Fruity Fractions



Second Grade
Fractions – Number Sense Unit

Second Grade
Fractions – Number Sense Unit
Fruity Fractions

Standards: Students understand different representation of numbers, the relationship between/ among numbers and number systems.

Objective: At week's end, students will be able to understand that the total of fractional parts makes a whole and understand commonly used fractions.

Literature Connections: Eating Fractions by Bruce McMillan
The Half-Birthday Party by Charlotte Pomerantz
How Pizza Came to Queens by Dayal Kaur Khalsa

Teacher Resources: Imagine Schools Curriculum Guide

Materials: Parent Letter: Citrus fruit: lemon, lime, orange, grapefruit, English muffins, cream cheese, fruit jelly, various fruits (not citrus) banana, strawberries, peaches, canned mandarin oranges, grapes or cantaloupe are good, cutting utensils, paper plates, napkins, measuring spoons, paper plates, yarn, buttons, cotton balls, other decorative odds and ends

Background: Children come to school with some knowledge of fractions; they can most likely recognize halves and perhaps fourths and thirds. However, because they have been allowed to work with imperfect models, they often have misconceived ideas about fractional numbers. To a young child, taking one-half a cooked may mean nothing more than not to take all of that cookie; he or she may, in fact, ask for the big half.

One of the first instructional tasks is to teach fractional congruence. For example, if a cookie is cut into two halves, then each half must be the same size and shape as the other. This concept should, in turn be followed by comparing fractional values. For example, one half is greater than one-fourth, but two-fourths equal one-half. When students understand these ideas in relation to both the concept of a fraction of one=whole and the concept of a fraction of a group, they will be ready to begin operations on fractions.

Knowledge of fractions extends children's understanding of numbers and helps them accurately describe numerical situations. Just as children need to see models of whole numbers to understand them, they must see models of fractions in order to understand them.

Culminating Project:
"Fruity Fractions Pizza Party"

The Half Birthday Party

-Day One-

Materials: Book, The Half Birthday Party, drawing paper, crayons or markers

Vocabulary: Fraction: A way to describe a part of a whole or a group.
Numerator: the number In a fraction, the total number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the total number of equal parts or groups. The bottom number in a fraction.

Think More: Brainteasers

Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a "Think, Pair, Share" strategy will work best. First students "think" on their own, then "pair" with a friend and finally "share" their ideas with the class.

Solve More: Activity One:

1. Read The Half Birthday Party by Charlotte Pomerantz. It works with parts of a set to teach model fractions. Daniel organizes a party for his sister who is ½ of a year old. All the gifts are ½ gifts (one shoe, one earring) and there is ½ of a cake and ½ of a candle.
2. After reading the book to the class and discussing its funny fractions, have students think of something they could take to a half-birthday party and draw it on their paper.
3. Extend this activity by having students throw a ⅓ or ¼ birthday party and draw the appropriate gifts.

Explain More: Have students share their answers and illustrations with the class. Put together a 1/3 or 1/4 class book of their illustrations. Keep for their portfolios.

Connect the Fractions
-Day Two-

Materials: Proejctor, pattern blocks, pattern blocks for students

Vocabulary: Fraction: A way to describe a part of a whole or a group.
Numerator: In a fraction, the total number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the total number of equal parts or groups. The bottom number in a fraction.

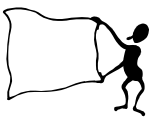
Think More: Brainteasers

Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a "Think, Pair, Share" strategy will work best. First students "think" on their own, then "pair" with a friend and finally "share" their ideas with the class.

Solve More: Activity One:

1. On the overhead or projector display one color pattern block and tell student that it is ¼ of the whole shape, or project fraction pieces if you have them. Also just drawing the shape with a marker will work , using a piece of construction paper, will make a shadow.
2. Have small groups of students make the complete shapes.
3. Let them put their shapes on the projector.
4. Continue with more shapes.

Explain More: Have students explain how they knew how many shapes to put. Did they know before they started? How? Did they use the guess and check method?



Connecting the Parts
-Day Three-

Materials: Cubes, 1-cm graph paper, crayons or markers, construction paper , Citrus Fruit

Vocabulary: Fraction: A way to describe a part of a whole or a group.
Numerator: In a fraction, the total number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the total number of equal parts or groups. The bottom number in a fraction.

Think More: Give each table a different citrus fruit: lemon, lime, orange, or grapefruit. Have them peel it and carefully peel the pieces apart. Have students tell what fraction of the fruit they received.

Solve More: Activity One:

1. Give each table a stack (15 or more) of two different color cubes (10 of one color and 5 of another).
2. On a piece of construction paper, make three columns. Students will build whole towers using the cubes. In the first column, have students make a tower of 5 cubes and record the fraction.
3. The five, which represents, the total in the tower will be the denominator. For example (if the two colors are 10= blue and 5 = yellow, the fraction would be 5/5 = blue and 0/5 = yellow). Talk about when the whole set is made up of the same thing it is a whole. Have students share their wholes. They can think of their towers as the number
4. In the next column have students create a tower with both colors, but still standing 5 cubes high. Have them share with the class.
5. Now have them make one more tower, 5 cubes high with a different combination. Have them discuss their fractions. What do they notice? How could they arrange these? Descending order – by which color? Ascending order – by which color?
6. Have students transfer their towers onto graph paper. They can create more combination in another row using 6 as the denominator. Have them illustrate their tower into a number one…by putting a canopy on it.

Explain More: Did students understand the concept of 1 whole? Were they able to order their fractions?

Fear Factor Fractions
-Day Four-

Materials: Paper plates, cotton balls, buttons, paper scraps, beads, yarn (to represent gross stuff – eyeballs, worms, bugs)

Vocabulary: Fraction: A way to describe a part of a whole or a group.
Numerator: In a fraction, the total number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the total number of equal parts or groups. The bottom number in a fraction.
Equivalent: Having the same value

Think More: Brainteasers

Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a "Think, Pair, Share" strategy will work best. First students "think" on their own, then "pair" with a friend, and finally "share" their ideas with the class.

Solve More: Activity One: Fear Factor Pizza

1. Make a giant class pizza on bulletin board paper with paint. Outline 30 sections.
2. Prepare a "Fear Factor Pizza" by having students select from a mystery bag the item they are to decorate on their slice of giant pizza.
3. Have 30 slips of paper in the bag: 15 should say eyeballs, 10 should say worms, 5 should say bugs. You can vary the three gross items, be creative.
4. Let kids get on all fours and decorate their slice. They can paint, draw, glue on cotton balls for eyes, yarn for worms, felt for bugs…. whatever you have that can be transformed into something gross.
5. Cut the slices apart and sort them into common numerators. The denominator will be the number of slices in all (30). (You could cut them apart before the kids decorate them if you wish, but most kids like to work together on the floor.)
6. Put the pizza back together with the common pieces next to each other. See if students can draw conclusions about the sizes. Does anything look like 1/2, 1/3 or 1/6?

Activity Two: Equivalent Fractions

1. Now it is time to learn about equivalent fractions.
2. Have students sit around the giant pizza, leaving walking space between them and the pizza. Conduct the following discussion.
    - Look at the bugs, Will the people sitting in front of the bug slices please stand up and pick up the slice in front of you.
    - How many slices are there? (5)
    - What is the fraction for the bugs (5/30)

- Class, look at the empty space where the bugs used to be. How many spaces of this size do you think are in the whole pizza?
- When someone makes a guess, have the students with bug slices; walk around until they have circled the whole pizza.
- Class counts in unison each time they pass to the new spot to check the answer. They should make 6 trips, including their first spot.
- Write on the board: 5/30 = 1/6

3. Repeat the activity with the worms and eyeballs. (Could start with eyeballs – easier answer, but more people walking.)
4. Make menus and have students order different pizza combinations. For example, 1/15 bugs, 1/30 worms, or if they are really into winning, ½ eyeballs.

Explain More: Were children able to visualize the equivalent fractions? Did the whole body involvement keep all students attentive to the lesson? Were students able to transfer the concepts from the hands-on activity to the paper pencil activity?

Fruit Pizza Party
-Day Five

Materials: English muffins, various fruit (not citrus, canned mandarin oranges, bananas, peaches, strawberries, grapes), cream cheese, orange marmalade or other jelly plastic knifes or dull butter knives (may want parent assistance today), measuring spoons, cookie sheet, wax or baking paper (names written on the paper for pizza placement) Notify the kitchen or borrow a toaster oven for the hour.

Vocabulary: Fraction: A way to describe a part of a whole or a group.
Numerator: In a fraction, the total number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the total number of equal parts or groups. The bottom number in a fraction.

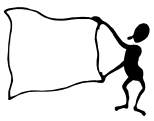
Think More: Brainteasers

Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their Number Notepads to work on problems. Using a "Think, Pair, Share" strategy will work best. First students "think" on their own, then "pair" with a friend and finally "share" their ideas with the class.

Solve More: Activity One:

1. Have students work in teams at their table. Let one table be in charge of the bananas, another be in charge of the strawberries, another be in charge of the grapes, etc. Have students cut their items into fractions. One person at the table records the denominator for their item (if they cut 20 slices of bananas they would write /20.)
2. The remaining tables will put the cream cheese and then jelly on the muffins (use measuring spoons to keep with it math-related).
3. After all items are prepared, have a discussion about the amounts you have. Have class decide how to "divide" the toppings equally.
4. Students receive one muffin (with the cream cheese and jelly on it) and proceed to get the toppings of their choice.
5. After they complete their selections, they set their muffins down on the wax paper cookie sheet on the spot which their name is written.
6. Cook until cheese is melted and fruits are soft.
7. Compare the students' pizzas. What fraction of the class had bananas? What fraction had strawberries? etc. Have students record these answers in their number notepad.
8. Enjoy!

Explain More: Were students using mathematical language as they prepared the pizza? How well did they create fractions of the class pizzas?

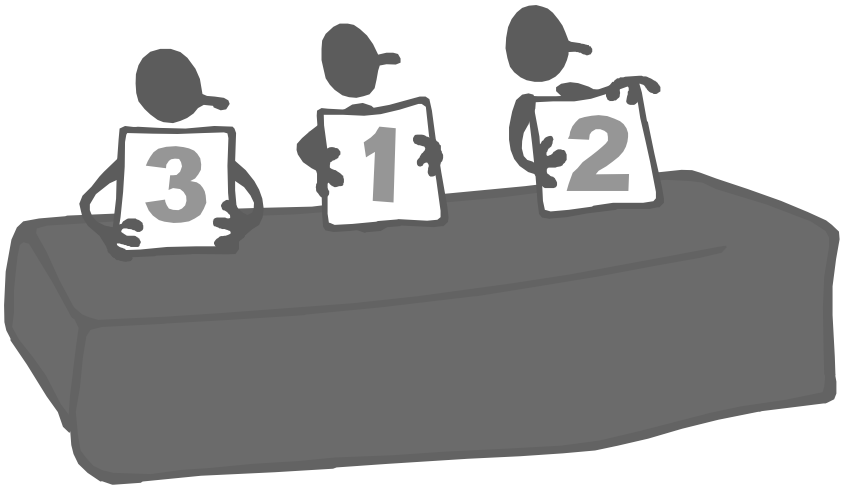


Peer assessment on group work.

Math Masterminds

Culminating Activity:
Students conduct a “Cook Off” where they share their recipes for fruit pizza. Invite family and friends to the Fruity Party.

Assessment and Communication



For the
Encore Math Enrichment Program

Assessment and Communication

The following supplements are provided to assist you in assessing your students learning in the Encore Mathematics program. The course will be graded on a Satisfactory and Unsatisfactory basis. Each week teachers should record how students are doing and evaluate the effectiveness of the lessons. A portfolio should be kept for each student, which will contain examples of their learning and growth in the program. Examples for the portfolio could include Number Notepads, interest inventories, self and peer assessments, teacher observation checklists, work samples, reports and/or group projects. A portfolio evaluation form should accompany all work samples.

The lessons in the Mathematics Encore module are standards-based and reflect the skills and concepts students should know and be able to do in a math class. Each unit will culminate with students showing what they have learned in Math Masterminds, which will be assessed by the teacher and the student's peers.

This section contains the following assessment and communication supplements:

Standards-based Rubrics	Skills and Concepts Assessment
Number Notepads	Problem Solving and Reflection Notes
Portfolio Evaluation Forms	Teacher and Student Evaluation
Self-Assessment Sheet	Student Self-Assessment
Peer Assessment Sheet	Collaborative Group Ratings
Interest Inventory	Portfolio Entry
Class Record Chart	Class Participation Rating
Student Record Chart	Student Weekly Records
Parent Communication Forms	Progress, Information, and Invitation

Standards-based Rubrics

Directions: Teachers may use this rubric, or one that you design to assess a daily skill and/or concept.

Score	Representation	Criteria
3	Exceeded the standard	The student demonstrates a **thorough understanding** of the mathematics concepts and/or procedures required for the task. The student has correctly completed the task using mathematically sound procedures and has provided clear and **complete explanations and interpretations.**
2	Met the standard	The student demonstrates an **understanding** of the mathematics concepts and/or procedures required for the task. The student's response to the task is essentially correct, with the mathematical procedures used and the explanations and interpretations provided demonstrating a **general understanding**.
1	Attempted the standard	The student has attempted the standard but can demonstrate only a **partial understanding** of the mathematics concept and/or procedures needed for completion of the task. The student's work **lacks complete understanding** of the mathematical concepts.
0	Did not attempt the standard	The score of zero indicates that the student has provided a **completely incorrect or uninterpretable response or no response at all.**

Standards-based Rubrics

Directions: Design a rubric to assess a daily skill and/or concept you expected students to master in this unit.

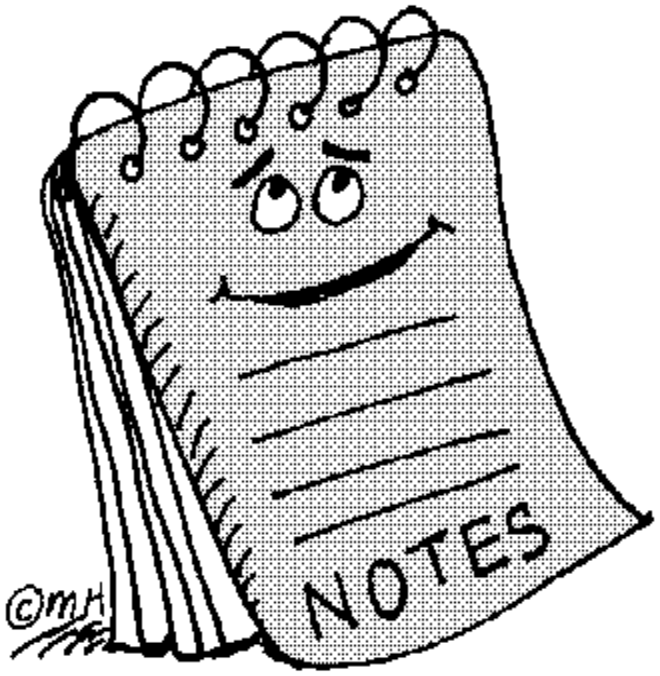
Score	Representation	Criteria
3	Exceeded the standard	
2	Met the standard	
1	Attempted the standard	
0	Did not attempt the standard	

Number Notepads

For Primary "Think More!"

Students make these into a math journal to solve problems, take notes,
store vocabulary, and share thoughts during their Think More
and Explain More! time in the Mathematics Encore program.
Photocopy five per student (front to back) to be folded into a booklet for the week's unit.

Number Notepads



Problems Solved by _____


Think More!

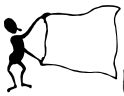

Solve Math Mazes Here: Date_____


Explain More!


Explain Your Learning Here:


Think More!


Solve Math Mazes Here: Date_____


Explain More!


Explain Your Learning Here:

Observation Checklist

Prepare a table set (5 students) of these and staple them together.
Keep them on a clipboard and conduct table observations when appropriate.

Table _____ Student's Name _____

Criteria	-	+	Comments
Does the student know what to do?			
Does the student get right to work?			
Is the student organized?			
Can the student do the required task independently?			
Can the student do the required task with peer assistance?			
Can the student do the required task with teacher assistance?			
Has the student done the task accurately?			
Can the student explain the work?			
How does the work look?			
Does the student work well with others?			
Does the student use time wisely?			
Other			

Observation Checklist

Prepare a table set (5 students) of these and staple them together.
Keep them on a clipboard and conduct table observations when appropriate.

Table _____ Student's Name _____

Criteria	-	+	Comments
Does the student know what to do?			
Does the student get right to work?			
Is the student organized?			
Can the student do the required task independently?			
Can the student do the required task with peer assistance?			
Can the student do the required task with teacher assistance?			
Has the student done the task accurately?			
Can the student explain the work?			
How does the work look?			
Does the student work well with others?			
Does the student use time wisely?			
Other			

Portfolio Evaluation Form

Directions: Teacher and student discuss the contents of his/her portfolio and assign a score of 0-3 for each criterion. A satisfactory or unsatisfactory rating will result from the average of the scores.

_____'s Encore Portfolio

Encore Program _____

	Write in the earned score and total at the bottom to calculate the student's report card grade.			
Evaluation of Contents	Unsatisfactory Did not Attempt Goals	Satisfactory Attempted Goals	Good Met Goals	Excellent Exceeded Goals
	0	1	2	3
1. **Completeness**: Meets portfolio requirements (Use Portfolio Table of Contents)				
2. **Variety**: Tries new things.(Use portfolio selection form)				
3. **Quality**: Sets high standards for completed work. (Use rubrics)				
4. **Effort**: Sets goals and works on them. (Use portfolio selection form)				
5. **Reflection**: Defines strengths and weaknesses (Use self-assessment form)				
6. **Growth**: Shows improvement over time. (Use portfolio selections)				
7. **Cooperation**: Works well with others (Use peer form)				
8. Other:				
Criteria Score (add the columns)				
Total Score (add the column totals)				
Average Score (Total /7)				
Achieved the program standards Average of 0 = Unsatisfactory (U) Average of 1-3 = Satisfactory (S)				

Portfolio Table of Contents

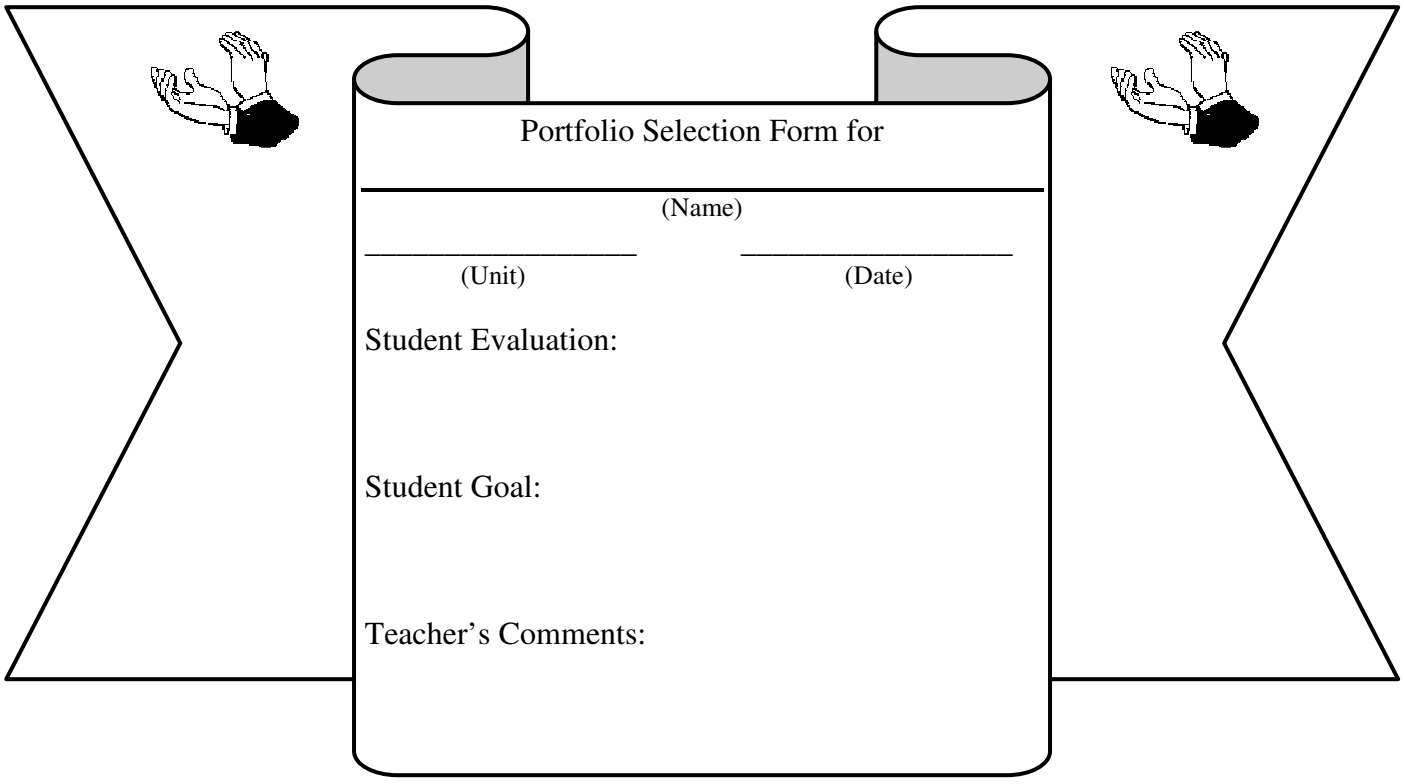
Directions: Students attach this form to the inside right hand side of their portfolio folder.

_____'s Portfolio

	Quarter -1-	Quarter -2-	Quarter -3-	Quarter -4-	
Work Sample	Date	Date	Date	Date	Comments

Portfolio Evaluation Forms

Directions: Students and teachers complete this portfolio form and attach to the work to be placed in the portfolio. At least four items should be selected for the Encore Portfolio. (For example: beginning and end of each 4-week module).



Portfolio Selection Form for

_____

(Name)

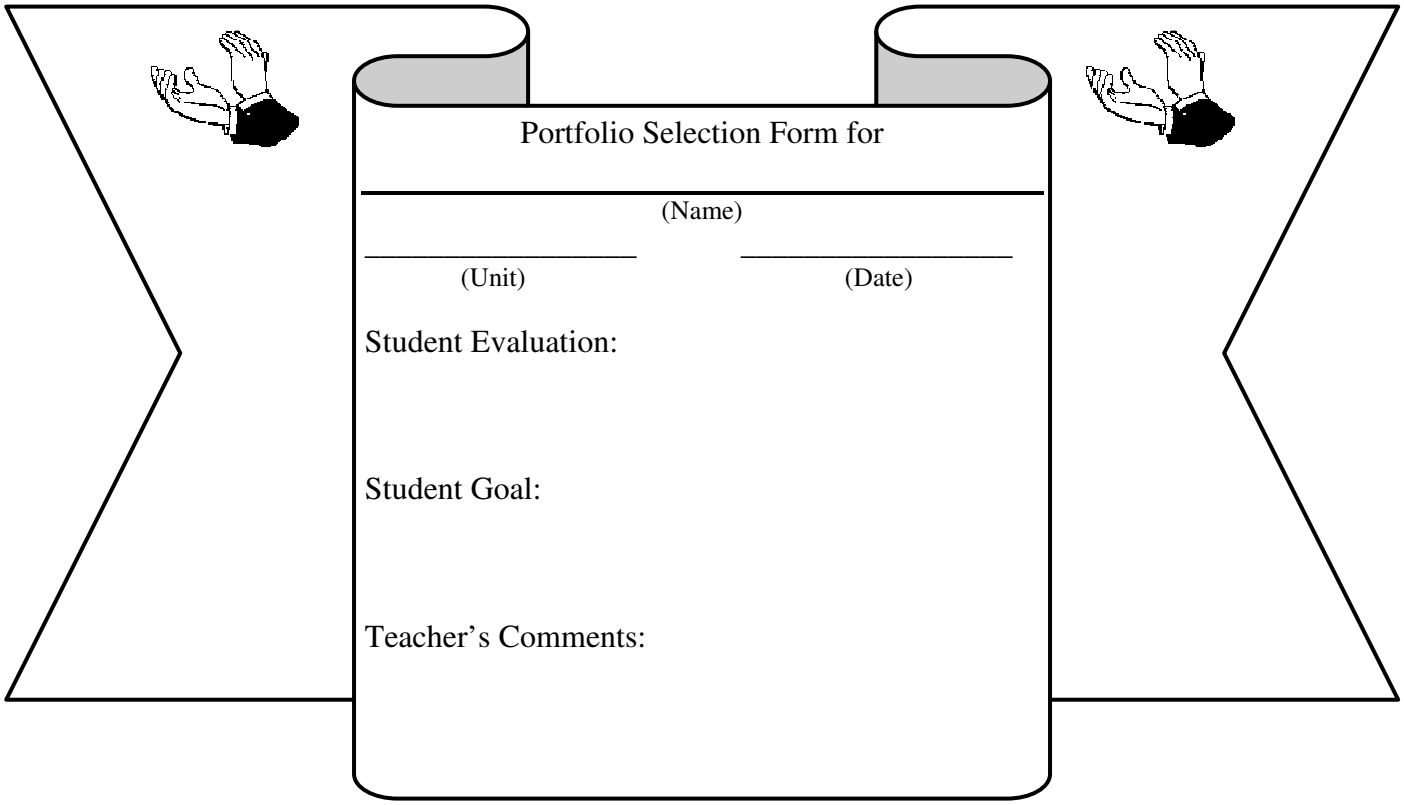
_____ _____

(Unit) (Date)

Student Evaluation:

Student Goal:

Teacher's Comments:



Portfolio Selection Form for

_____

(Name)

_____ _____

(Unit) (Date)

Student Evaluation:

Student Goal:

Teacher's Comments:

Self-Assessment Sheet

Directions: Students reflect on their strengths and weaknesses.

When I solve a math problem I feel…

When I compete against others in math games I feel…….

I have gotten better in:

I still need work on:

I am proud of:

_____

Name of Mathematician

Peer Assessment Sheet

Directions: Students ask their classmates to give them feedback on their collaborative projects and cooperative game playing.

You helped our group by:

Signed by:

I like the way you:

Signed by:

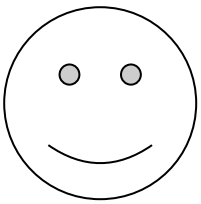
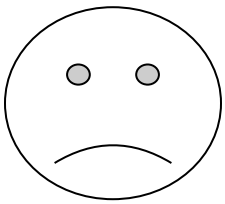
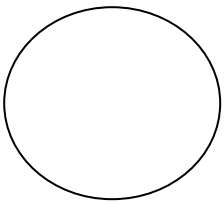
_____

Name of Mathematician

Primary Interest Inventory

Name_____ Class_____

How do you feel about math?

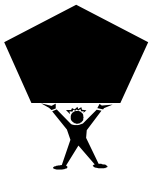




Circle as many answers as you like.

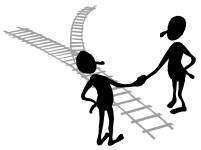
I like to:


Play games


Solve Problems

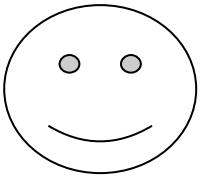
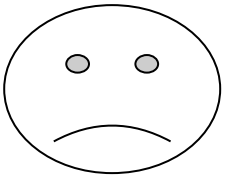
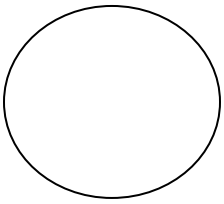

Use Manipulatives


Use Mental Math


Work with Others

Work Alone

How do you feel about your mathematical ability?

I'd like to know more about……

Here's something I'd like to try in math class……..

Student Record Chart

Keep weekly records of students work by using rubrics or assessment resources.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Grade S/U
UNIT										
NAME										

Parent Communication Form

Directions: Fill out a parent communication form to introduce each unit and request supplies or give other information (field trips, guest speakers etc)

Mathematics Encore Program Parent Communication:

Dear Parents,

In the Mathematics Encore program we are about to begin our unit on _____

_____. We would like to request _____

Thank you so much,

Mathematics Encore Program Parent Communication:

Dear Parents,

In the Mathematics Encore program we are about to begin our unit on _____

_____. We would like to request _____

Thank you so much,

Mathematics Encore Program Parent Communication:

Dear Parents,

In the Mathematics Encore Program we are about to begin our unit on _____

_____. We would like to request _____

Thank you so much,

Parent Communication Form

Directions: Fill out a parent communication form to invite parents and guests to your culminating Encore activity.

Mathematics Encore Program Parent Communication:

Dear _____,

We would like to cordially invite you to attend our culminating Encore activity

scheduled for _____

We hope you will be able to attend.

Sincerely,

Mathematics Encore Program Parent Communication:

Dear _____,

We would like to cordially invite you to attend our culminating Encore activity

scheduled for _____

We hope you will be able to attend.

Sincerely,

Mathematicss Encore Program Parent Communication:

Dear _____,

We would like to cordially invite you to attend our culminating Encore activity

scheduled for _____

We hope you will be able to attend.

Sincerely,

Background Information

For
Encore Mathematics Instruction

Problem Solving Strategies

GUESS, CHECK AND REVISE

If you have an idea about how to solve the problem but aren't positive it will work, "Guess and Check" might be the strategy to use. "Guess and Check" works when: you have a limited number of possibilities to try; you know what kind of answer to expect, or you have enough information to know if the answer makes sense.

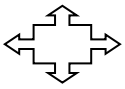
Tip: Guess and Check should not become a substitute for thinking. Use only when there is a good reason behind every guess.

Use Easier Numbers (2,5,10)

Students may get discouraged by big numbers. Have them rewrite the problem with friendlier numbers. Use "Easier Numbers" by: substituting them for some or all of the numbers in the problem. Make a list of the easier numbers used. Solve the easy problem first. Use the same procedure to solve the hard problem.

Tip: Students must know that the easier numbers are only temporary. Students should use simple, round numbers.

Draw a Diagram
Make a Model
Look For a Pattern



Drawing a diagram helps you visualize problems. Rules for "Visual Models": Label diagrams clearly. Make diagrams clear and in proportion. Use whenever a picture might help. Patterns can simplify problems. Keep previous patterns in mind.

Tip: Keep drawing simple.

Make a Table/Organize a List

To keep information in your problem straight, it may be a good idea to use a table. Use a table to organize data or keep track of confusing numbers and facts; spot trends and identify patterns; or correlate one set of facts to another.

Tip: Keep tables simple. List only the information that you need.

Work Backwards….
5,4,3,2,1….

Sometimes working backwards from what you do know will help you figure out what you don't know. You can work "Backwards" by making a list of what you know and sorting out step-by-step processes for a complicated chain of information. This will help you figure out the question when you already know the answer.

Tip: In some problems, steps are missing. Make sure you have all the information before you begin.

Act It Out

When seeing the situation may help you find the solution, acting out may be your strategy. "Act Out" when the problem lends itself to using props. Seeing the situation will give you insight into the solution.

Tip: Keep it simple. Only act out when not much preplanning is needed.

Manipulative Use and Management

How to Use Manipulatives:
If you believe that math should be hands-on, going from the concrete to the abstract, then that belief will translate into meaningful learning experiences for your students. If you enjoy working with manipulatives in an active setting, your students will too. Sometimes you will be using manipulatives with the whole class and sometimes it is better to have small groups working with the manipulatives. However, some situations call for a demonstration to the whole group before placing manipulatives at a learning center for students to use on their own. There may be a certain day of the week that the room is set up with centers. For example, when working on geometry, five geometry centers could be set up at which students are building shapes, comparing shapes, using geoboards, sewing quilt patterns, or playing Battleship. Students could rotate to all of the centers in one day, or they could visit a different center each day.

How to Manage Manipulatives:
As you know, more movement and verbal interaction are expected when you have a hands-on, student-centered classroom environment. In order to keep your sanity, here are a few words of advice.

- Throughout the year, allow students free time to "play" with the manipulatives. By providing them this unguided time, they will curb their curiosity and be able to focus on the mathematical concepts rather than on the manipulatives at the time of your lesson. The amount of time you let them "play' depends upon the needs of your class.
- Demonstrate and discuss the safe and responsible use of the manipulatives you will be using for each unit. Only introduce a few manipulatives at a time and role play their correct use. For example, show how to put the rubber bands on a geoboard without them flying across the classroom.
- Prepare a way to store and distribute the manipulative activities. Practice the procedures students will use for distribution and collection.
- As a class, design rules for this hands-on activity time. Some rules might be created to signal clean up time, encourage sharing, etc.
- Before students begin an assignment with manipulatives, model the activity with the whole class before asking students to work on it independently.

Manipulative Materials:
Many of the math manipulatives required for your math Encore lessons are in your Core Day math materials kits. The others have been purchased for your school. However, the consumable items need to be collected from students at the start of each unit. A parent communication letter has been provided in the Communication Section of this packet. As students start to bring in the items, place them in a large container. Later have students sort them into labeled containers (laundry detergent boxes work well. Have a parent prepare your boxes by covering them with attractive contact paper and labeling the outside with the name of the item to be collected). Items to collect are listed in the materials section of each lesson. Make a list of them on the parent letter before the start of each unit. Examples of items are: plastic ziplock bags, beans, toothpicks, dixie cups,

coins, plastic eggs, magazines, straws, craft sticks, Styrofoam fruit and vegetable trays, bolts, nuts, washers, different sizes and shapes of boxes, cans and spheres, paper plates, old measuring cups and spoons, plastic knives and spoons, toilet paper rolls, clothespins, buttons and rubber bands

How to Manage Cooperative Groups

Working cooperatively with others requires many skills that students may not have acquired or seen modeled too often. A demonstration of proper "play" must be modeled and practiced many times a year. During the math Encore program, students will work cooperatively on projects, when using manipulatives and when playing math games. Cooperative learning improves attitudes toward learning and academic achievement. When children work together they are exposed to ways of thinking and strategies that they may not have discovered on their own. It prepares students for real life situation, in which people share responsibilities with others, cooperate, and work together toward common goals.

Thought and planning must be given to setting up groups. Groups should be heterogeneous. Mixing achievement levels during the Encore program allows for peer tutoring. Random groups or special-interest groups can be formed periodically, but heterogeneous groupings usually work best.

A good size for groups is about four students. Group a high and a low student with two average students. Keep groups together for the entire module. If situations develop that interrupt the group's progress, make changes where necessary. For students to work well together, relationships need to be built. Providing time for students to get to know their group members is important. They could share their interest inventories with each other as a way of developing common bonds about math.

Teach your students the three basic principles of constructive group work and post them in the class:

- Guide: Help and demonstrate what to do without telling or doing everything yourself. Take turns. Only one person from the group can request the teacher's assistance when necessary.
- Check: Pay attention and listen to others, Respond in a helpful way if someone makes a mistake. Use words like, "Good Try" or "Better Luck Next Time"
- Praise: Let others know they are doing a good job many times during the course of a game or project.

Teach your students the various roles that group member might have:

- Recorder: Writes the group answers, summarizes discussions and may be the person who requests the teachers assistance.
- Reporter: Reads directions and is the spokesperson for the group during sharing time.
- Leader: Makes sure everyone has a job and is participating. Responsible for encouraging others to stay on task and put forth their best effort. Needs to use

phrases like: “Does everyone agree?” “Let’s review our notes”. “Fred, what do you think?”

- Materials Manager: Gathers and returns all materials needed for the group.

The Encore Math program lends itself to cooperative grouping in many ways.

- *Cooperative Projects* include building geometric structures, cooking experiences and/or creating displays such as a quilt. Each project team should have assigned roles, clear expectations and peer assessment.
- *Using Manipulatives* often will be done in groups of table members and/or pairs of students.
- *Playing Math Games* might be your biggest but most rewarding challenge. Games will help students learn basic skills, as well as build good citizenship qualities. Students will learn how to cooperate, how to be gracious winners and losers, and how to wait for one’s turn.
    - There are many games in the Encore curriculum. Some may involve only two people, and some may require the whole table. Some are board games in which students take turns to make it around the board and some are card games in which students take turns receiving and discarding cards. Round Robin games such as “I Have. Who Has?” require listening skills as well as mental math know-how.
    - Consumer games are also part of the Encore math program. Chess, checkers, Battleship™ require problem solving strategies as well as critical thinking. Dominoes provide opportunities for children to work on a variety of skills and concepts ranging from addition and subtraction facts to understanding relationships.
    - Student-created games are also part of the math Encore day. Students may create tic tac toe boards, bingo cards, or various card games.

    Teachers should select games to be used according to the needs and levels of the students. The focus of the game should be on the skill being practiced rather than winning or losing. Students need to be aware of the purpose of the game, the rules of the game and the appropriate way to conduct themselves while playing the game. Games provide a way to apply problem solving skills in real situations. The competition may help students discover that the more they learn, the better they play the game, and the more they play the game, the more they learn.

Using this student-centered approach effectively will create an environment for mathematical exploration, lay a foundation for advancing mathematic skills, and produce a satisfying Encore experience for you and your students.

Materials and Resources

For the Encore Math Program

Encore Math Materials and Resources

Core Math Program Manipulative Kits

Other Manipulatives for Encore Program:

- Class set of Calculators
- Basic Operations Flash Cards
- Fraction Cards
- Money Activity Kit
- Write on/Wipe off Clocks
- Classpack of Tangrams

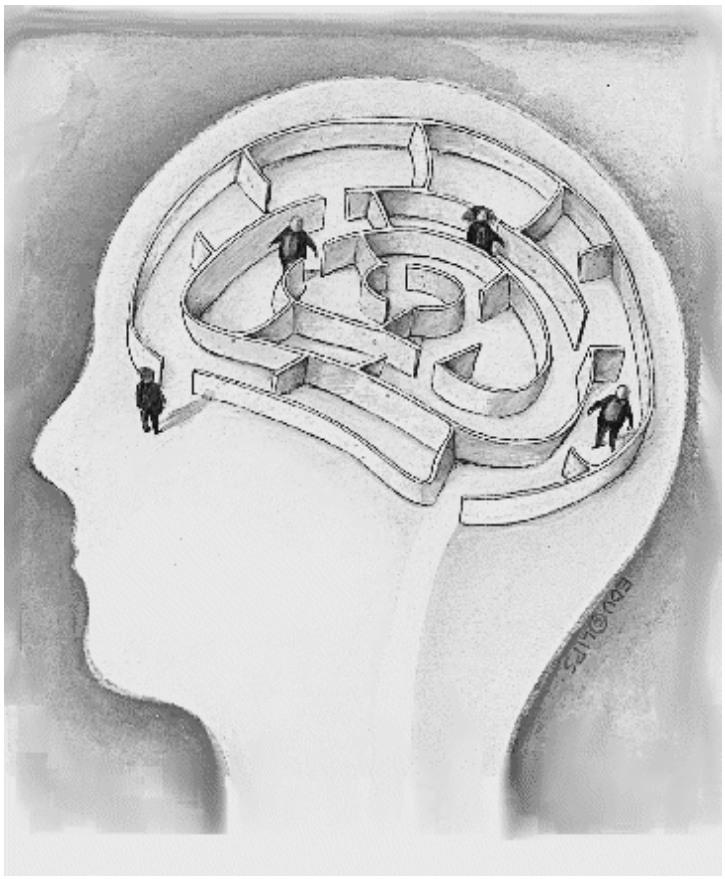
Games

- Chess
- Battleship

Recommended Websites:

- Fun Brain: www.funbrain.com/fract/index
- A+ Math: www.aplusmath.com
- Triple A Math: www.aaamath.com
- Teacher Corner: http://www.theteachercorner.net
- Education World:
- Houghton Mifflin's Brain Teasers:

Math Mazes



A Primary Packet of Math Problems to Tease Your Brain

(Resources: Creative Publications and Critical Thinking Press)

Math Mazes

Directions: Pick a riddle, trick or brainteaser for the **"Think More!"** section of your Encore Math lesson. These can be written on the board, or projector or done orally. Students solve the problem in their **"Number Notepads"**. Use the "think, pair, share" technique as your routine. Students *think* on their own (about 5 minutes), then *pair* up with a partner to discuss possible solutions (for about 5 minutes), then *share* their answers with the class (for 5 minutes). These are fun and not meant to be a lesson in skills, but rather in critical thinking and problem solving.

Geometry

Algebra

Number Sense

Time

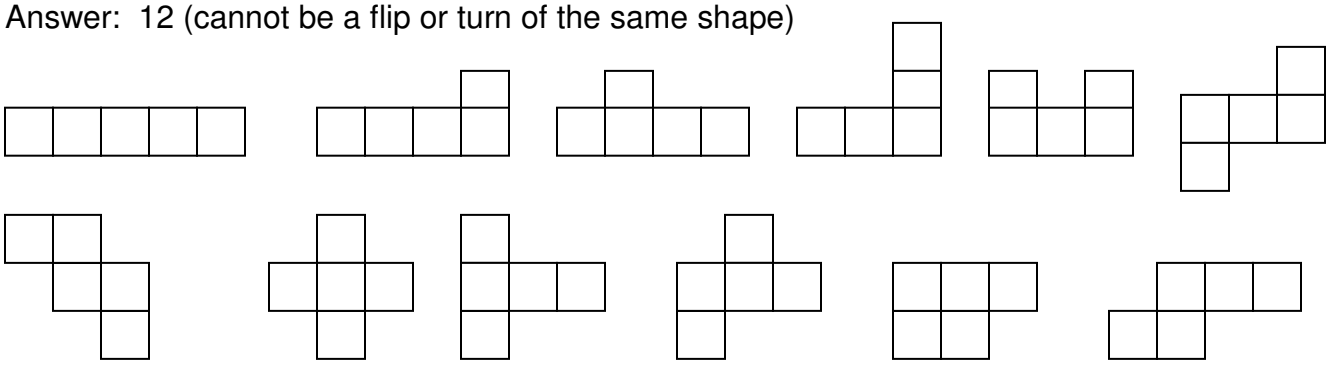
Geometry

Graph Paper Challenges

- Students use graph paper to solve these puzzlers.

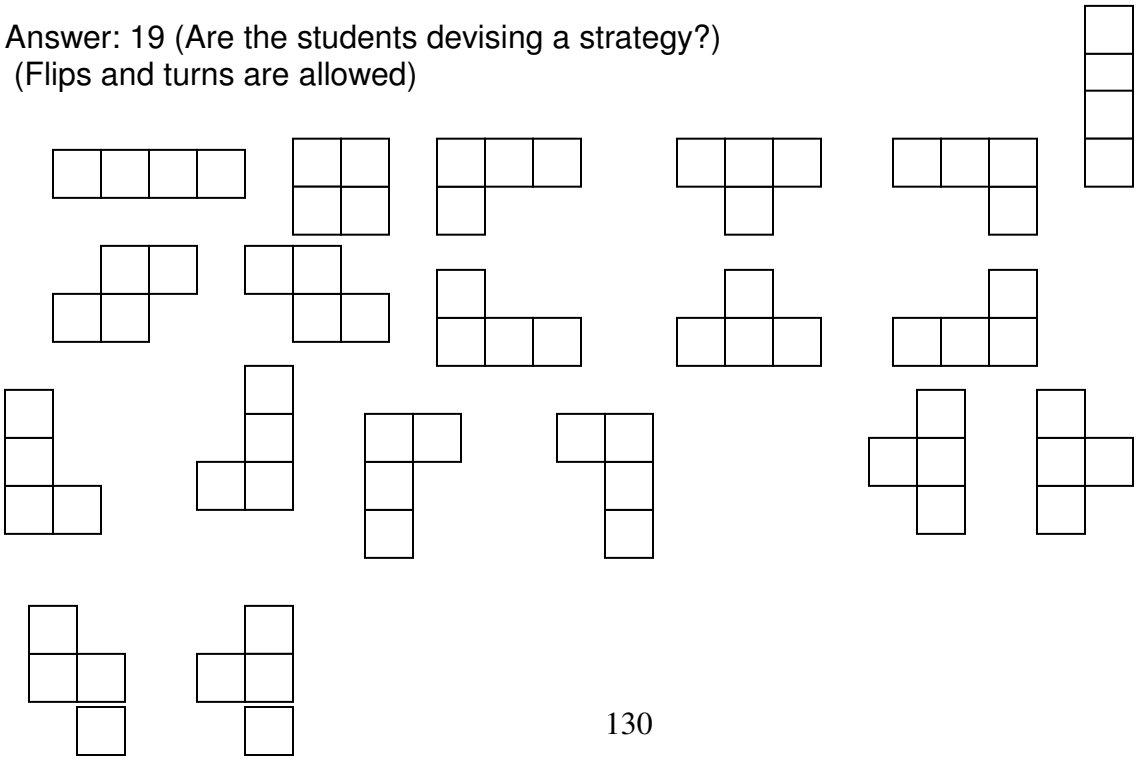
1. Use the graph paper to draw all the different pentominoes (a set of squares connected side-to-side, not corner to corner) that can be made by connecting five squares. How many can you create?

Answer: 12 (cannot be a flip or turn of the same shape)



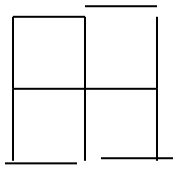
2. Draw all the ways you could buy four attached stamps.

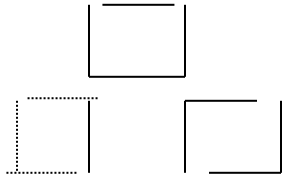
Answer: 19 (Are the students devising a strategy?)
(Flips and turns are allowed)



Using Toothpicks:

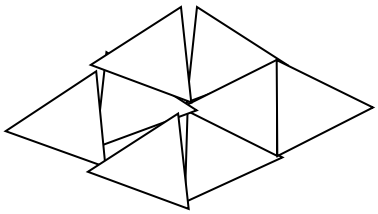
1. Make this shape with your 12 toothpicks. Move 3 toothpicks to other spots to make 3 equal (congruent) squares.

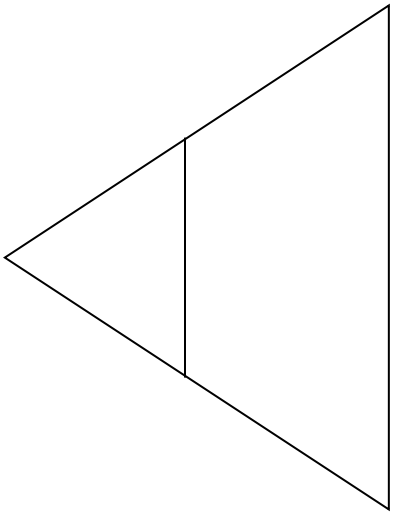




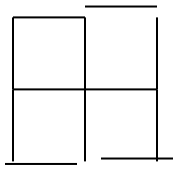
Answer: dotted lines are the moved toothpicks

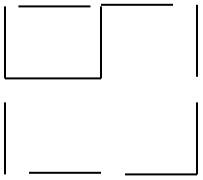
2. Remove nine toothpicks to get 2 triangles. They are not congruent.



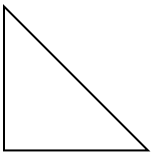


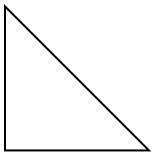
3. Take away two toothpicks to leave 2 squares. (They are not congruent).

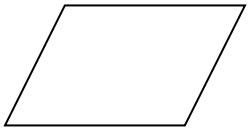
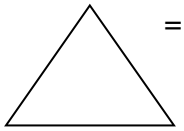


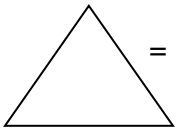
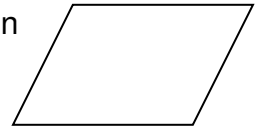


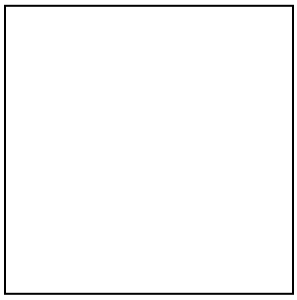
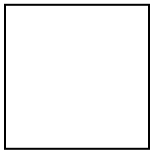
Pattern Shape Puzzlers

1. If  = 1, then  = ? (Answer: 2)

2. If  = 1, then  = ? (Answer: ½)

3. If  = 1, then  = ? (Answer: ½)

4. If  = 1, then  = ? (Answer: 2)

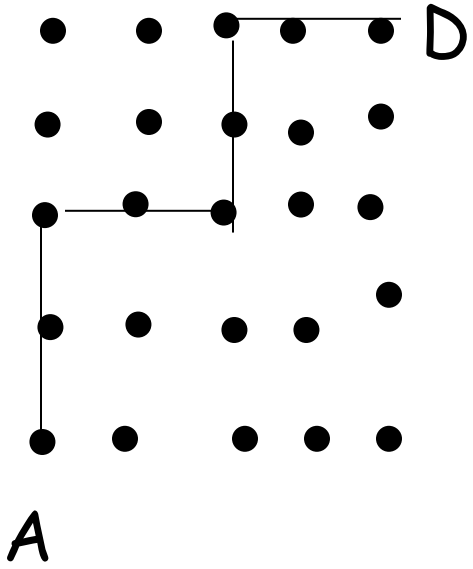
5.  = 16, then  = ? (Answer: 4)

Algebra

Using dot paper

1. Using only vertical and horizontal lines (no diagonals) to move upwards and to the right, how many different routes can you find from A to D.

50 paths, such as



Write your own problems. Use lower numbers to make it easier or higher numbers to make it harder.

1. A farmer had a dozen eggs to sell.

2. The school has 50 kindergartners.

3. The children made $150.00 at the book sale.

Write your own word problem for the equations.

1. ☐ + ☐ + ☐ =N

2. . ☐ - ☐ + ☐ =N

Can you keep up? Leave out some steps to make it easier or add some steps to make it harder.

1. Take the total number of toes on both feet. Add the total number of babies in twins. Subtract the total number of ears on two people. 5 +5 = 10, 10 +2 = 12, 12-4 = 8

2. Take the total number of ears on a dog. Add the total number of feet on a dog. Subtract the total number of tails on a dog. Add the total number of eyes on a dog. 2+2-1+2 = 5

3. Take the total number of sides on a triangle. Add the total number of wheels on a bike. Subtract the total number of sides on a square. Add the total number of sides on a circle. 3 + 2 –4 + 0 = 1

4. Take the total number of doors on your car. Subtract the total number of steering wheels. Add the total number of wheels. Add the total number of radios. Subtract the total number of trunks. (Answers could vary – if they have a 4 door or 2-door . See if they discover this. 4 –1 + 4+1-1 = 7

Number Sense

Riddles

1. Why was six afraid of seven?
   Answer: Because seven, eight (ate), nine.

2. What is sure to go up but never come down?
   Answer: Your age.

3. What did one math book say to the other math book?
   Answer: I've got problems

4. Which of the 50 United States has the most math teachers?
   Answer: Math – a-chusetts

5. What do you get when a math teacher is a magician?
   Answer: Tricky problems

6. Create the biggest problem that you can think of. Don't tell what it is. Write it. I bet I can write a bigger one!
   Answer: A BIGGER ONE

Write an equation for this problem. If you can't, explain why.

1. How many ears on are 10 people? Answer 20

2. Ten balls were in a box. Alan took the basketball out. How many basketballs were left? (Don't know how many basketballs are in the box, only says balls)

3. Hotdogs cost more than soda. What is the cost of 3 hotdogs? (Don't know the cost of anything, so can't work this out. What could help? Knowing the cost of the soda?)

4. I have 5 pencils, 2 pens, 3 crayons and 10 paper clips. How many writing utensils do I have? 5+2+3= x or 5+ 2+ 3 = 10

Extraneous information: One of these sentences just doesn't belong here. Write the line that doesn't belong and then rewrite the problem using only the needed information. Just because there are numbers, it doesn't mean you have to use them.

1. A airplane holds 200 passengers. One hundred and two people are on the plane now, *52 women and 50 men*. *Twenty eight people have tickets and are about to board.* How many seats are still available?

2. Two boys who are *12 and 14 years old*, rode their skate boards 12 miles into town. How far is their round trip?

3. *On highway 836, the speed limit is 55 miles per hour. If I drive 200 miles and go* 60 miles per hour, how long will it take me to go 120 miles?

Measurement

Time Tricks

1. When does 10 + 3 = 1?
   Answer: Three hours after ten is one.

2. At what time between 7:00 and 8:00 will the hands on a clock be in a straight line?
   Answer: About 7:06

3. How many birthdays does the average person have?
   Answer: One – just like any other person.

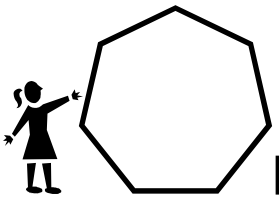
4. Have a student add 4 consecutive dates from a calendar. The student tells the sum. You tell the student the 4 dates.
   Answer: Just divide the sum by 4. (See if the kids can figure this out).

5. Some months have 30 days. Some months have 31 days. How many months have 28 days?
   Answer: All of them!

Using Tangrams

1. All 26 letters of the alphabet can be constructed with the seven tangram pieces. Use all seven pieces to form a letter. How many other letters can you make with the pieces? Trace them in your Number Notepads.

2. Use all seven tangrams to make your favorite polygons. Trace them and label the shape.



Math Word Tricks

An ordinary word is spelled with letters. Tricky words are spelled with letters too, but the letters are shown in special ways to tell something about the meaning of the word. Can you make these words into pictures that help you remember their meaning?

Example: DIVISION

1. Circle	2. Parallel	3. Odd	4. Even
5.Curve	6. Obtuse	7. Acute	8. Triangle
9.Rectangle	10. Square	11. Flip	12. Congruent

Play on Words
Brainstorm to create a picture to go with a caption about a math word or concept. The picture and caption should create a math cartoon.

1. “Stan, you are always right.” (Right angle)
2. “You can count on me.” (Example of counting)
3. “I can dance circles around you.” (Circles)
4. “Jeffrey, you are such a square.” (Square)
5. “Shirley, maybe you need to look at things from a different angle.” (Angles)
6. “We’ve got to stop meeting like this.” (Perpendicular lines)
7. “You make good sense.” (Cents)
8. “Drop me a line sometime.” (Line)

Odd Man Out!
Students brainstorm reasons that one number does not belong and why the others stay together. (comparing and contrasting)

1. 236, 279, 21, 837 (Possible answer: 21 is not 3 digits)
2. 2, 9, 7, 5 (Possible answer: 2 is not odd)
3. 15, 12, 20, 45 (Possible answer: 12 is not or a multiple of 5)
4. 16, 8, 18, 11 (Possible answer: 8 not between 10 and 20)
5. 112, 22, 12, 104 (Possible answers: 104 because it doesn't have a 2)