Imagine Schools *ENCORE*

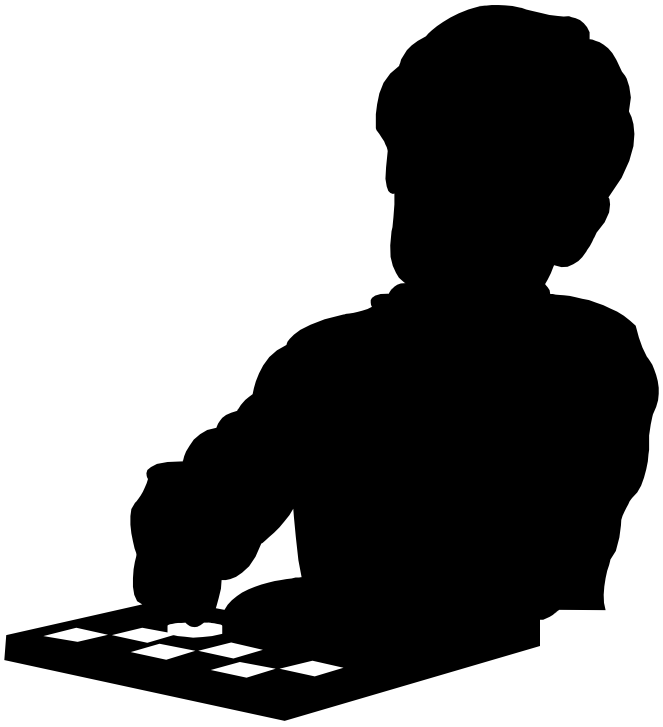
Mathematics Enrichment Program
for Grades 3-5

Developing Character

Enriching Minds

Imagine Schools Presents

"Let's Play It Again!"



An Encore
Mathematics Enrichment Program
For Grades 3 – 5

"Let's Play It Again!"

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"Let's Play It Again!"

An Encore Mathematics Enrichment Program for Grades 3-5

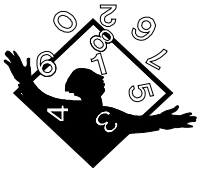
Welcome to the Encore Mathematics Enrichment program, in which children will be encouraged to investigate basic math concepts, construct their own mathematical meaning, and communicate their mathematical ideas through playing games, collaborating on projects, and exploring manipulatives. As they experience active learning, they will have the opportunity to become confident problem solvers, developing mathematical thinking abilities, and assimilate concepts. This project-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 Intermediate Encore Hour

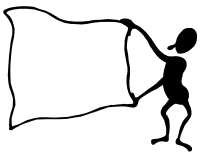


Think More activities will start each Mathematics Encore lesson. They should take 10 to 15 minutes. During this time, students will problem solve and think critically in groups or on their own.

- Display the brainteaser on the projector or chart. Have students work on the problems in their Number Notepad (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.

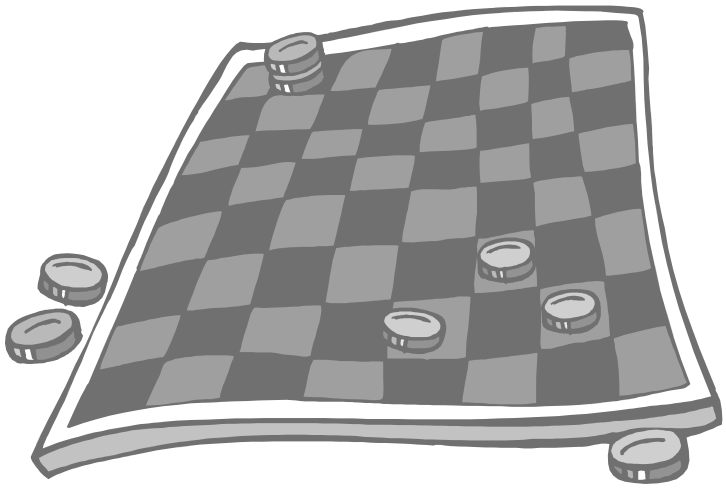
Math Masterminds! activities will culminate the end of each nine weeks. Students can invite friends and family members to view their work in Math Competitions, Math Displays, or Math Demonstrations. Classes may want to team up with other classes to plan another way to show their mathematical knowledge.

"Let's Play It Again!"

Grade Level Themes and Selections (3-5)

	Third Grade	Fourth Grade	Fifth Grade
	Mathematical Changes	**The Systems of Math**	**A Mathematical Environment**
Mapping out Geometry	Sail Boat Races A Change of Plans: A Study of Slides, Flips, and Turns	Battleship A System of Points: Ordered Pairs	Quilting Squares An Environment of Shapes: Writing Descriptions
Algebra Mystery Masterpieces	Magic Acts Changing Equations	Rodeo Days A System of Equations	Game Boards Unequal Environments
Number Sense "You Want a Piece of Me?"	Denominator Delights Adding and Subtractions Fractions	Fraction Feasts Fractions, Decimals and Percents	Crunchy Calculations Fractions, Decimals and Percents
Game Week	Mathematics Manipulatives and Selected Games for Critical Thinking and Problem Solving		
	Dominoes	Battleship	Chess

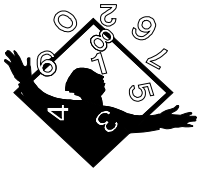
"Let's Play It Again!"



Third Grade Mathematics
Encore Program

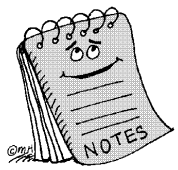
Introductory Procedures

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

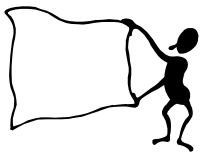


1. Think More is the opening.

Number Notepads will be used in the Think More 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.



2. Solve More is the project or activity.



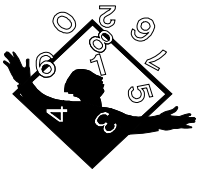
3. Explain More is the closing.
Number Notepads will be used again during this section for reflection and self and peer assessing.

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 Mastermind is the culminating activity for the week.

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 Notes—so 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????" You will have a chance to express yourself in your Number Notepads! I think that you might be surprised by the math you already know.

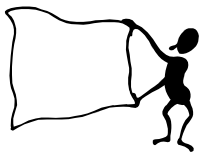
"Can anyone think of a few guidelines that the class should follow during "Number Notes"? (Summarize student answers into one or two positive directives). Write them on the chart or board.

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 conducting 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.

Having practiced 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 direction clear and consistent. Make a clear distinction between procedures (knowing what to do and what is expected) and rules (hurting others). If students forget the procedures, review and practice them. If students break a rule, administer consequences.

Encore Math Third Grade Materials and Resources

Non-consumables

Imagine Schools Curriculum Guide
Document Camera or overhead projector
Core Math Program Manipulatives:
Class set of calculators, Basic Operations Flash Cards, Deck of Cards, Money (coins and bills), Clocks, Class pack of Tangrams, Geoboards, Balance Scale, Spinners, dice, Dry erase boards, Fraction Cards
Fan
Cake/Brownie pan and cupcake pan

Games
Chess, Battleship, Dominoes, Checkers, Chinese checkers, Monopoly, Life, Bingo, Tic, Tac, Toe, "I Have, Who Has" card game

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's 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 NOTEPADS

Unit 1 Geometry:

Styrofoam trays, toothpicks, clay, fan, flags, mirrors, and plastic baggies, push pins (optional), cut out letters of the alphabet, Styrofoam trays, sails – construction paper cut outs, toothpicks, clay, dishwashing detergent, rectangle pan (brownie pan), water, recording sheet, fan, various cut out shapes, paper squares 8" by 8", tangrams, plastic baggies, projected grid paper with quadrants, file folders, graphing paper, objects to weigh (blocks, pennies, hard candies, etc.)

Unit 2 Algebra:

Balance scales, objects (objects to weigh: blocks, pennies, hard candies), Magic props (black hat, wands, black capes, juggling balls) and outfits

Unit 3 Number Sense:

6 class sets of different colored paper plates or construction paper circles (4" diameter) of 6 different colors, spinner, brad, deck of cards, 5' by 7' index cards, Popsicle sticks, Counters or small candies, grids, deck of number cards, dry erase boards, cupcake pan, cake ingredients for cupcakes, cupcake liners, bowls and spoons, frosting, and plastic knives

Third Grade Booklist

Third Grade Week 1

Reflections by Ann Jonas

Third Grade Week 2

My Name is Alice by Jane Bayer

Third Grade Week 3

Eating Fractions by Bruce McMillan

Gator Pie by Louise Mathews

"Let's Play It Again!"

Third Grade
Mathematical Changes

Third Grade
Geometry Unit

Standards: Understand concepts of symmetry, congruency, and similarity.
Understand concepts of flips, slides and turns.

Objective: At week's end, students will be able to correctly demonstrate a flip, slide and turn with geometric and non-geometric shapes.

Literature Connections: Reflections by Ann Jonas

Materials: Send a parent letter asking for Styrofoam trays, toothpicks, clay, fan, flags, mirrors, and plastic baggies (Push pins optional)

Teacher Resources: Imagine Schools Curriculum Guide

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:
"A Change of Plans"

Trans<u>l</u>ations=<u>Sl</u>ide
-Day One-

Materials: Overhead projector/document camera, shapes, paper squares 8" by 8", tangrams, plastic baggies, projected grid paper (or transparency) with quadrants, file folders, graphing paper.

Vocabulary: <u>Transformation</u>: A rule for moving every point in a plane figure to a new location.
<u>Tran**sl**ation</u> (**sl**ide): A transformation that slides a figure a given distance in a given direction.
<u>Ro**t**ation</u> (**t**urn): A transformation in which a figure is turned a given angle and direction around a point.
<u>Re**fl**ection</u> (**fl**ip): A transformation that which creates a mirror image of a figure on the opposite side of a line.

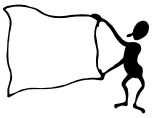
Think More: Emphasize the nonlinguistic representation in Vocabulary words on the board.

Math Mazes Brainteaser: Cut tangrams out of a square piece of paper (See diagram). Tell children they are going to be CHANGING shapes today. Save tangram pieces in a baggie for future use.

Solve More: Transforming Shapes: When you transform something you change it. In geometry, when you move a figure, you make a transformation of it.

1. Project a coordinate grid on the board. Place a triangle on the grid transparency. Tell the children that the first change they will learn about is **changing location.** In their Number Notepads, have students record the triangle's location by recording the coordinate pairs at the bottom left vertex. (Here's a saying to remember the order: birds walked **across** the land **before** they flew **up** in the sky) Have someone come to the projector and *slide* the shape to the right or left, keeping the shape in the same upright position. Students record the new location (coordinate pair) in their Number Notepads. Look at the vertex and see how many spaces on the grid the triangle moved. If the vertex moved the same amount in the same direction it is called a translation or slide. Ask them about the movement. What remained the same? (Direction and shape of the figure) What changed? (Its location) You can remember that a tran**<u>sl</u>**ation is a **<u>sl</u>**ide because of the "**sl**."
2. Every student receives coordinate grid paper (Appendix A) or have students make a grid by labeling their graph paper. Students work in pairs. Use file folders to shield their mystery location.
3. Secretly they plot a new location for their shapes by placing them on the grid with the shapes touching at least two coordinate points. They record the coordinate points in their number notes. Their partner guesses ordered pairs until he or she finds the new location (like Battleship).
4. Remember, for it to be a translation, every vertex must move the same distance in the same direction. Once the two vertices of the shape have been identified the game is over and students pick a new location.

Explain More:



Brainstorm other games that use location as part of the strategy in student's *Number Notepads*. (Chess, checkers) Talk about these games, do the pieces slide to the new location? Tell students they may bring those games to school this week (Battleship, checkers, chess, Chinese checkers - any games in which movement is the strategy)

Turns=Rotations
-Day Two-

Materials: Letters of the alphabet, (and cardboard and push pins optional)

Vocabulary:
Transformation: A rule for moving every point in a plane figure to a new location.
Tran**sl**ation (**sl**ide): A transformation that slides a figure a given distance in a given direction.
Ro**t**ation (**t**urn): A transformation in which a figure is turned a given angle and direction around a point.
Re**fl**ection (**fl**ip): A transformation that which creates a mirror image of a figure on the opposite side of a line.

Think More:

Have a student demonstrate a slide (dance step – two to the left, two to the right). Now have them demonstrate a turn (like a ballerina). Ask how these two movements are similar. How are they different? Have a few more students give it a try at their seats.

Solve More:

Activity One: Turns on a Point

1. Illustrate the difference by showing on the projector a slide of the letter E and a turn of the letter E. Demonstrate how to keep one vertex from moving (by holding the bottom left corner with your finger or push pin). Rotations are when something turns. (Have you ever heard of a rotisserie oven?) In geometry, rotating means turning the figure around on a point. This point is called the **turn center** or point of rotation.
2. Demonstrate a skateboard move. Perform a half turn. Ask students what this is called in skateboard language (a "180"). Turn all the way around (a "360").
3. Have students draw a circle on their grid paper and divide it into 4 quadrants.
4. Have them draw a point in the center of their circles.
5. Have them put their letter in the circle with its bottom vertex on the point of rotation (turn center). (Figure A)
6. Have them hold this vertex with their fingers to keep the point from moving off its place on the grid.

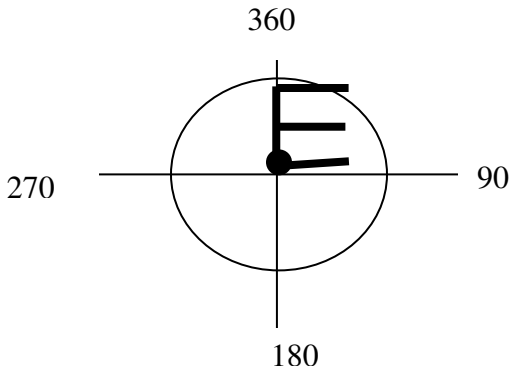


Figure A

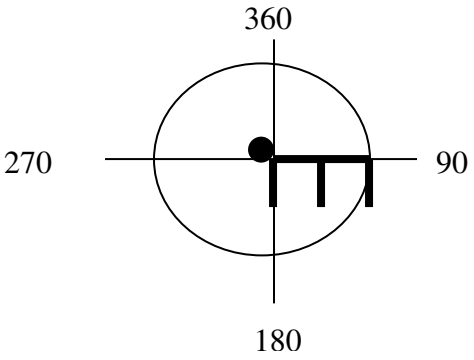


Figure B

7. Have children rotate (turn) their letter to the 90-degree mark (Figure B). The backside of the E will rest on the 90-degree line. Repeat this for other angles: 180, 270, 360. Repeat with other letters. This is describing the rotation using the angle that the figure is rotated around (or about) the point of rotation.
8. Have students experiment with these turns, holding up their results to show their understanding.

Explain More: Students reflect in their Number Notepads how we can change figures. Was today's lesson difficult or easy for you? Why?

Reflections: Flips
-Day Three-

Materials: Mirrors, shapes, letters of the alphabet, grid paper.

Vocabulary: Review the week's words.

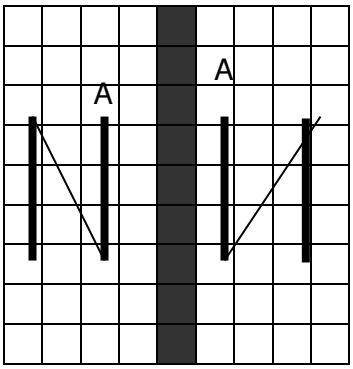
Think More:

Brainteaser: Look in a mirror. Put your right hand on your right ear. Now look at a friend. Each of you put your right hands on your right ears. Your friend's right will not be the same as your right if you are facing each other, but the mirror will have your reflection, showing a mirror image of your action on the same side. What you see in the mirror is the "reverse" image of what you are really doing. In geometry this is called a reflection. A **reflection** is a transformation in which a figure is flipped over a line. That's why it's also called a **flip**. Each point in a reflection's image is the same distance from the line as the corresponding point in the original figure.

Solve More:

Practice flips. Can anyone do a gymnastic flip? Do you end up looking the same way you started? What if you flip a coin? The coin flips over and now has a new look.

1. Cut your graphing paper into four equal parts. Fold each of the resulting pieces in half and draw a dark line on the fold. This will be your reflecting line (See diagram).
2. Give each table a letter of the alphabet (cut out of construction paper). Students should trace the letter on their construction paper and cut it out.
3. Have students lay their letter on the grid paper and trace it. Without moving line A (See diagram), teach students how to flip the letter over the reflection line.
4. Teacher demonstrates this on the projector with the letter "N." Draw each line with a different color. The line of the letter N that is closest to the dividing line will still be the closest line to the dividing line after a flip.
5. Have tables exchange their traced letters and complete a new flip on the remaining three grid squares.



Explain More:

Students are able to produce flips with letters and shapes. Performance rubric should be used.

Real World Flips
-Day Four-

Materials: Geoboards
Vocabulary: Review week's vocabulary.

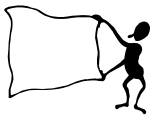
Think More: Brainteasers:

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: Geoboard slides, flips, and turns

1. Have students work in pairs with the geoboards.
2. Have the pair divide the geoboard in half with one long rubber band.
3. One student makes a shape with his or her rubber bands and the other student makes a flip, turn, or slide of it over the dividing line. (Remind students to make a point to help them make the turns.)
4. The student who made the original shape needs to identify which movement the second student used.
5. Activity continues by rotating which student makes the initial shape.

Explain More: Students are able to make and identify slides, flips, and turns in their Number Notebook.



Ship Shape
-Day 5-

Materials: Styrofoam trays, sails, toothpicks, clay, dishwashing detergent, rectangle pan (brownie pan), water, recording sheet, fan

Vocabulary: Review week's vocabulary.

Think More:

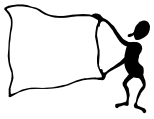
Brainteasers:
Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks, and puzzles. Students use their Number Notepads to work on problems. Using a "Think, 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:

Create ships and analyze their movements.

1. Cut out a triangle from the Styrofoam trays about 3" by 3" by 3" for the ship
2. Cut a small slit (triangle) on the back edge.
3. Cut out a sail (right triangle) from paper or plastic about 4" by 4" by 4".
4. Push the toothpick through the straight side of the sail.
5. Attach the sail to the ship by sticking the piece of clay into the center of the tray and standing the toothpick up in it.
6. Set in the pan of water.
7. Blow (or use a fan) and see it sail.

Explain More: Record how it moves in the Number Notebook. (ex. Ship starts out sliding smoothly, abruptly turns left, and then flips over and sinks)



Math Masterminds

Sail Boat Races – A Change of Plans

Students will enter their sailboats in a regatta. Student judges will record how long the boats slide (translate) through the water, if they make a turn (rotation and/or degrees) or if they flip (reflection) over.

Sailors will also compete in the drop off. Competition will commence when sailors take an eyedropper and put a drop of dishwashing liquid in the rudder slit at the back of their boat. The effect of the soap disrupting the surface tension of the water is a boat racing through the water.

Invite fans to your sail boat races. They will see beautiful boats making unbelievable turns across the water. On-lookers will witness boats sliding gracefully to the finish line. We hope none will flip over during the race. May the best sailor win!

Standards: Students recognize, understand and extend patterns.
Students utilize symbols and mathematical expressions to represent mathematical situations.

Objective: At week's end, students will be able to identify missing parts in patterns, describe, extend and create numerical and geometric patterns through models, and pose and solve problems by identifying a predictable visual or numerical pattern.

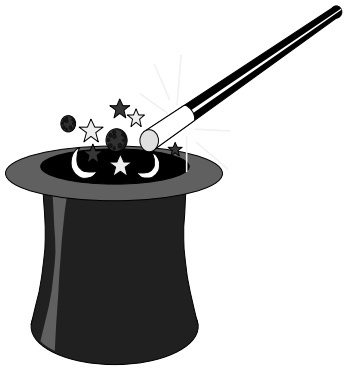
Literature Connections: My Name is Alice by Jane Bayer

Materials: Parent Letter: Magic props and outfits

Teacher Resources: Imagine Schools Curriculum Guide

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:
"Magic Tricks"

Calculator Changes
-Day One-

Materials: Calculators

Vocabulary:
Pattern: Something that changes in a regular way.
Series: A group with an order of arrangement.
Function: Pairs of numbers that follow a rule.
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.
Operations: Addition, subtraction, multiplication, and division are some of the mathematical operations.
Sum: The result when numbers are added.
Difference: The result when numbers are subtracted.
Product: The result when numbers are multiplied.
Quotient: The result when numbers are divided.
Variable: A quantity that can have different values. A symbol stands for a variable.
Expression: A variable or combination of variables, numbers, and symbols that represents a mathematical relationship.

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 notes 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: Calculator Changes

1. Pass out calculators.
2. Students will discover number patterns by using the calculators. Instruct students how to open and clear their calculator to get ready.
3. Identify the placement of the number keys and locate the operations (+, -, /, and x).
4. Tell students to *Press 1 + 1 =* and ask what they think the pattern might be.
5. Tell them to *Press the =* key once more. What happened? Students should respond that the sum is now 3.
6. Ask students to identify the pattern. (+1)
7. Have students press the equal sign several more times.
8. Repeat this process using different patterns, such as +5, +10, -2 (begin with a large number that is a multiple of 3, etc.).

Activity Two: Calculator Race

1. Have students start by pressing 1+1, then say, "On your Mark, Get Set, GO."
2. Students press the = sign for one minute. Who reached the highest number?
3. Optional: Do three trials. Record them on the board. Calculate the range, mean, median, and mode.

Solve More:

Activity Three: Mystery Number – Hey, Isn't this Algebra?

1. Enter a mystery number (remember it, you have to use it again).
2. Add 10 (press = after each operation)
3. Multiply by 2
4. Subtract 6
5. Divide by 2
6. Subtract the mystery number
7. Press =
8. What is your answer? (7)

Activity Four: Changes Years

1. Enter your age
2. Multiply by 3 (press = after each operation)
3. Add 12
4. Divide by 3
5. Add 93
6. Subtract 100
7. Add 3
8. Press =
9. Is this your age?

Activity Five: Birthday Guesses

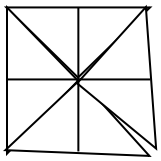
1. Enter the month of your birthday.
2. Multiply by 2
3. Add 6
4. Multiply by 50
5. Add the day of your birth.
6. Subtract 365
7. Add 65
8. When is your birthday?

Activity Six: What is a Variable?

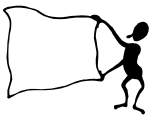
1. Students work in pairs. One student writes expressions in his/her Number Notepad and the other student works out the problem on the calculator. Partners try to arrive at the same answer using these two different modes (calculator versus paper and pencil). Partners change jobs after each puzzle.
2. Student A, who is using the calculator, types in a mystery number. Student B, who is using paper and pencil, writes down X in his or her Number Notepad, since the value of the number has been kept a mystery.
3. Both students multiply their number (or variable) by 2. Student B writes the expression 2x.
4. Both students add 8. Student B writes the expression 2x + 8.
5. Now both students divide by 2. Student B writes the expression 2X + 8 ÷ 2.
6. Teacher may need to show students how to reduce this expression to X + 4
7. Both students subtract the original number. Student recorder writes the expression X + 4 – X
8. What is the answer? (4) Student A and B compare their answers. Did they come up with the same answer? They should have!
9. Students can make up some more problems to work out with their partners.

Activity Seven: Function Puzzle

1. Students create a function puzzle, by folding a piece of paper into a Chinese fortuneteller puzzle. Each puzzle will have its own number and the number on the flaps will be added only to that number. When the student opens the flap the sum is written underneath. (See diagram)



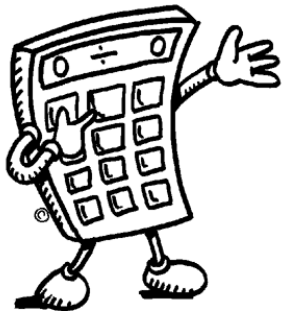
Explain More: Read poem: “Pocket Calculator”
Have students talk about how mystery numbers are easier to understand when using the calculator…or are they?



Complete an observational checklist on who is able to follow the directions and who is having trouble sequencing and following along.

Pocket Calculator

By Bobbi Katz



Add them up!

Subtract!

Divide!

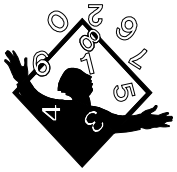
Your magic brain is tucked inside
A teeny, weeny, boxy space
With numbers written on your face.
My brain is so much bigger, yet
It fumbles answers you can get,
And you must think it's very slow
At finding out stuff that you know.
(But when it's time to read a poem
Or dash into the ocean's foam
I calculate I'll leave you home!)

Balancing Act
-Day Two-

Materials: Balance scales, objects (blocks, pennies, hard candies, etc.)

Vocabulary: Review Monday's vocabulary.

Think More:



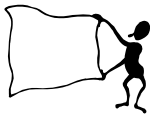
Brainteasers
Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks, and puzzles. Students use their Number Notepads to work on problems. Using a "Think, 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: Balancing Act

1. Tell students that they are going to balance equations.
2. Pass out one balance scale to each table and a box of identical items (one table has blocks or connecting cubes, another table has buttons, another table has paperclips, etc.).
3. Tell students that an equation must be balanced. There must be the same amount on each side of the equal sign.
4. Write an example on the board: $3 + X = 3 + 5$
5. Ask the student what X must equal. (5)
6. Illustrate this with the balance scale. Put 3 items in the left tub and 3 + 5 items in the right tub. Record a picture in Number Notepads. Then add 5 more to the left tub and see what happens.
7. Have students complete a few more with you and then some on their own to share with the class.
8. Now do some inequalities. $5 \neq 7$
9. Illustrate this with the balance scale. Have students create an equation that would be true for these numbers ($5<7$ or $7>5$)
10. Complete a few more of these.
11. Now complete some problems with unknowns. $10 = 4 + y$ (Tell students that the unknown can be a symbol or any letter. Let them pick some interesting ones as they record this in their Number Notepad.
12. Now have students create story problems for their equations. Tell them to turn their models into something else (video games, food, people).
13. In their Number Notepads, students write equations such as:
    Susan has 5 candy bars in all. Three of the bars are Milky Ways. How many are Snickers? Illustrate 5 items in one tub on the scale and three in the other. How many will make the equation equal? (2).

Explain More: Have students share their story problems. Have them explain how they used the balance scale to prove the equation.



Review vocabulary. Play Hangman. Record which students are remembering key terms. Provide vocabulary cards for home practice and review to those who are struggling.

Table Settings
-Day Three-

Materials: projector, Set the Table document to project on board

Vocabulary: Table: A way to organize data using rows and columns
Variable: A quantity that can change.
Constant: A quantity that stays the same.

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 notes 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: Define the Terms

1. Write on the board: Number of cents in a dime.
2. Number of days in a week.
3. Number of quarts in a gallon.
4. Ask students to think about these items and draw some conclusions about them. Lead them to think: *These things do not change. They stay constant.*
5. Now write on the board: Number of cents in your pocket.
6. Number of minutes you sleep.
7. Amount of water you drink in a day.
8. Discuss these items. Help students to draw the conclusion that these things can change.
9. In math we call the quantities that can change variables.
10. Today we are going to use tables to figure out the values of the variables.

Activity Two: Set the Table

1. Making a table can help you solve problems. For example: Susy is 8 years old. Her brother is 2. How old will he be when she is 16 years old?
2. Walk students through these steps:
3. Step 1: What do you know? Susy is 8. Her brother is 2.
4. Step 2: What do you need to find out? Susy's brother's age when she is 16.
5. Step 3: Make a plan. When something is happening over time, a table is a good way to plan.
6. Step 4: Create a table. Have students create a table in their Number Notepad. Ask: "How many pieces do we know in this story? (2) So make two rows, one for Susy and one for her brother.

Susy	8
Brother	2

7. What do we want to find out? (How old the brother will be when she is 16. Ask children, “About whom do we know one more thing? (Susy) What do we know? (That she will be 16.) So what can we do with that information? Let students brainstorm with their peers and jot down their ideas in their Number Notepads.
8. Let students share ideas with the class. See how many are on a similar path. Most should have figured out that if a year goes by for Susy, a year goes by for her brother. So as her table year goes up to 16, her brother’s years will go up too.

Susy	8	9	10	11	12	13	14	15	16
Brother	2	3	4	5	6	7	8	9	10

9. Repeat this strategy with “Set the Table” problems (put them on the overhead). Students create tables in their Number Notepads.

Explain More: Can children point out when using a table will help them solve problems? For those who are struggling, at what step in the problem do they start to become confused? Make some anecdotal reports on students who cannot do this independently.

A Set of Organizing Tables

Problem Solving Strategy: Making a Table

1. A snake is at the bottom of a 10-foot hill. He slithers up the hill 4 ½ feel a day. At night when he rests, he slides down 2 ½ feet. How long does it take the worm to crawl up the hill?

Number of Days	1	2	3	4	5	6
Number of Feet						

2. A turtle attempts to climb up a wall 10 feet high. Each day the turtle climbs 5 feet, but each night it slips backwards 4 feet. How many days will it take the turtle to get to the top of the wall?

Number of Days	1	2	3	4	5	6
Number of Feet						

3. Clara is having a party. The first time the doorbell rings, 1 person comes in. Every time after that, a group enters with 2 or more persons than the group that entered on the previous ring. How many people will enter on the sixth ring?

Number of Rings	1	2	3	4	5	6
Number of Persons						

Mathemagic

-Day Four-

Materials: Magic props (black hat, wands, black capes, juggling balls)

Vocabulary: Review the week's vocabulary.

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 notes 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:

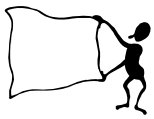
1. Let students pick what act they would like to perform:
   - Balancing Equations=Juggling Balls

   Students will decorate balls with representations of one number. For example, if they pick 6, they could write each of these expressions on the balls they will juggle: 2 + 4, 2 x 3, 12 ÷ 2, 5 + 1 (and so on). They juggle these expressions at the magic show.
   - Discovering the Variable = Black Hat

   Students create mystery numbers and put them in their magic hats. Students make up an act for the audience, in which they challenge the audience to guess the mystery number from his/ her clues. I
   - Calculator Capers = Magic Wand

2. Students plan their performances by deciding how to present the math concept with the magic display, what props they will need, and what displays they will make.
3. Students practice their tricks and share with an audience.

Explain More: Students share how algebra is like magic. Are they able to remember the math concepts by relating them to magic tricks?



Math Masterminds! Students perform a magic show for invited guests (including families, younger students and staff). Each cooperative group shares a skill through an act (see 1-3 above). They can be creative in how they perform a trick to show a mathematics concept.

Students can also use the Math Mazes in the back of this packet. There are riddles, toothpick teasers and puzzles.

Magic Acts

-Day Five-

Materials: Magic Props (Black Hat, Wands, Black Capes, Juggling Balls)

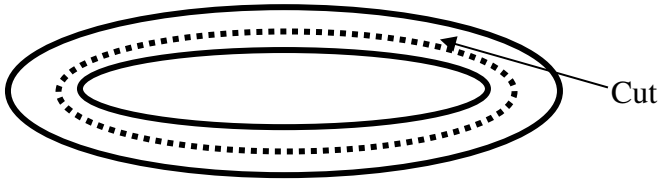
Vocabulary: Review the week's vocabulary.

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 notes 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: Making a Magical Strip

1. Teachers model this activity.
2. Cut off a 2" strip from an 11" by 18" sheet of paper.
3. With a pencil, put an A at the left end of the strip, and a B at the right end. Now, turn the strip over, keeping the B on your right. Bring the two ends together.
4. Next, twist the B end and place the B on top of the A. Tape the ends together with transparent tape.
5. Put tape on both sides.
6. Now you have a loop with a half twist in it.
7. When performing this act, say to the students, "The loop looks as if it has two sides, doesn't it?"
8. Have students color start coloring their loops. They will discover that there is only one side. It's magic! This kind of twisted loop is called Mobius strip, after the man who invented it.
9. Tell students that they can perform magic with this strip with this next act.
10. First they must predict what will happen when they cut the Mobius strip straight down the middle.
11. After students finish cutting the strip, they will see that they still have only one loop – but twice as long as the one they started with.



12. Recite this poem:

A mathematician confided
That a Mobius strip is one-sided.
And you'll get quite a laugh
If you cut one in half
For it stays in one piece when divided.

Activity Two: Telling a Number Fortune

1. Long ago, people believed there was a kind of magic in numbers. They though that numbers cold tell about the future and about many other things. So they worked out what they thought were magic ways to use numbers to tell them things.
2. Ask your students if they would like to know their "magic number" and what it will tell them about themselves?
3. Give a number to each letter of the alphabet.

A-1	E-5	I-9	M-4	Q-8	U-3	Y-7
B-2	F-6	J-1	N-5	R-9	V-4	Z-8
C-3	G-7	K-2	0-6	S-1	W-5	
D-4	H-8	L-3	P-7	T-2	X-6	

4. Print your whole name. Beneath each letter, put the number for that letter, like this:
5. HEATHER VOGEN
6. 8512859 + 46755
7. 38 + 27 = 65

8. Add up the numbers and you will get an answer with two numbers, such as 65. Add the two numerals together (11). That is your "magic number." If you get a number that's higher than nine, you must then add the two numerals (1 + 1 = 2). Heather's magic number is 2.
9. Be the fortuneteller at the Magic Show if you want to give everyone a magic number.

Activity Three:

1. Students continue to work on their magic acts.
2. Students may practice them for peer review before performing them for the audience.
3. Peers should evaluate whether the mathematical concept was shared through the magic act.

Explain More: Students share how algebra is like magic. Are they able to remember the math concepts by relating them to magic tricks?

Math Masterminds! Students perform a magic show for invited guests. Each cooperative group shares a skill through an act. They can be creative in how they perform a trick to show a mathematics concept.

Students can also use the Math Mazes in the back of this packet for an act in the show. There are riddles, toothpick teasers, and puzzles. Stories, jokes and poems about mathematics also could be part of the show. Card tricks and rope tricks could also be shared.

Third Grade
Number Sense Unit

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
Gator Pie by Louise Mathews

Materials: Parent Letter: 6 class sets of different colored paper plates

Teacher Resources: Imagine Schools Curriculum Guide

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 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:
"Denominator Delights"

"A Fraction of Our Lives"
-Day One-

Materials: Number Notepads

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

Think More:

Brain Teaser:
Pick a "Number Sense" brainteaser in the Math Mazes section of this packet 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: "A Fractions of Our Lives"

1. Do a K-W-L on the board to review what students know and understand about fractions.
2. Why would you need to use fractions?
   - To name a part of a whole thing or to name a part of a collection.
3. How do we write fractions?
   - Numerator ← parts you are talking about **3/4**
     Denominator ← parts in the whole or set
4. How do we read fractions?
   - Reading a fraction is different from reading a whole number. The numerator is easy, just say the number. To read the denominator, use ordinal numbers (e.g. thirds, fourths, fifths). We write ¾, we say three fourths.
5. Where do we see fractions?
   - On measuring tools: ruler, number line, cooking tools

Activity Two:

1. Divide the class into equal groups, giving instructions according to the number of students in each group. For example, if there are six students in each group, give commands such as these: Talk about the numerator and denominator.
   - 1/6 of you stand
   - 2/6 of you take a step back
   - 5/6 of you turn around.
2. Talk about the numerator and denominator. Which one did you pay attention to for this activity? Why does the denominator stay the same? How could we change it? (By changing the number of students in a group)
3. Do a few more activities with different numbers of children to illustrate the changing denominator.

Explain More:

Can students identify the denominator and numerator? What is their level of background information?

"Fraction Serving Plates"
-Day Two-

Materials: Paper Plates (6 class sets of different colors) or construction paper circles (4" diameter) of 6 different colors, spinner, brad, deck of cards

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

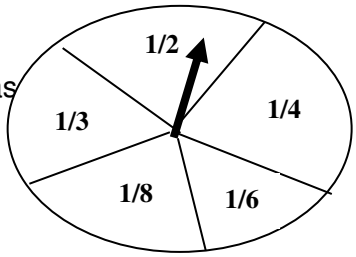
Think More:

Brain Teasers:
Pick a "Number Sense" brainteaser in the Math Mazes section of this packet or pick a brainteaser of your own.

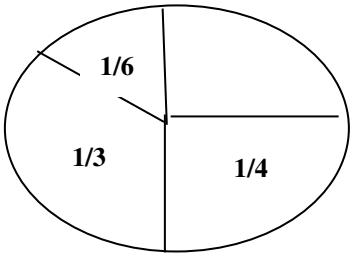
Solve More:

Activity One: Understanding equivalent fractions

1. Students will mark (by drawing lines) each color of paper plate with a different fraction value.
   a. Red = 1 whole, blue = ½, yellow = 1/3, green = ¼, orange = 1/6, pink = 1/8
   b. Cut the fraction plates on the lines.
   c. Review how many 1/2s make a whole, how many 1/3 make a whole, and the meaning of the denominator.
2. Play "Piecing Together a Whole".
   a. Make a spinner with fraction values.
   b. Students will use their red (or whole) plate as their individual game board and, with each spin of the spinner, they may choose whether or not they wish to lay the corresponding fractional part on top of the red plate.



   c. The object is to put together enough fractional pieces to equal exactly one whole.
   d. See example: this player needs ¼ to complete the whole.



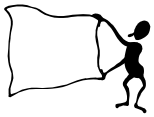
Activity Two: Fraction Rummy (deck of cards)

1. Deal seven cards to each player.
2. The remaining cards are placed in a pile face down, and the top card is turned over and placed next to the pile.
3. The players then check their cards and if they have any matching fraction pairs, they lay them on the table.
4. The game proceeds with the next player picking up either the turned-over card or the top one from the pile.
5. If she/he obtains a matching card, she/he may lay the pair on the table, but whether she/he does or not she/he must discard one card and place it face up beside the pile.
6. Play continues in this manner until one player is rid of all her cards.
7. The player with the most matching pairs is the winner.

Activity Three: Fraction War (deck of cards)

1. The cards are mixed and seven are dealt face down to each of the players (from two to six players) who put them in a pile without looking at them.
2. The extra cards are set aside in a pile to be used later.
3. At a signal every player turns over her /his top card and the player with the largest or smallest (determine this before game begins) fraction takes all of the turned-up cards.
4. In the case of a tie, those players draw from the extra card pile, and the one obtaining the largest fractional amount gets the cards.
5. The winner is the player who is able to take the greatest number of cards in a specified time.

Explain More: Have students discuss how the visual representations helped them understand equivalent fractions. Evaluate the effectiveness of the card games.



"One is Not the Loneliest Number"
-Day Three-

Materials: Number notepads, 5' by 7' index cards, Popsicle sticks, fraction pieces from day two's activity.

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

Think More:

Brain Teaser:
Pick a "Number Sense" brainteaser in the Math Mazes section of this packet or pick a brainteaser of your own.

Solve More:

Activity One: Common Denominators

1. Create #1 fraction puppets by tracing a number one (from the die machine) onto the index cards. Inside the number one, write one of the fractions that equal one: 2/2, 3/3, 4/4, 5/5, 6/6, and 7/7. Cut out the index card # 1 and glue it on to a Popsicle stick. Pass out one to each table.
2. Review multiplication tables.
3. Play the "Table Equivalent" game. Students connect dots with a line for each correct answer. The object of the game is to make 4 segments that create a box. When a box is created, the table may place its table number inside the box. The table with the most boxes is the winner.
   a. Create the grid on the board for the dot-to-dot game. (Five dots down, five dots across – the more dots the longer the game)
   b. Write fraction equivalents on the board such as: 1/2 x ? = 4/8, 3/4 x ? = 18/24, 2/5 x ? = 10/25, 2/3 x ? = 6/9, 1/5 x ? = 7/35, 1/3 x ? = 2/6
   c. Each table will determine which number sentence would be correct with their # 1 fraction puppet filling in the '?'.
   d. A spokesperson from each table will take turns making his or her guess. If he or she is correct, he or she may go to the board and draw a line connecting the two dots.
   e. Play continues to new tables.
   f. More equations will be put on the board and play returns to the beginning table. A new spokesperson for the table is elected and play continues.
   g. The winning table is the table with the most boxes.

Activity Two: Adding and Subtracting Fractions

1. Tell students that the reason for changing the denominators is so that you can add and subtract the fractions. Discuss when you might have to do that?
2. Put on the board 1/3 + 1/2 = ?. Ask students to draw both of these fractions using circles (1/2 they will know how to draw, 1/3 is made by making the peace sign). Ask students how they would add these fractions?
3. Tell them to use what they have learned in Activity One to change the denominators. (1/3 now will be 2/6 and 1/2 will be 3/6) Ask them if they can add 2/6 + 3/6. Have students illustrate both of these fractions with circles. Now ask them how many sixths they have (5). The denominator stays the same because it is identifying the size of the piece. The numerator tells you how many you have of that size.
4. Repeat the process with more examples for addition and subtraction.

Explain More:

Do students know their multiplication tables? Can they find the common denominator with mental math? Did any use the guess and check strategy? Were they able to apply the knowledge of common denominators to adding and subtracting fractions?

Daily Delights
-Day Four-

Materials: Counters or small candies, grids, # 1 fraction cards, deck of number cards, dry erase boards

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

Think More:

Brain Teaser:
Pick a "Number Sense" brainteaser in the Math Mazes section of this packet or pick a brainteaser of your own.

Solve More:

Activity One:

1. Pair up two students. They will need a dry erase board (or number notepads) to record their answer and a sheet of grid paper.
2. Students make a fraction bar (horizontal line on their boards.
2. Students pick two cards from the number cards. The number on one card will be the denominator; the other number will be the numerator for their fraction.
3. Each student will make sets of his/her denominator on the grid paper.
4. The object of the activity is to get a common denominator for the two fractions.
5. Using small candies or small counters, students will create a visual representation of the denominator of both fractions.
6. Student A will add sets of his/ her number until he/she reaching a "common" number with Student B (Who is doing the same thing with his/her denominator.)

Example:

$\frac{1}{2}$ + $\frac{1}{3}$ =

*	X	X		
*	X	X		

Figure A

*	X	
*	X	
*	X	

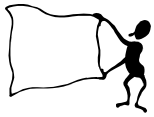
Figure B

7. Both grids now have 6. Ask students to analyze how they discovered 6 for the first faction? Pull out the #1 puppets from this unit.
8. Students should be able to find the fraction of one they need (Remind them that it is not the same #1 puppet for both fractions.

A. 1/2. X ? = 6 and B. 1/3 X ? = 6
A = 3/3 B = 2./2
3/6 + 2/6 = 5/6

9. The team that figures out the most equation gets a prize.

Explain More: Can students create the concepts from this hands-on activity?



"Keep It Simple!"
-Day 5-

Materials: Small candies, number one fraction cards, deck of cards, grid paper, index cards

Vocabulary:
Fraction: A way to describe a part of a whole or a group.
Numerator: In the fraction, the number of equal parts talked about. The top number in a fraction.
Denominator: In a fraction, the number of equal parts or groups. The bottom number in a fraction.
Simplest Form: A fraction whose numerator and denominator have no common factor greater than 1.

Think More:

Brain Teaser:
Pick a "Number Sense" brainteaser in the Math Mazes section of this packet or pick a brainteaser of your own.

Solve More:

Activity One: " Keep It Simple!"

1. Students will be using division to reduce fractions.
2. List on the board many fractions, some which are already in simplest form and some that are not.
3. Have students write 'yes' on one side of their index card and 'no' on the other side.
4. Point to a fraction on the board and ask students to hold up the index card that indicates whether they feel this fraction is in simplest terms. They must think of their multiplication tables and decide if they are able to divide anything into the numerator and denominator to reduce it.

Example: 12/18 = NO, 1/3 = YES, 11/13 = YES, 9/15 = NO

5. Bring out the #1 puppets. Remind students that whenever you are finding common denominators or reducing fractions you have to be working with the number one. Ask students why this is? (Because when you multiply or divide by one the answer is the same number.)
6. Students must find the factors of the denominator and numerator in order to find the right #1 puppet to use in their converting.

Example: 12/ 18 Factors for 12: 2, 3, 4, **6.** Factors for 18: 2, 3, **6**, 9 (A venn diagram of common factors would be a good activity here.)

7. Six is the greatest common factor and can be used as the # 1 puppet.
8. Ask students what operation should be used if they are trying to 'reduce' a fraction. What does 'reduce' mean? (Lead them to the conclusion that to make things smaller division or subtraction is used, to make things larger multiplication and addition is used.
9. $12/18 \div 6/6 = 2/3$
10. Repeat steps with more problems. Hint: the fraction in simplest form has the fewest possible pieces.

Explain More: Were students able to list factors? Could they manage these multistep problems?

Denominator Delights
-Culminating Activity-

Materials: Cake ingredients for cupcakes, cupcake liners, bowls and spoons, frosting, plastic knives

Vocabulary: Review the week's vocabulary.

Think More:

Brain Teaser:
Pick a "Number Sense" brainteaser in the Math Mazes section of this packet or pick a brainteaser of your own.

Solve More:

Activity One:

1. Assign jobs for baking the cake to each table. (Table 1 – measures, Table 2 – pours, Table 3 – mixes, Table 4 – bakes, Table 5 – cleans)
2. Have a central area for cooking. Students come up to this area when it is their job.
3. After baking is complete, pass out the cupcakes to each student.
4. Students need to horizontally cut the cupcake in half and apply frosting between the two layers.
5. They may also frost the top. (Have frosting on the tables for groups to share.)

Activity Two:

1. Students will work with fractions by cutting this cake into parts.
2. As they slice the cake, they need to record the fraction they have made in their Number Notes or a new booklet made just for this lesson (cake shape book).
3. Students should work slowly starting with ½ and working their way to higher numbers. (Teacher should decide what is required.) Students will discover that the higher the number in the denominator, the smaller the piece will be. Discuss this observation. After they have cut their cakes and recorded the sizes, they may eat pieces and discuss the fraction they are eating.
4. May want to use the book, Eating Fractions as an illustration.

Explain More: Can students identify fractions in real world situations?

Math Masterminds! Invite classes and the administration to your 'Denominator Delights" party. Create menus that only serve food in fractional amounts. Charge customers using fractions (e.g., ½ of a dime = a nickel)

Third Grade
Game Week

Objective: At week's end, students will be able to play cooperatively with their classmates and gain mastery on basic skills and operations.

Teacher Resources: Core Math Program Games or Manipulatives

Materials: Parent Letter: Chess, Checkers, Chinese checkers, Battleship, Monopoly, and Life

Background:
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 a gracious winner and loser, 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 where students take turns to make it around the board and some are card games where 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, and 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 and board 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 not 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.

"Let's Play It Again!"

Fourth Grade
The System of Mathematics

Encore Math Fourth Grade Materials and Resources

Non-consumables

Imagine Schools Curriculum Guide
Document Camera or projector
Core Math Program Manipulatives:

Class set of calculators, Basic Operations Flash Cards, Deck of Cards, Money (coins and bills), Clocks, Class pack of Tangrams, Geoboards, Balance Scale, Spinners, Dice, Dry erase boards, Fraction Cards, Rulers, Pattern blocks

Games

Chess, Battleship, Dominoes, Checkers, Chinese checkers, Monopoly, Life, Bingo, Tic, Tac, Toe, "I Have, Who Has" card game

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:

Cardboard, red hots (or other little round candies), rubber bands. thin string licorice, dot stickers, pretzels, Coordinate grid (paper), polygons shapes, and colored pencils

Unit 2 Algebra:

Cowboy outfits or other western gear, markers, balloons or counters, construction paper, paper bag of books, 2 boxes of paperclips

Unit 3 Number Sense:

Party food, half gallon milk containers, centimeter graphing paper, cut out shapes to use with the projector or document camera

Fourth Grade Booklist

Fourth Grade Week 1

The Shopping Basket by J. Burningham

A Pet for Mrs. Arbuckle by G. Smyth

All in a Day by M. Anno

Round Trip by A. Jonas

The Case of the Stolen Case Book by Barabara Rinkoff

Fourth Grade Week 2

Addition Annie by David Gisler

Sea Witches by Joanne Robertson and Laszlo Gal

Fourth Grade Week 3

Eating Fractions by Bruce McMillan

Gator Pie: by Louise Mathews

Fourth Grade
Geometry Unit
A System of Points

Standards: Know how to identify and plot ordered pairs and use coordinate systems to describe paths/movement/change.

Objective: At week's end, students will be able to correctly create representations on a coordinate grid.

Literature Connections:
The Shopping Basket by J. Burningham
A Pet for Mrs. Arbuckle by G. Smyth
All in a Day by M. Anno
Round Trip by A. Jonas
The Case of the Stolen Case Book by Barabara Rinkoff

Materials: Parent Letter: cardboard, red hots (or other little round candies), rubber bands. Licorice, dot stickers, pretzels

Teacher Resources: Imagine Schools Curriculum Guide

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 System of Points"

Coordinate Plane and Ordered Pairs
-Days One-

Materials: Cardboard, rulers, and red hot candies

Vocabulary:
Coordinate Grid: A 2-dimensional system in which a location is described by its distances from two intersecting usually perpendicular straight lines called axes.
Coordinates: An ordered pair of numbers that give the location of a point in a coordinate grid.
Plane: A flat surface that extends in any direction
Axis: A reference line from which distances or angles are measured on a coordinate grid.
Axes: Plural of axis.
X-axis: On a coordinate grid, the horizontal axis.
Y-axis: On a coordinate grid, the vertical axis.
Origin: The intersection of the X- and Y-axes in a coordinate plane. It is described by the ordered pair (0,0).
Ordered Pairs: A pair of numbers that gives the coordinates of a point on a grid in this order: (horizontal coordinate, vertical coordinate).

Think More: Brainteasers

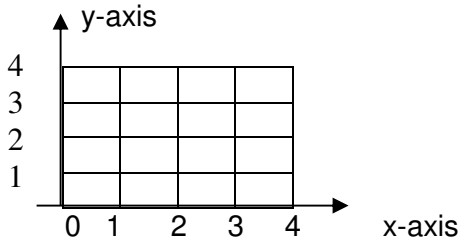
Select from the Math Mazes in the back of this packet. Brainteasers are meant to spark creative thinking and problem solving. They are not meant to review math concepts. The packet contains riddles, tricks and puzzles. Students use their number notes to work on problems. Using a "Think, Pair, Share" 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:

A grid is very useful. In some cities, streets are laid out in a grid, making it is very easy to tell someone how to get from one place to another. A coordinate grid is a way to locate points in a plane. Today we are going to make our own coordinate grids. Pass out cardboard.

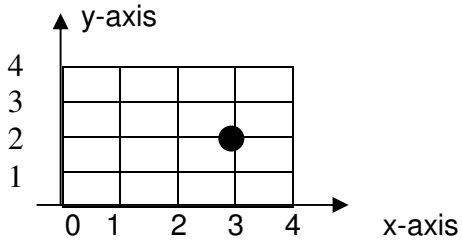
Activity One: Red Hot Grids

1. Pick an edge on your cardboard and lightly write, "top" on it.
2. Use your ruler to make a mark straight-line 2cm in from the left side. Do this again at the bottom and lightly mark it. Line up your ruler from the top mark to the bottom mark and draw your straight line.
3. Label this the y-axis at the top.
4. Repeat this process to make a horizontal line across the bottom of the cardboard 2cm from the bottom edge.
5. Label this the x-axis on the right side.
6. Put your ruler on the x-axis, starting at the origin. Mark every 4 cm lightly. Repeat these hash marks at the top of the cardboard. Connect the straight lines.
7. Put your ruler on the y-axis. Starting at the origin, mark every 4 cm lightly. Repeat the process on the right side of your cardboard. Connect the marks into nice straight-line segments.
8. You should have 5 horizontal line segments and 5 vertical line segments.
9. Now you need to label your coordinate plane. Find the origin and label it "0." Label the vertical line segments on the x-axis from one to four. Next, label the horizontal lines on the y-axis from one to four.
10. Complete your coordinate plane by placing arrowheads at the top of the y-axis and the right side of the x-axis.
11. Compare your coordinate plane with your neighbor's. Do they look the same?



Activity 2: Now that we have made coordinate planes, we can begin using ordered pairs. We can name any point on this plane with two numbers. These two numbers are called coordinates. The pair is always named in order (first x and then y), so it's called an ordered pair, not an unordered triplet.

1. Let's find the point (3,2). "Birds learn to walk **across** the land, before they fly **up** in the sky" will help you remember which way to go first. You travel across the x-axis (horizontally) to the 3rd unit, and then you travel up (vertically) 2 units on the y-axis. This is where you stop.
2. Place a red hot candy on the spot.

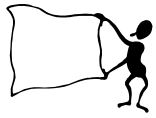


3. Pick up the candy and put a drop of glue on the bottom of it. Carefully return the candy marker over the point (3,2). Hold it down for the count of 10 and allow it to dry.
4. Mark the following ordered pairs by gluing down a candy red hot on each point.

(0,1)	(4,4)	(2,3)	(4,1)	(1,4)	(2,2)	(4,2)	(1,2)
(3,1)	(0,3)	(2,0)	(3,4)	(1,1)	(0,4)	(4,3)	(0,0)
(1,3)	(3,0)	(4,0)	(2,4)	(1,0)	(3,3)	(0,2)	(2,1)

5. Let this dry until tomorrow. Put your name on it and store it in a safe place.

Explain More: Ask students to write in their Number Notepads places where they have seen this system of finding a point? (Maps and graphs) Save this sweet coordinate grid to display during the culminating week.



From Points to Perimeters
-Day Two-

Materials: Rubber bands, red hot grids from Day One, thin string licorice, rulers

Vocabulary: Perimeter: The distance around a figure.
Polygon: A closed plane figure formed from line segments that meet only at their endpoints.

Think More:

Brain Teaser:
Pick a "Number Sense" brainteaser in the Math Mazes section of this packet or pick a brainteaser of your own.

Solve More:

Activity One: In this activity we will practice locating points and creating polygons.

1. Locate the following points on your red-hot plane. (1,3) (3,3) (2,1) (1,1).
2. Take a rubber band and carefully wrap it around the plotted points on your red-hot plane. What type of polygon did you make?
3. Take a piece of thin licorice and follow the path of the rubber bands. Snip off the end when it meets the beginning point.
4. Take the licorice string off the polygon and lay it on your ruler to measure the length. This is the perimeter of your polygon. The perimeter is the distance "around" a shape. How long was the perimeter? Check with your neighbor.
5. Repeat this process with a few more ordered pairs.
6. (2,3) (4,2) (3,0) (1,1) _____perimeter
7. (1,3) (2,3) (3,2) (2,1) (1,1) _____ perimeter
8. (1,3) (3,4) (4,3) (4,1) (2,0) (1,1) _____perimeter

Extension: Have students transfer their drawings and findings on to graphing paper.

Explain More: Have students write when perimeter is used in the real world in their Number Notes.

Polygon Patterns
-Day Three-

Materials: Coordinate grid, polygons shapes, Number Notepads, pretzels

Vocabulary: Review this week's vocabulary.

Think More:

Brain Teaser:
Pick a "Number Sense" brainteaser in the Math Mazes section of this packet or pick a brainteaser of your own.

Solve More:

Activity One: Salty Shapes

1. Students will try to predict the polygon formed when connecting the ordered pairs by discovering a pattern.
2. Give students grid paper. (They can use graphing paper.) Have them create a coordinate grid by drawing an x-axis from 0 to 16 (Count the lines) and a y-axis from 0-16. The point at 0 will be the same for both axes. (Review making a grid with the red hot boards if necessary.)
3. Write the set of ordered pairs on the board for polygon #1.

   Polygon #1: (2,2) (0,4) (2,6) (6,6) (8,4) 6,2)

4. Have students find a pattern while looking at the ordered pairs and try to discover which polygon will be created when these points are connected. Conduct a think, pair, share activity. Have students record their predictions in their Number Notepads.
5. Students will work as a cooperative group to locate and label the points for Polygon #1 on one of the group's coordinate grid by placing a dot at the points.
6. Next, groups will connect the dots with their pretzel sticks. If the sticks are too long nibble them down to size. Glue the pretzel onto the paper once it fits.
7. Have students compare their predictions to the actual polygon created. How did they do?
8. Continue making polygons with more sets of ordered pairs.

   Polygon #2: (8,7) (10,11) (6,11)
   Polygon #3: (8,1) (11,4) (15,4) (12,1)
   Polygon #4: (5,11) (1,11) (1, 9) (3,7) (6,9)
   Polygon #5: (11,11) (13,11) (15,9) (15,7) (13,5) (11,5) (10,7) (10, 9)

9. Students should look for patterns as they predict the polygons that will be created when these ordered pairs are connected.
10. Save the group's pretzel polygons for the culminating week's display.

Explain More: Can students use patterns to make educated predictions?

Grid Board

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

More Polygons
-Day Four-

Materials: Coordinate grid paper, pretzels or ruler and colored pencil

Vocabulary:
Heptagon: A seven-sided shape.
Nonagon: A nine-sided shape.
Decagon: A ten-sided shape.
Undecagon: An eleven-sided shape.
Dodecagon: A twelve-sided shape.

Think More:

Brain Teaser:
Pick a "Number Sense" brainteaser in the Math Mazes section of this packet or pick a brainteaser of your own.

Solve More:

Activity One:

1. Students will use the ordered pairs to locate each point on their coordinate plane paper.
2. Students will work in cooperative groups. One person in the group will be responsible for each shape. At the end of the assignment, each group should have created five polygons either with pretzels glued onto the coordinate grid or with colored lines.
3. Use pretzel sticks or a colored pencils and a ruler to make line segments that connect the points to form the sometimes forgotten polygons.

Polygon #1: (7,4) (6,5) (6,6) (7,7) (9,7) (10,5) (9,4)
Polygon #2: (7,3) (5,5) (5,6) (7,8) (9,9) (11,8) (11,6) (10,4) (8,3)
Polygon #3: (7,2) (4,5) (4,7) (5,9) (7,10) (9,10) (11,9) (12, 7) (11,4) (9,2)
Polygon #4: (7,1) (4,3) (3,4) (3,6) (4,9) (7,11) (9,11) (11,10) (13,8) (13,6) (10,2)
Polygon #5: (7,0) (4,1) (2,3) (1,5) (1,7) (2,9) (4,11) (6,12) (9,12) (12,11) (14,9) (14,4)

4. As students finish each polygon, have them draw a picture and write a definition of each shape (number of sides and angles) in their Number Notepads.

Explain More:

Have students used patterns to make predictions during this assignment. How well did groups work together?

Battleship Tournament
-Day Five-

Materials: Battleship game, geoboards, red hot grids from Monday, rubber bands, dot stickers

Vocabulary: Review the week's vocabulary.

Think More:

Brain Teaser:
Pick a "Number Sense" brainteaser in the Math Mazes section of this packet or pick a brainteaser of your own.

Solve More:

Activity One:

1. Teach students how to play battleship.
2. Group students in pairs. Some of the students will have the real Battleship Game and others will have the geoboard game and the red hot grids.
3. Have students with geoboards and red hot grids create a letter of the alphabet with ordered pairs (see examples below).
4. Students make the letter of the alphabet on their geoboards or red hot grid with rubber bands.
5. Students use grid paper to record their guesses toward discovering their opponent's letter.
6. If the student gets a 'hit', he/she records an x at that coordinate point on his/her record-keeping grid. If the student gets a 'miss', she/he puts a 0 at that location on his/her record-keeping sheet.
7. The winner discovers the identity of his/her opponent's letter.

Examples:

P= (1,0) (1,1) (1,2) (1,3) (1,4) (2,2) (3,2) (3,3) (3,4) (2,4)
A = (0,0) (1,2) (2,2) (2,4) (3,2) (0,4)
L = (1,0) (1,1) (1,2) 1,3) (1,4) (2,0) (3,0) (4,0)

Explain More:

Talk about this week's lesson. Had they had lessons on coordinate pairs before? What was different about this one? Did they find this lesson easier to understand than lessons in the past? Why or Why not? Write responses in number notes for reflection.

Rubric for this week's assessment: Students could locate points using ordered pairs correctly and could measure perimeter accurately.

Math Masterminds! Have students create art displays using coordinate plane activities (red hot grids and pretzel polygons). Invite guests to view their "System of Points."

Invite guests to a "Battleship Tournament" like a chess competition. Have students explain the system of ordered pairs used in the game.

Fourth Grade
Algebra Unit

Standards: Students use mathematical models to represent math relationships

Objective: At week's end, students will be able to use formulas to answer questions about quantities and their relationships and express real world mathematic relationships using physical models and equations.

Literature Connections: Addition Annie by David Gisler
Sea Witches by Joanne Robertson and Laszlo Gal

Materials: Parent Letter: Cowboy outfits

Teacher Resources: Imagine Schools Curriculum Guide

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:
"Rodeo"

"Express Yourself"
-Day One-

Materials: Projector, various props: paper bag of books, 2 boxes of paperclips

Vocabulary: Expression: A variable or combination of variables, numbers, and symbols that represents a mathematical relationship.
Variable: A quantity that can have different values. A symbol can stand for a variable.
Variable Expression: An expression that represents an amount that can have different values.

Think More: Brainteasers:

		6
9		

PROBLEM

In a magic square the digits 1-9 are arranged so that every row, column, and diagonal has the same sum. Fill in the magic square.

2	7	
	5	1
4	3	8

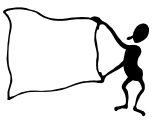
ANSWER KEY

Solve More:

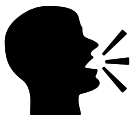
Activity One:

1. Tell students that an expression can name a number like 7 or is a variable like x or y. sometimes an expression shows an arithmetic operation, like 7x or 7+x. There are no equal signs in an expression. It is like a phrase.
2. Tell students that they are going to learn how to write expressions. Ask them to think of word expressions. *LOL = lots of laughs, XOXO = hugs and kisses, totally rad = very good, dis = insult, rag on = nagging.* These are phrases that "represent" a meaningful phrase. In math, expressions represent or show a relationship.
3. Demonstrate some story problems. Show a paper bag and three books. Tell students there are books in the bag. Ask them how many books you have. Ask them what they know (3 books). Write 3 on the board. Ask them what other information they know (a bag) since we don't have an amount. What can we put in place of an amount? (a variable, x). Ask them what operation would put these two together (addition). So the expression is 3+x.
4. Project the following page to give students other examples of how to use a variable in the place of a missing number.
5. Let students work in pairs on "More Expressions" (See following pages). First they determine the unknown and assign a variable (letter) for it. Then they decide what the relationship is between the unknown and the number that is known. They complete an expression for that relationship.

Explain More: Ask students if they better understand algebraic expressions. Ask them to share any new insight or added confusion they may have had during today's lesson.



"Express Yourself"



Problem	Word Expression	Algebraic Expression
Show a full box of paper clips and add 3 to the box.	(Full Box) + 3	(y) + 3
Show a box of paper clips and withdraw 4.	(Full Box) - 4	(y) - 4
Show two full boxes of paper clips.	(Full Box) x 2	2(y) When your expression has a variable, leave out the multiplication sign (x).
Show a full box of paperclips "shared equally" between two people.	(Full box) ÷ 2	(y) ÷ 2

More Expressions

Students can work in pairs on these problems, writing their expressions in their Number Notepads.

Write an expression for each person's age in years. Let K be Karen.

1. Tessa is 10 years older than Karen. (K + 10 = Tessa)
2. Alex is 3 years younger than Karen. (K - 3 = Alex)
3. Alan is 2 times older than Karen. (2K = Alan)

Extra Credit: Who is the oldest?

Write an expression for the amount of money each student has in his or her pocket. Let J = Joelle.

1. Vickie has $2.00 more than Joelle. (J + $2.00 = Vickie)
2. Fernie has $10.00 less than Joelle. (J - $10.00 = Fernie)
3. Emilio has half as much money as Joelle. (J ÷ 2 = Emilio)

Extra Credit: Who has the most money?

Write an expression for the number of people in the movie theater.
Let W = women

1. There are twice as many men as women. (2W = men)
2. There are a third as many children as women (W ÷ 3 = children)
3. There are 25 more teenagers than women. (25 + W = teenagers)

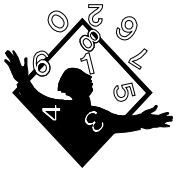
Extra Credit: What movie is it?

"A System for Guessing"
-Day Two-

Materials: Number notepads, dry erase board, markers

Vocabulary: Review this week's vocabulary.

Think More: Brainteasers



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Solve More: Activity One:

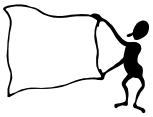
1. Play the game "I'm thinking of two numbers."
2. Have students work in pairs. Tell them to think of a problem that begins with "I am thinking of two numbers that _____." (For example: sum is 12) They must then think of two clues for their numbers. (For example: One is two digits and even.
3. Teach students the Guess and Check Strategy. Guess and Check is used when more than one condition needs to be met to find the answer.

Problem Solving Steps
<u>Understand</u>: Understand the conditions to be met.
Sum is 12, one number is 2 digits and even
<u>Plan</u>: Guess an answer that meets one condition
11 is two digits
<u>Try It</u>: Check to see if it meets the other condition.
11 is not even
<u>Look Back</u>: If it doesn't work, use what you know from your first guess to make another guess.
10 is two digits and even
<u>Solve:</u>

If 10 + x = 12, then x = 2
Answer 10, 2

4. Students copy these strategies in their Number Notepads.
5. Show the following numbers on the board: 2,5,6,7,9
6. Ask which 3 numbers have a sum that is odd and greater than 20.
7. (Answer: 9+5+7 =21) Ask how they solved this? Did they get it on their first guess? How did they change their answer after their initial guess?
8. Using the same 5 numbers, ask which 3 numbers have a sum that is an even number greater than 20?
   (9+7+6 = 22)

Explain More: Ask students why it makes sense to start by finding the sum in the last problem. Ask students to think of other problem solving strategies they have learned this year. Which technique do they use the most? The least? Why?

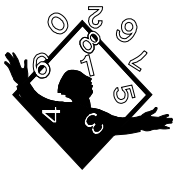


"A System of Colors"
-Day Three-

Materials: Balloons or counters, A System of Colors Worksheet

Vocabulary: Review this week's vocabulary.

Think More: Brainteasers



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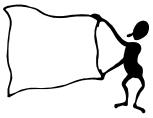
Solve More: Activity One

1. Students will use balloons or counters to assist them in interpreting clues about the number of different colored balloons in a party arrangement. Each problem will contain a variable and a clue. The clues will change from one problem to the next.
2. Teach students how to use a table to figure out the problems.
3. Example: *If you have 14 balloons in all, 1 more red balloon than yellow balloons, and 4 more white balloons than yellow balloons, then how many of each color do your have?*
4. Students may use Guess and Check for the yellow balloons to get started: If their guess is too high, they lower the amount for the yellow balloon in their next try. If their guess is too low, they raise the amount for the yellow balloons until they find the answer.

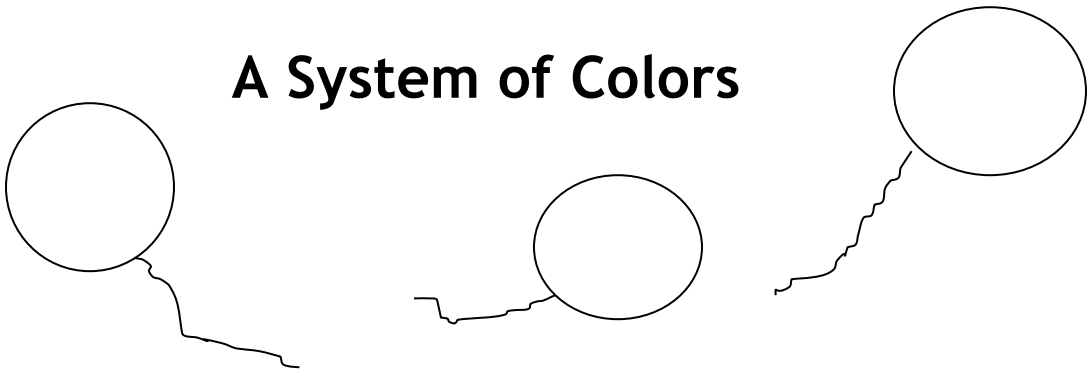
# of Yellow Balloons	# of Red Balloons	# of White Balloons	Total Balloons
6	7	10	23 (too high)
2	3	6	11 (too low)
3	4	7	14 (right)

5. See "A System of Colors" Activity.

Explain More: Express your favorite part of this activity. Express your least favorite part of this activity. How well did your group work together? Use an assessment to rate your group and yourself.



A System of Colors



Directions: Heather's parents own a balloon shop. They are putting together a catalog of all the balloon arrangements that they sell. Heather is helping them put together arrangements using different colored balloons. The three colors are red, yellow, and white. Each arrangement is different.

*Use the clues to help you solve the problems. You may want to use manipulatives (counters or balloons) to show how many of each color are in the arrangements.

1. Brittany Spear Arrangement
   - ❖ 3 red balloons ____red
   - ❖ 2 more white roses than yellow balloons ____white
   - ❖ Total of 9 balloons ____yellow

2. Justin Timberlake Arrangement
   - ❖ 2 yellow balloons ____red
   - ❖ 3 fewer white balloons than red balloons ____white
   - ❖ Total of 9 balloons ____yellow

3. Jennifer Lopez Arrangement
   - ❖ 3 red balloons ____red
   - ❖ 7 more white balloons than yellow ____white
   - ❖ Total of 12 balloons _____yellow

4. Ben Aflack Arrangement
   - ❖ 9 white balloons ____red
   - ❖ Twice as many red balloons as yellow balloons ____white
   - ❖ Total of 18 balloons ____yellow

5. Oprah Winfrey Arrangement
   - ❖ 16 balloons in all ____red
   - ❖ 4 fewer yellow balloons than red balloons ____white
   - ❖ 6 white balloons ____yellow

Send Your Own Arrangement

Make your own arrangement by starting backwards!

- Determine how many balloons you want for each color.
  - Example: 8 red balloons, 4 white balloons, 2 yellow balloons
- Develop your own clues or hints for each colored balloon. Use key statements:
  - How many balloons in all? How many balloons fewer than _____?
  - How many balloons more than _____?
  - How much is twice as much?
  - Same number as
  - ½ as many
  - ____x as many

Answer Key

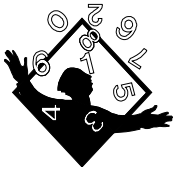
1. Brittany Spears	3 red 4 white 2 yellow
2. Justin Timberlake	5 red 2 white 2 yellow
3. Jennifer Lopez	3 red 8 white 1 yellow
4 Ben Aflack	6 red 9 white 3 yellow
5. Oprah Winfrey	7 red 6 white 3 yellow

Rodeo Guesses
-Day Four-

Materials: Rodeo mats

Vocabulary: Equation: A statement that two mathematical expressions are equal.

Think More:



Brainteasers
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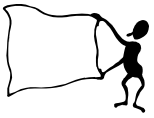
Solve More:

Activity One: Equation Systems
Students have been working on 'expressions' this week. That is, mathematical phrases that show relationships. Show an 'expression' on the board (2 + x) and say, "Today we are going to work with equations. Can anyone see a mathematical word that you know within the word equations? (Equal) That is correct. In order to have an equation, you must have something that equals something else." Write an equation on the board. (2 + x = 8) Have students compare the 'expression' and the 'equation'. Have students record the two definitions in their Number Note pads.

1. Students will again be using the system of Guess and Check to find the answers in today's problems.
2. As the students "go out to the ranch", they will be solving systems of simultaneous equations. Rodeos 1-6 have three unknown quantities. Rodeos 7-13 have four. Students should find a way to arrange counters/cubes in the rodeo areas to satisfy this rule:
3. *The number on the gate should be the total number of horses in the two rodeo areas connected by that gate.*
4. Give the students a copy of Rodeo 1. Explain the directions and let students solve the problems. Point out the "hint" below each problem. This "hint" makes the problems a snap to solve.
5. Next, give pairs of students Rodeo 2 and 3. This time the "hint" is a little different. Let the students solve these problems and then have a class discussion about ways to use this kind of hint.
6. *Encourage students to reach a conclusion such as: "The total number of horses is seven. You don't know how many purple and orange horses there are, but together purple and orange equal three - the number on the gate. So, yellow must equal four – seven minus three."* The discovery of this kind of thinking is what is important in this lesson. Find ways to encourage as many students as possible to make this discovery for themselves. Don't tell them!

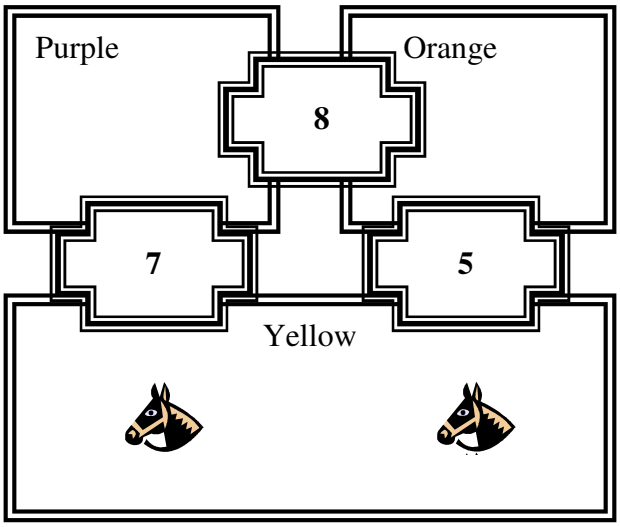
Explain More:

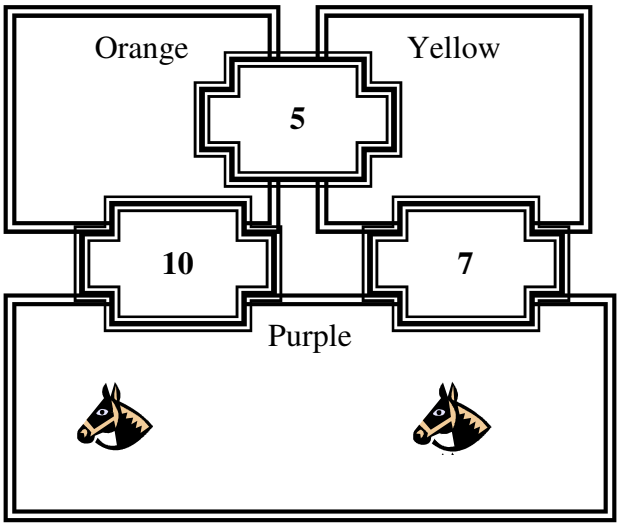


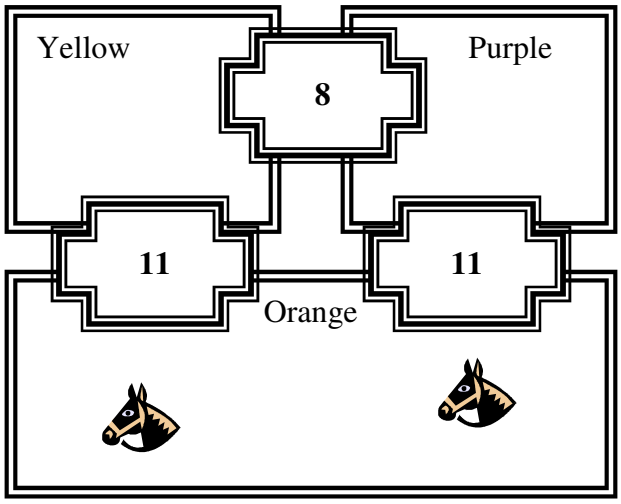
Circulate and talk to pairs quietly to assess the class. Save the group discussion until most students have some ideas of their own. To avoid one student yelling out the solutions, have them work in pairs to discover the system and then write their ideas on paper and give them to you. Ask students how they can write algebraic expressions to solve these problems.

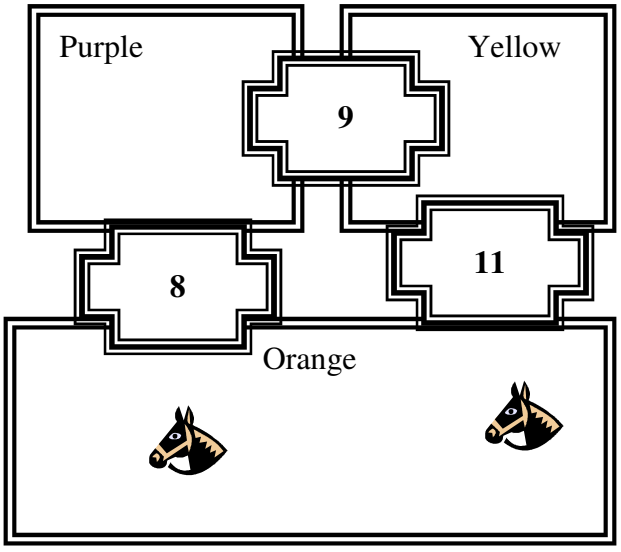
Rodeo #1

There are horses in each rodeo. Gates connect the rodeo areas. The number on each gate tells the total number of horses in the two rodeo areas it connects. Use cubes to show how many horses are in each rodeo area.







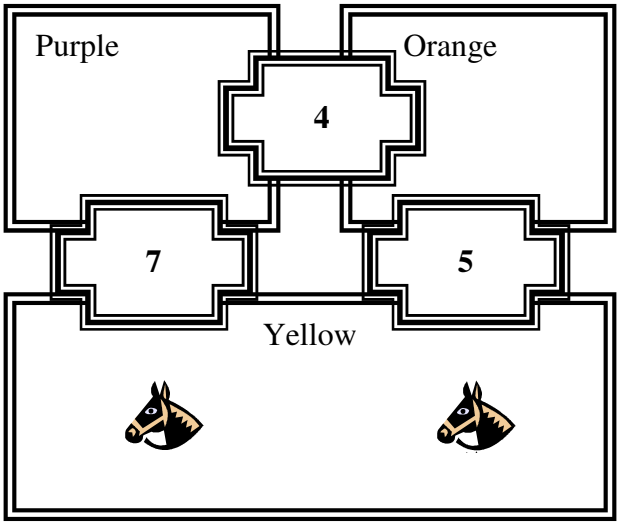


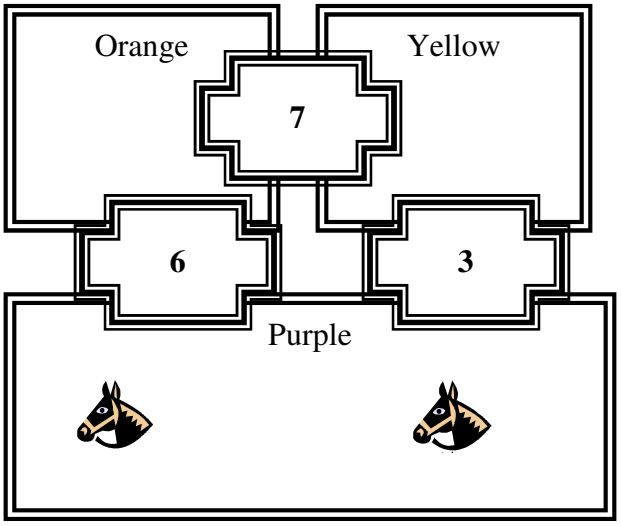
Hint: Yellow = 4

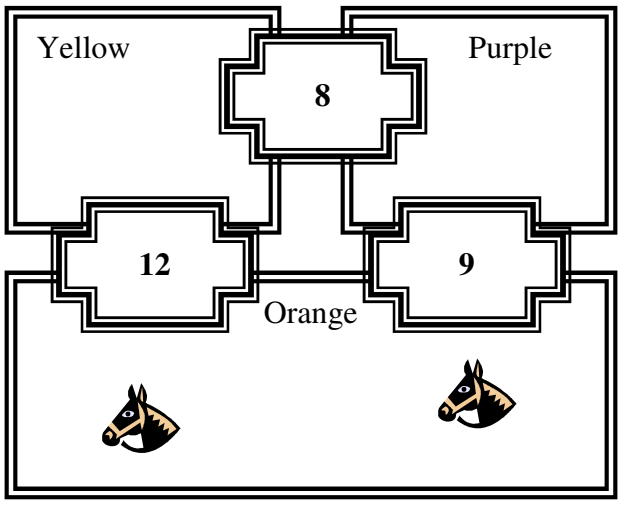
Hint: Orange = 5

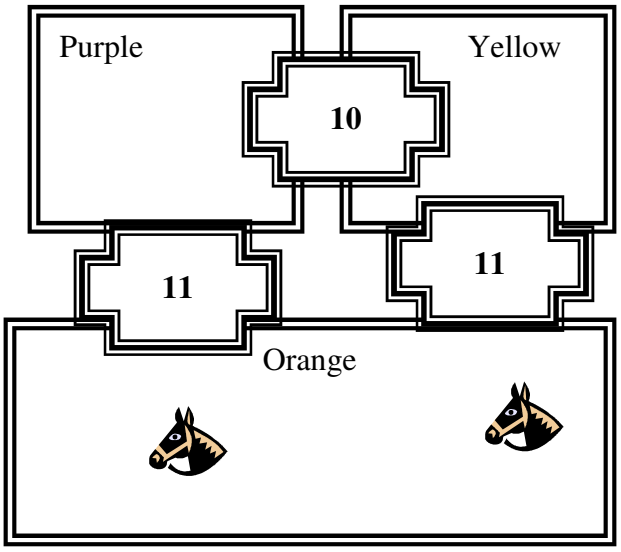
Rodeo #2

There are horses in each rodeo. Gates connect the rodeo areas. The number on each gate tells the total number of horses in the two rodeo areas it connects. Use cubes to show how many horses are in each rodeo area.







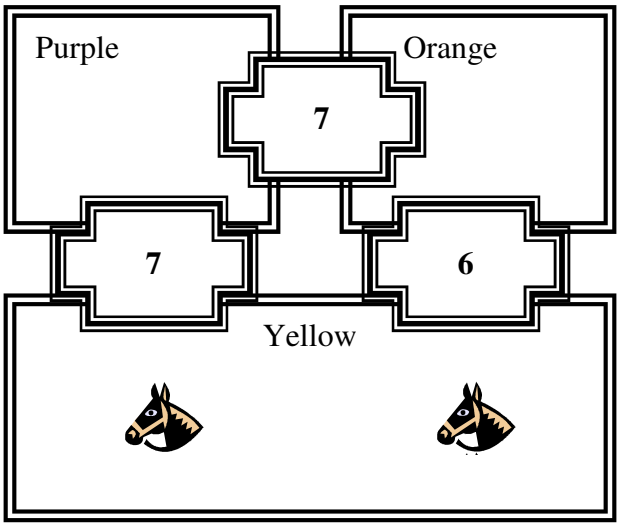


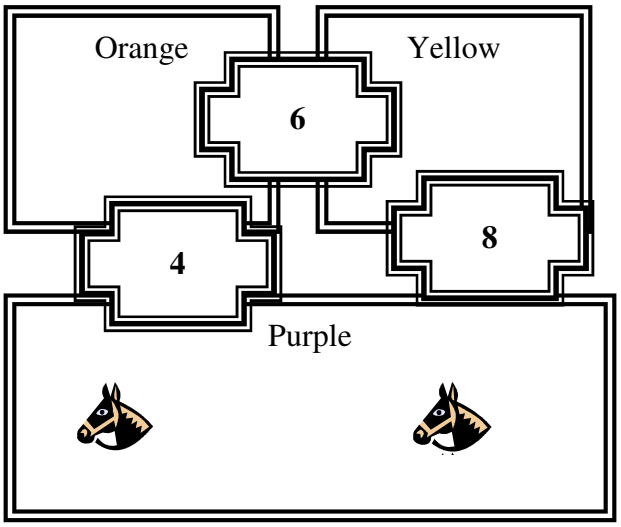
Hint: Sorry no hint.

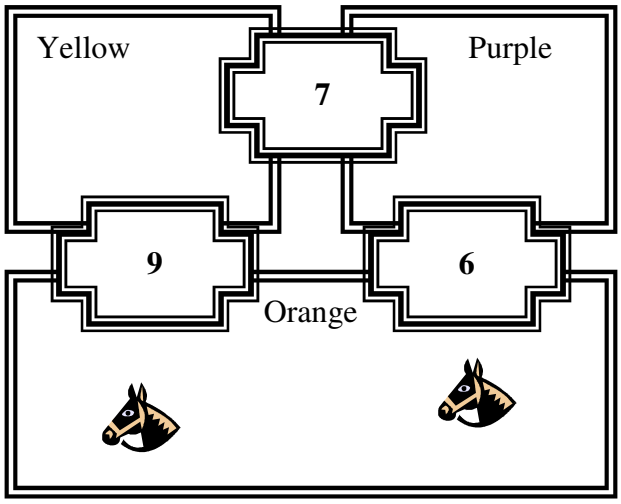
Hint: Sorry no hint.

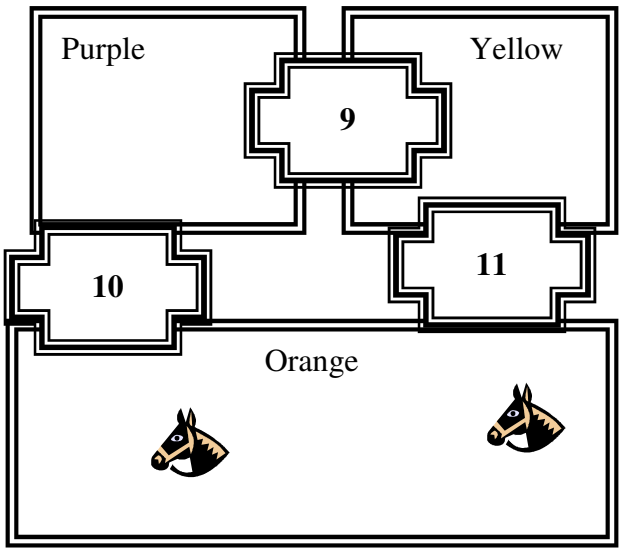
Rodeo #3

There are horses in each rodeo. Gates connect the rodeo areas. The number on each gate tells the total number of horses in the two rodeo areas it connects. Use cubes to show how many horses are in each rodeo area.







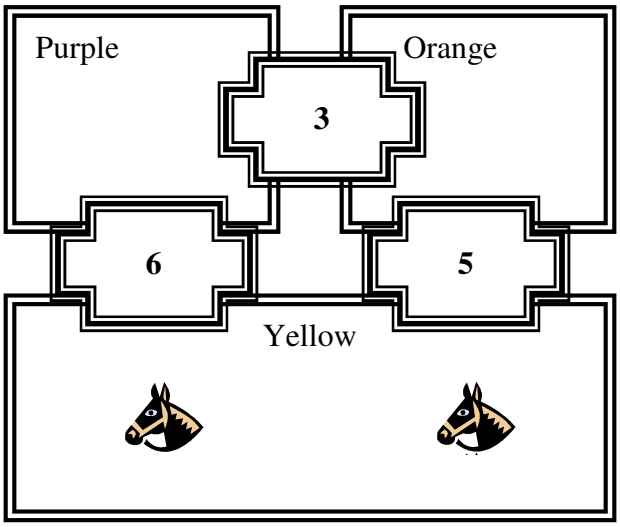


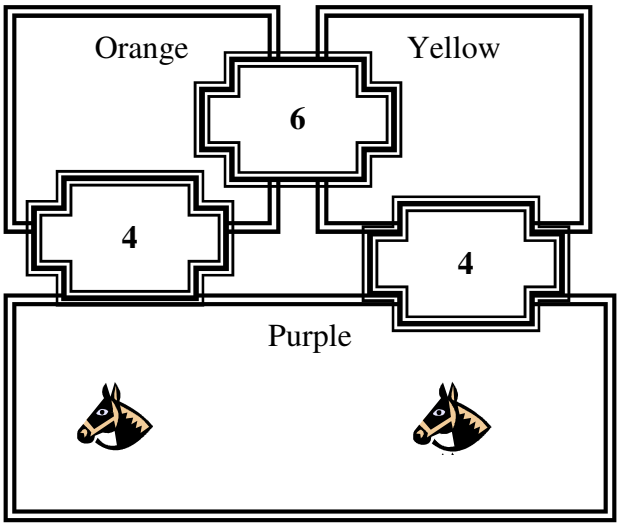
Hint: try this one with no hint

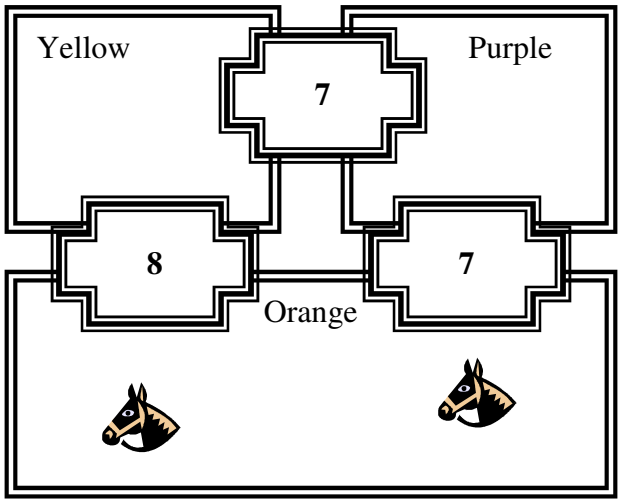
Hint: try this one with no hint

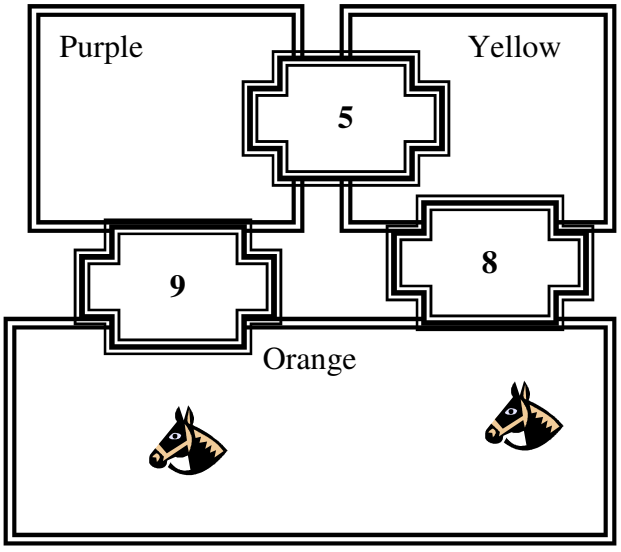
Rodeo #4

There are horses in each rodeo. Gates connect the rodeo areas. The number on each gate tells the total number of horses in the two rodeo areas it connects. Use cubes to show how many horses are in each rodeo area.







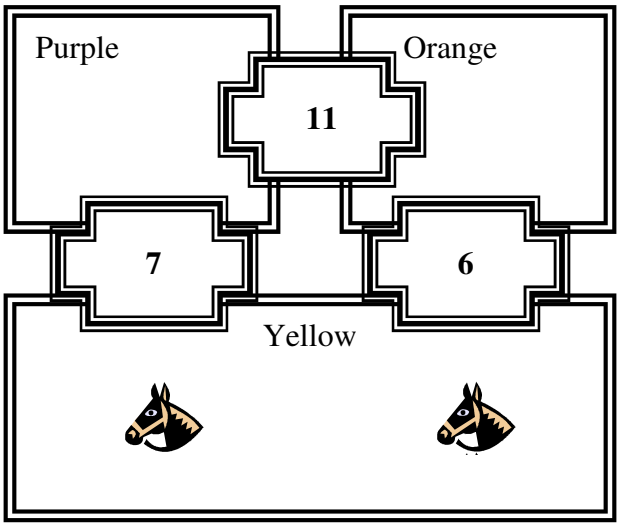


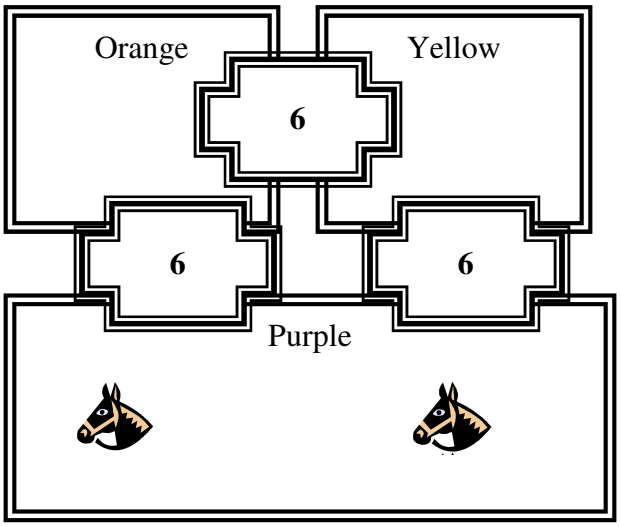
Hint: Total number of horses = 11

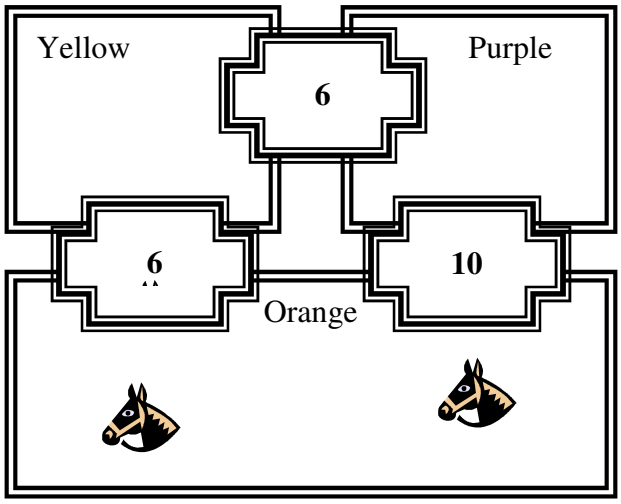
Hint: Total number of horses = 11

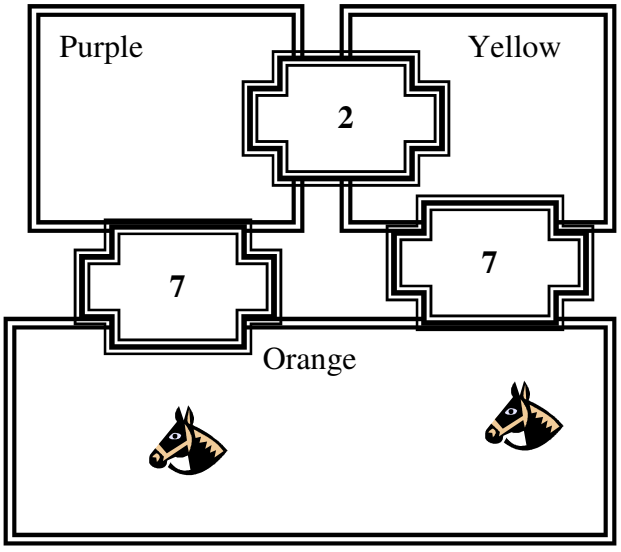
Rodeo #5

There are horses in each rodeo. Gates connect the rodeo areas. The number on each gate tells the total number of horses in the two rodeo areas it connects. Use cubes to show how many horses are in each rodeo area.









Hint: Total number of horses = 11

Hint: Total number of horses = 8

Answer Key

Rodeo #1

1. Purple = 5	Orange = 3	Yellow = 2
2. P=6	O=4	Y=1
3. P=4	O=7	Y=4
4. P=3	O=5	Y=6

Rodeo #2

1. P=3	O=1	Y=4
2. P=1	O=5	Y=2
3. P=2	O=6	Y=6
4. P=5	O=6	Y=5

Rodeo #3

1. P=4	O=3	Y=3
2. P=3	O=1	Y=5
3. P=2	O=4	Y=5
4. P=4	O=6	Y=5

Rodeo #4

1. P=2	O=1	Y=4
2. P=1	O=3	Y=3
3. P=3	O=4	Y=4
3. P=3	O=6	Y=2

Rodeo#5

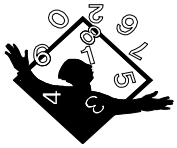
1. P=6	O=5	Y=1
2. P=3	O=3	Y=3
3. P=5	O=5	Y=1
4. P=1	O=6	Y=1

Rodeo Days
-Day Five-

Materials: Construction paper, cowboy outfits, and other western gear

Vocabulary: Equation: A statement that two mathematical expressions are equal.

Think More: Brainteasers
Select from the Math Mazes in the back of this packet



Solve More: Activity One: Creating Rodeos

1. Students construct rodeo areas with their desks and construction paper.
2. Students convert their chairs into horses with construction paper and paper bags.
3. Students transfer the algebra problems on to a poster board.

Explain More: How are students working together? Is everyone is participating?

Math Mastermind! Students dress as cowboys and cowgirls and present these algebra problems to an audience. They act out how they discovered the answers by manipulating the information.

Fourth Grade
Number Sense Unit

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 the different ways numbers are represented and used in the real world.

Literature Connections: Eating Fractions by Bruce McMillan
Gator Pie: by Louise Mathews

Materials: Parent Letter: Party food, half gallon milk containers

Teacher Resources: Imagine Schools Curriculum Guide

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 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:
"Fraction Feasts"

-Day One-

Materials: Fraction Riddles, dry erase boards

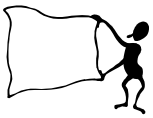
Vocabulary:
Fraction: A way of representing part of a whole or part of a group by telling the number of equal parts in the whole and the number of those parts you are describing.
Decimal: A number written using base ten. A number containing a decimal point.
Decimal Point: A dot separating the ones and tenths places in a decimal number.
Percent: A special ratio that compares a number to 100 using the symbol %. The word percent means hundredths or out of 100.

Think More: Brainteasers
Select from the Math Mazes in the back of this packet

Solve More: Activity One:

1. Review fractions with fraction flashcards. Play around the world.
2. Put Fraction Riddles on each table. Let groups work on them cooperatively for 15 minutes.
3. Students may use their dry erase boards for calculating.
4. Share their results and discuss how problems were approached and solved.

Explain More: How are students working together? Is everyone is participating?



Fraction Riddles

1. Susan bought three pizzas that were all the same size. One pizza was divided into halves, one was divided into fourths and the third was divided into sixths. All together there were twelve pieces of pizza. If Susan ate four pieces, did he eat 4/12 of the pizzas? Prove your answer.

2. Half of Heather's room is painted and the other half has paneling. If one half of the part that is painted is painted pink and the other half is painted violet, what part of the entire room is painted violet? Prove your answer.

3. Charlie walked ½ the distance around the track and ran ½ of the distance. Jay walked ½ the distance to the store and ran ½ of the distance. Did Charlie and Jay run the same distance? Prove your answer.

4. If 2/4 – ½, is 2/3 the amount of people in Florida equal to ½ of the amount of people in North Dakota. Prove your answer.

5. Would you rather have ¼ of $100 or 1/5 of $100? Prove your answer.

6. Audrey spent 1/6 of all the money in her bank and Sammy spent 1/8 of all the money in her bank account. Who spent more money? Prove your answer.

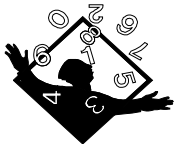
7. Two circles had the same diameters. If Jeff colored in 1/3 of one of the circles and Tanya colored in ¼ of the other circle, who colored in more of their circle? Prove your answer.

8. Marcos ran 2/10 of a mile. Roberto ran 1/5 of a mile. Who ran more? Prove your answer.

Fraction Art
-Day Two-

Materials: Pattern blocks
Vocabulary: Review Day One's vocabulary.

Think More: Brainteasers
Select from the Math Mazes in the back of this packet



Solve More: Activity One:

1. Prepare a fraction art paper for your answers. Fold a piece of white copy paper into 8 parts.
2. Take a hexagon and cover it with 3 blue blocks. Each block is 1 of 3 equal parts or 1/3 of the figure.
3. Trace this figure and shade 1/3 in section 1 of your paper.
4. Write a fraction for the shaded part and write a fraction for the unshaded part.
5. Take a hexagon and cover it with 6 blocks. Now take off enough to leave 1/6.
6. Trace this shape in section two of your paper.
7. Trace 2/6, 3/6 , 4/6 and 5/6 in the remaining sections.
8. Find equivalent fractions with other shapes. Trace and write them in the same section on your paper.
9. Draw conclusions about equivalent fractions.

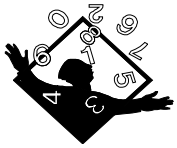
Explain More: How are students working together? Is everyone is participating?

-Day Three-

Materials: Pattern blocks, overhead projector or document camera, shapes or transparency of shapes

Vocabulary: Review Day One's vocabulary.

Think More: Brainteasers



Select from the Math Mazes in the back of this packet

Solve More:

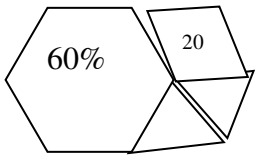
Activity One:

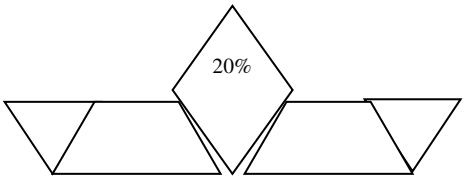
1. This activity is similar to Day Two's, however; we will be working with percentages today instead of fractions.
2. Ask the class how percentages and decimals are alike.
3. Do a K-W-L about percentages. Where have students heard of them? When have students used them?
4. Tell students that percent means per hundred. (They can remember this because it takes 100 cents to make a dollar.)
5. On the overhead, show a rhombus. Say, "If this rhombus has a value of 25%, how many do you need to make 100%?" (4)
6. Ask students to explain their answers.
7. Put 4 rhombuses on the projector to show 100%.
8. Remove 1 of the 4 blue rhombuses and add 2 green triangles. What percentage of this design is blue? (75%) What percentage is green? (25%)
9. How do you know?

Activity Two: Partner Puzzles

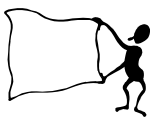
1. With a partner, students will use pattern blocks to create a design that is 20% blue. What does a design that is 20% blue look like? Record your work and explain how you know 20% of the design is blue.

Possible answers:





Explain More:

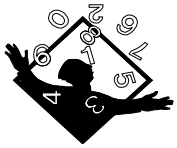


Were the students able to create a design that is 20% blue? Did the student's explanation clearly state how he/she figured the percentages for the design? Does the student's work indicate an understanding of percentages?

Making Plans
-Day Four-

Materials: Centimeter graphing paper
Vocabulary: Review this week's vocabulary.

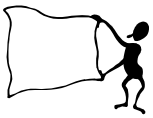
Think More: Brainteasers
Select from the Math Mazes in the back of this packet



Solve More: Activity One:

1. Students will construct a floor plan of their house and calculate the floor space in fractions and percentages.
2. Have students create a floor plan on centimeter grid paper, using a 10 x 10 grid.
3. Have the students complete the table.
4. Ask students how they can check to make sure that their percentages are right? (They should add up to 100.)
5. Students may work with partners to construct the floor plans and complete the chart.

Explain More: How are students working together? Is everyone is participating?



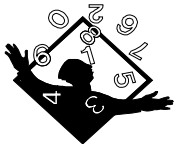
Making Plans

Materials: 10 by 10 gird

Room	Number of Squares	Fractional Part of the Floor Space	Percent of the Floor Space
Kitchen			
Bedroom 1			
Bedroom 2			
Closet 1			
Closet 2			
Living Room			
Family Room			

-Day Five

Materials: Party food, five empty half-gallon milk jugs per group, water
Vocabulary: Review the week's vocabulary

Think More: Brainteasers

Select from the Math Mazes in the back of this packet

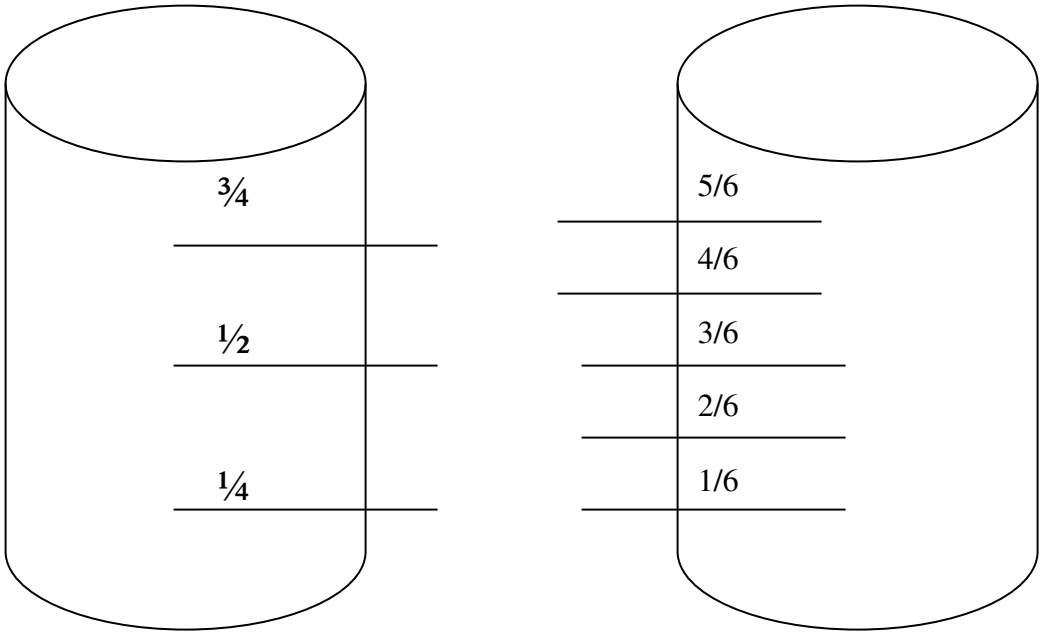
Solve More: Activity One:


1. Form groups of three or four.
2. Each group will get five milk jugs.
3. Students will label each jug. One jug will be FOURTHS, another will be THIRDS, the next will be FIFTHS, SIXTHS and EIGHTHS.
4. Using a ruler, groups will mark each container with hash marks. (See example.)
5. Students will practice pouring equivalent levels for their jugs. When they match the water level by the hash marks, they can record those fractions as being equivalent. (See example).
6. Discuss results.

Explain More: How are students working together? Is everyone is participating?


Math Mastermind! Fraction Feasts
Students have a fraction feast. They must identify the fraction and percent of vegetables, proteins, sweets, and fruits are of the feast. Make a menu listing the food items in fractional or decimal terms.

Equivalent Fraction Jugs



Fourth Grade
Game Week

Objective: At week's end, students will be able to play cooperatively with their classmates and gain mastery on basic skills and operations.

Teacher Resources: Imagine Schools Curriculum Guide Core Math Program Games and/or Manipulatives

Materials: Parent Letter: Chess, checkers, Chinese checkers, Battleship, Monopoly, and Life

Background:
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 a gracious winner and loser, 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 where students take turns to make it around the board and some are card games where 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, and 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 and board 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 not 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.

"Let's Play It Again!"

A Mathematical Environment
Fifth Grade

Encore Math Fifth Grade Materials and Resources

Non-consumables

Imagine Schools Curriculum Guide
Document Camera or overhead projector
Core Math Program Manipulatives:
Class set of calculators, Basic Operations Flash Cards, Deck of Cards, Money (coins and bills), Clocks, Class pack of Tangrams, Geoboards, Balance Scale, Spinners, dice, Dry erase boards, Fraction Cards
Quilts

Games
Chess, Battleship, Dominoes, Checkers, Chinese checkers, Monopoly, Life, Bingo, Tic, Tac, Toe, "I Have, Who Has" card game,

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's Brain Teasers: http://eduplace.com

Consumables or Activity Specific

NUMBER NOTE PADS

Unit 1 Geometry:

Marshmallows, quilts, cloth scraps, quilts, wrapping paper or fabric designs, pattern blocks, fabric pieces, hole puncher, yarn, T-chart, solid patterns, glue, tape, box lids, pattern blocks, (if using overhead projector will need transparencies of shapes), game board (attached to a file folder works best), game pieces, dice, pictures of quilts, pattern blocks cut out of colored paper, black paper 6"x 6", scissors, felt patterns, and cloth

Unit 2 Algebra:

Cardboard, markers, dice, document camera or overhead projector; project or create transparencies of "What's My Equation" form; dry erase boards, markers, and eraser; paper and pencil, scales, paper lunch bags, cubes, number line, post it notes, points on a line, projector, squares cut out of different colored constructions paper OR square color tiles, centimeter paper

Unit 3 Number Sense:

Money, place value grids, pipe cleaners, graphs from newspapers, bags of snack type chips

Fifth Grade Booklist

Fifth Grade Week 1

Lines and Shapes by Solveig Paulson Russell

Look Twice: Mirror Refractions, Logical Thinking by Duncan Birmingham

The Patchwork Quilt by Valerie Flournoy

The Quilt Story by Tomie dePaola

Fifth Grade Week 2

Anno;s Magic Seeds by Mitsumasa Anno

The King's Chessboard by David Birch

Knowabout Patterns by Henry Pluckrose

Fifth Grade Week 3

Arithmetic Pie by Babs Bell Hajdusiewicz

Pezzettino by Leo Lionni

Gator Pie: by Louise Mathews

Fifth Grade
Geometry Unit One
Describing Shapes in Words

Standards: Understand the characteristics and properties of 2-and 3-dimensional shapes.
Know appropriate vocabulary to describe characteristics of geometric shapes.
Know how to identify and plot ordered pairs and use coordinate systems to describe paths/movement/change.

Objective: At week's end, students will be able to describe in writing and verbally the characteristics of most geometric shapes and designs created by combining shapes.

Literature Connections: Lines and Shapes by Solveig Paulson Russell
Look Twice: Mirror Refractions, Logical Thinking by Duncan Birmingham
The Patchwork Quilt by Valerie Flournoy
The Quilt Story by Tomie dePaola

Materials: Parent Letter: marshmallows, quilts, cloth scraps

Teacher Resources: Imagine Schools Curriculum Guide

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:
"An Environment of Shapes"

Written Descriptions
-Day One –

Materials: Quilts, Woven Blankets worksheet

Vocabulary:
Parallelogram: A quadrilateral with two pairs of parallel and congruent sides.
Quadrilateral: A four-sided polygon.
Polygon: A closed plane figure formed from line segments that meet only at their endpoints.
Plane Figure: Any 2-dimensional figure. Circles, polygons, and angles are all plane figures.

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 notes 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:

Describing Shapes: When you transform something you change it. In geometry, when you move a figure, you make a transformation of it.

Activity One:

1. Display quilts that students have brought in or ones that you have gathered.
2. Have students identify the shapes that have been used to create the design.
3. Talk about how the shapes were moved and placed to create the design.
4. Pass out the 'Woven Blankets' worksheet. Students will identify the shapes and arrangement of the shapes to create the quilt design.
5. Tell students to take a few minutes to write down in their Number notepads all the polygons they can find: square, rectangle, triangle, trapezoid, rhombus, and parallelogram in the quilt.
6. Review the characteristics of each polygon.
7. Review the names of the parts of each (corner or angle, edge, side).
8. Complete Woven Blankets together. Counting and describing shapes by number of edges and corners.
9. Students will color this blanket and cut it out.
10. Each square will be glued onto a large piece of bulletin board paper. Let students lay each of their squares down first before they proceed to gluing.
11. Have them look at the design by its shape and color. Have they designed the most appealing arrangement? Would any one like to change a square's position?
12. Finalize the placement of the squares and glue them on to the framing paper. Hang it up for a beautiful display.

Explain More:

Write a description of one of the quilts shared today. Make a list of describing words on the board to help with this writing assignment. Determine the length and your expectation for their writing.

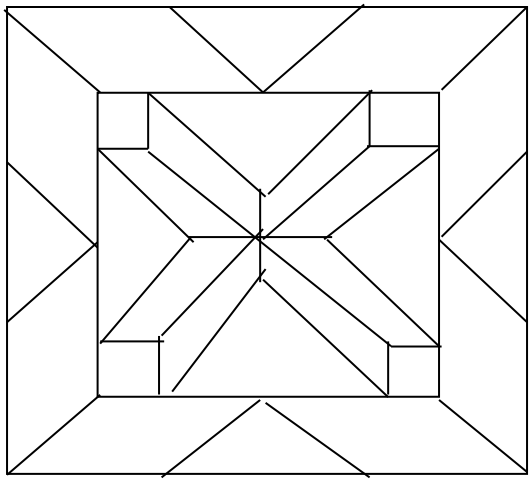
Rubric will show student understanding of shapes and ability to describe the shapes in writing.

WOVEN BLANKETS

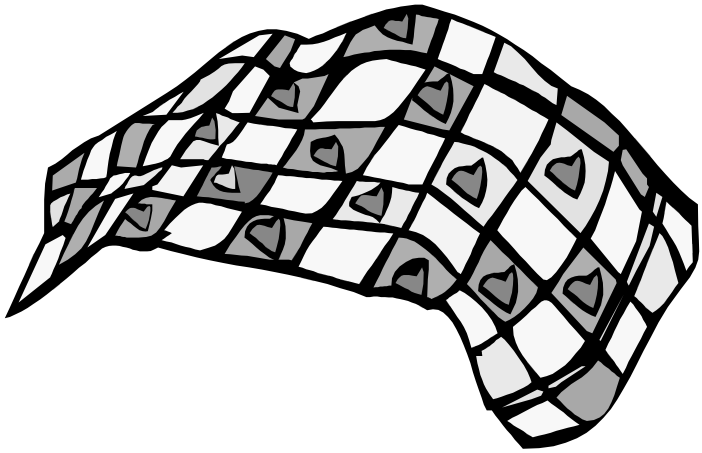
Here is a pattern from a woven blanket.

1. Below are numbers that help to describe the pattern.

   The 8-pointed star in the center of the design is made of _____ parallelograms.
   Touching the edges of the 8-pointed star are _____ triangles and _____ squares.
   Around the edges of this design are _____ more triangles and _____ more parallelograms. These parallelograms are bigger than those that meet at the center.



2. Color the blanket pattern. Color shapes that are the same using the same color.



Replicating Designs
-Day Two-

Materials: Quilts, wrapping paper or fabric designs, pattern blocks, Dotted Design worksheet Fabric pieces, hole puncher, yarn

Vocabulary:
Reflection: A transformation creating a mirror image of a figure on the opposite side of a line.
Rotation: A transformation in which a figure is turned a given angle and direction around a point.
Translation: A transformation that slides a figure a given distance in a given direction.
Transformation: A rule for moving every point in a plane figure to a new location.
Similar: Figures that have the same shape but not necessarily the same size.
Congruent: Figures that have exactly the same size and shape.

Think More: Brainteasers
Select from the Math Mazes in the back of this packet.

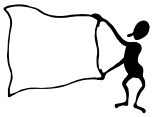
Solve More: Activity One:

1. Pass out 'Dotted Design' worksheet.
2. Have students reproduce the design in the remaining three quadrants.
3. Students must count the dots to get the size and placement correct.
4. Instruct the students to find the shapes in their quilt that are similar. Have them share their findings with a friend.
5. Instruct the students to find the shapes in their quilt that are congruent.
6. Students will describe their quilts using geometric terms in their Number Notepads.

Activity Two:

1. Pass out wrapping paper or fabric designs for students to analyze.
2. Students write in their Number Notepads a description of the design they received.
3. Give each student two-pieces of 4" by 4" construction paper.
4. Have students cut out the shapes from the wrapping paper and arrange them differently on one of their 4" by 4" pieces of paper.
5. Review flips (reflections) on the projector with some shapes.
6. Have a few students come up and flip shapes on the overhead. Talk about how the shapes 'flip' over an imaginary line.
7. Tell students to design a mirror image of their first design on their second piece of 4" by 4" construction paper.
8. Have students glue both designs down on their 4" by 4" construction paper.
9. Each student will find four other people in the class that have designs that are similar to theirs. They will make a list of reasons they have similar designs. They will share these similarities with the class.
10. Groups with similar designs will connect them with a hole punch and yarn to make a little larger team quilt.

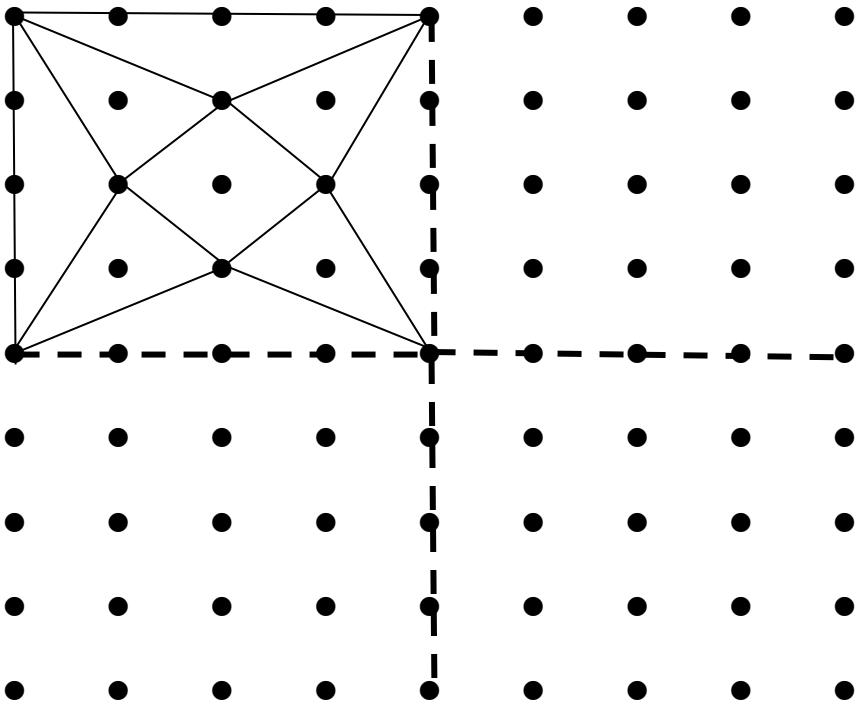
Explain More: Assess students' ability to describe the shapes and designs in writing. Students share their team quilts with the class. Did students remember the fundamental concepts from previous years? (Slides, flips, and turns) Could they easily flip their designs? How did they seek help?



Name Date

Dotted Designs

The dotted lines show two lines of symmetry, but there may be others!



3. Complete this design on the grid, then describe the design in the space below

_____

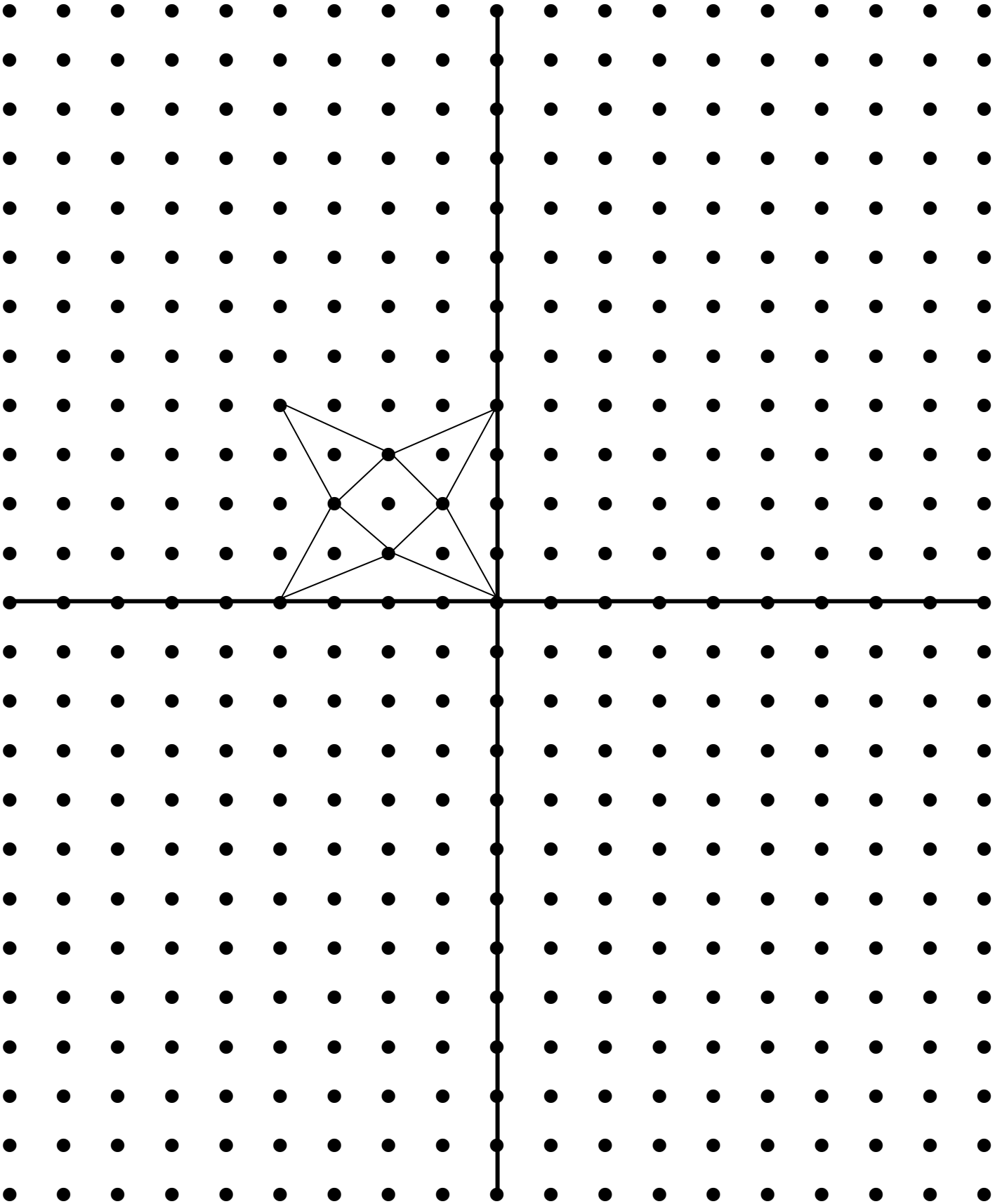
_____

_____

_____

_____

_____



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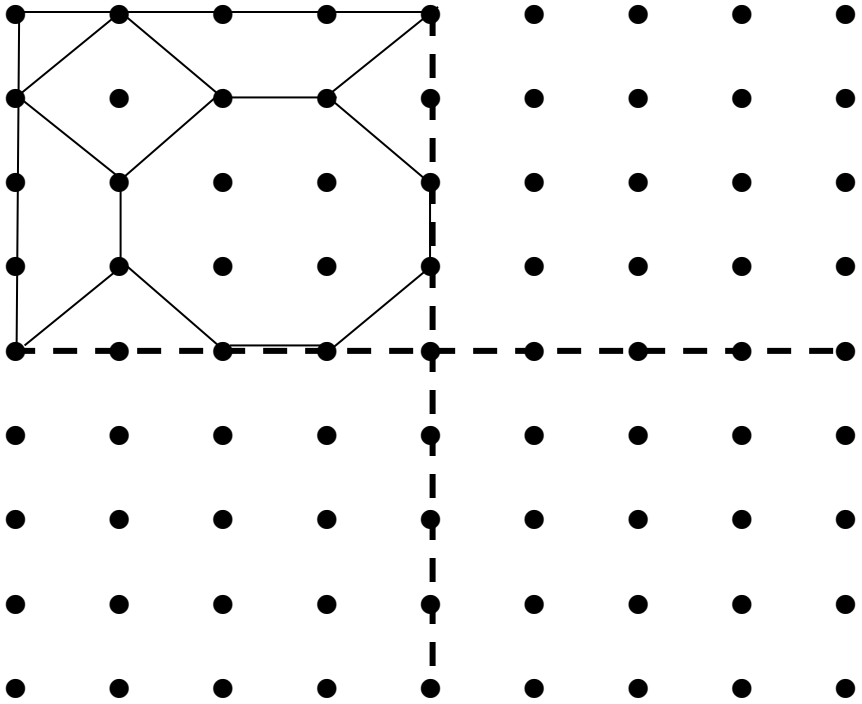


4. Complete this floor design on the grid provided and then describe the design in the space below

_____

_____

_____

_____

_____

_____

Comparing Solids
-Day Three-

Materials: T-chart, solid patterns, glue

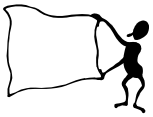
Vocabulary: Review the week's vocabulary

Think More: Have students write down all the solid figures they see in the classroom. (Globe – sphere, bookcase - rectangular prism, etc.)

Solve More: Activity One:

1. Display solid figures. Review classification and definitions.
2. Students make the shapes with folding and positioning.
3. Display the T-chart on the projector or the board.
4. Have pairs or groups of children compare two figures for the chart (they copy the T-chart and write their descriptions in their notebook).
5. Remind them that they will be graded on their correct use of vocabulary and how thorough their descriptions are.

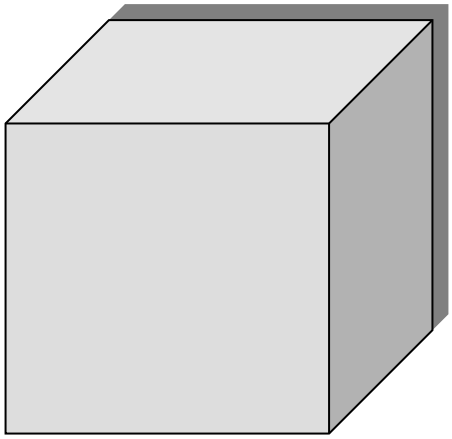
Explain More: Students reflect in their Number Notepads, which shape they like the best. Why? Was today's lesson difficult or easy for you? Why?



Constructing Solids

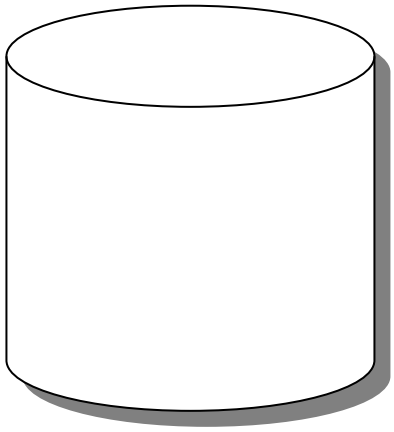
Materials

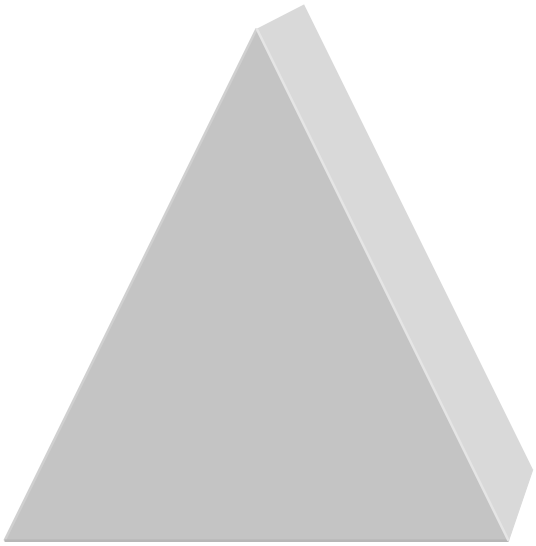
- 2-Dimensional Shapes
- Geometric Solids
- Paper
- Scissors
- Shape Patterns Masters
- Word Cards (one set per group)
- Glue or Tape



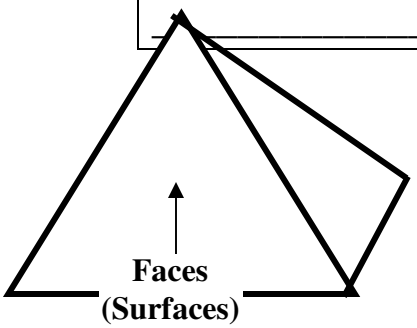
Procedures

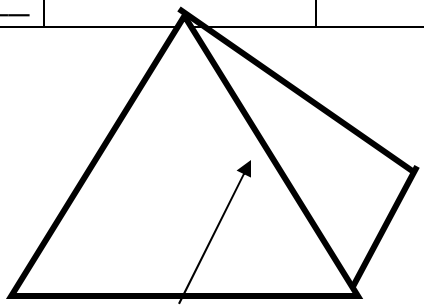
- Students cut out and assemble shapes
- Students label each assembled shape
- Students complete the Constructing Solids Table

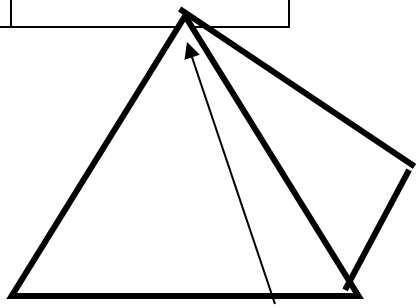


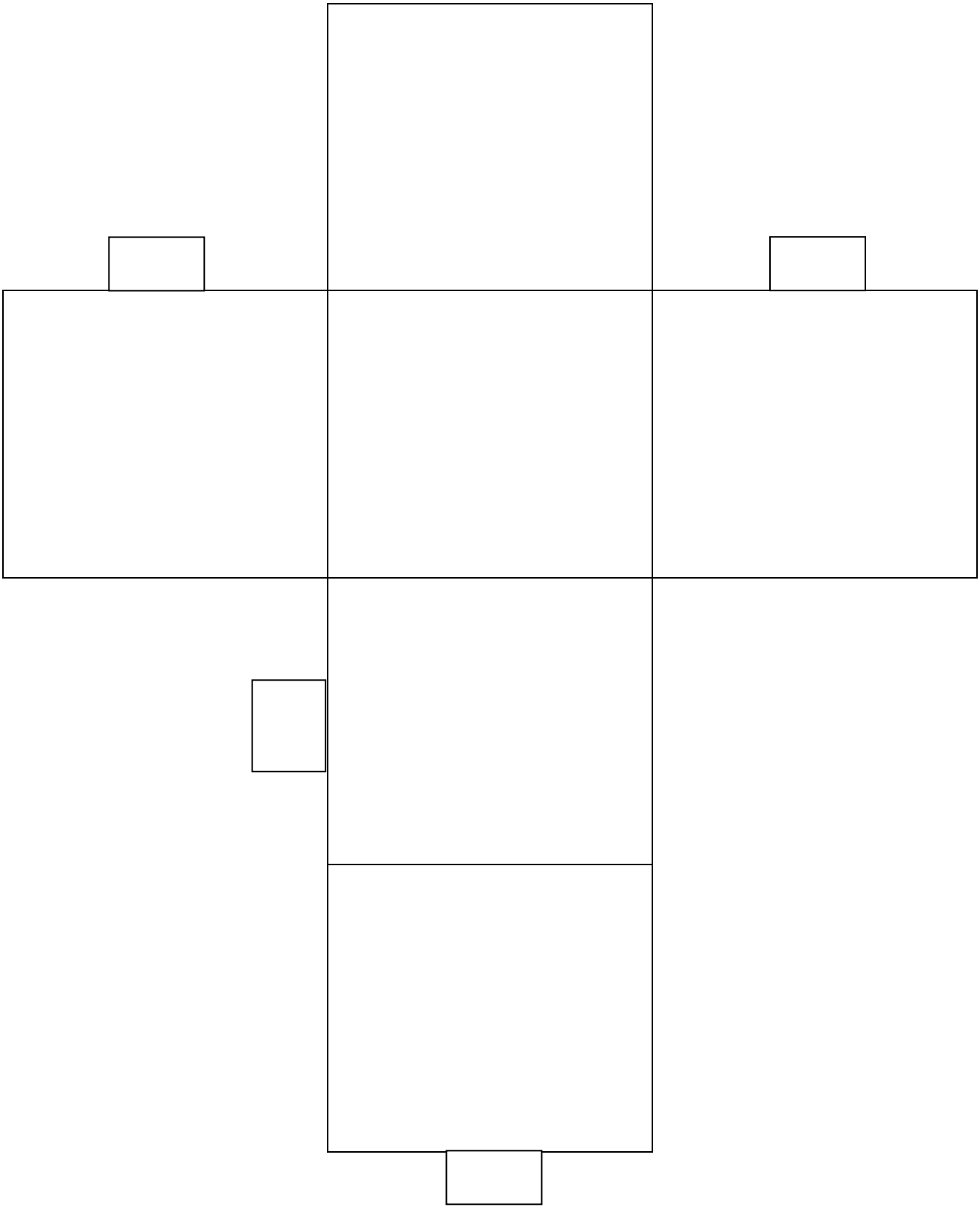


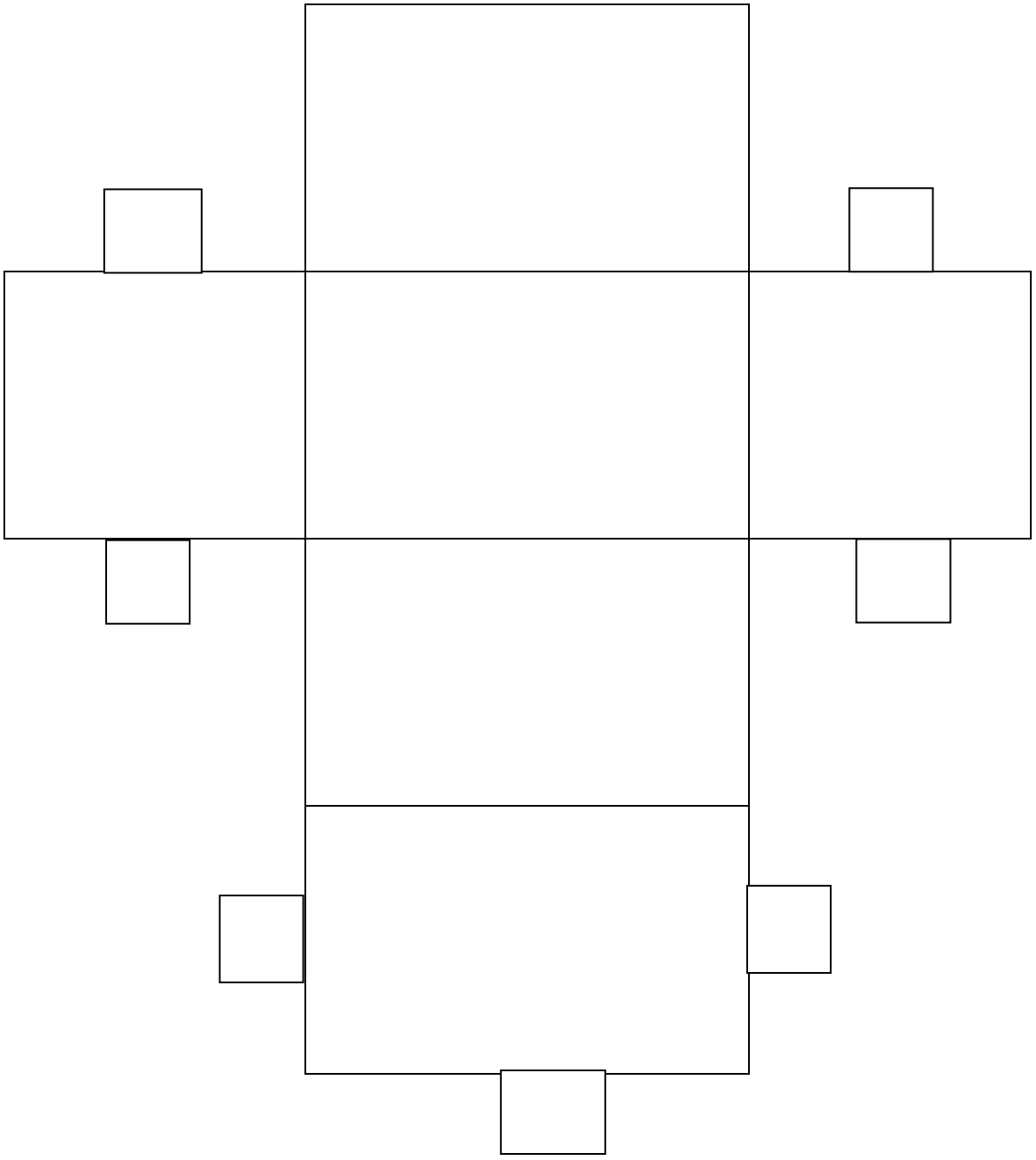
Geometric Solid	Number of Faces	Number of Edges	Number of
Cube			
Cylinder			
Rectangular Prism			
Pyramid			
Tetrahedron			
Triangular Prism			
Cone			
Select a Shape from Your Room _____			



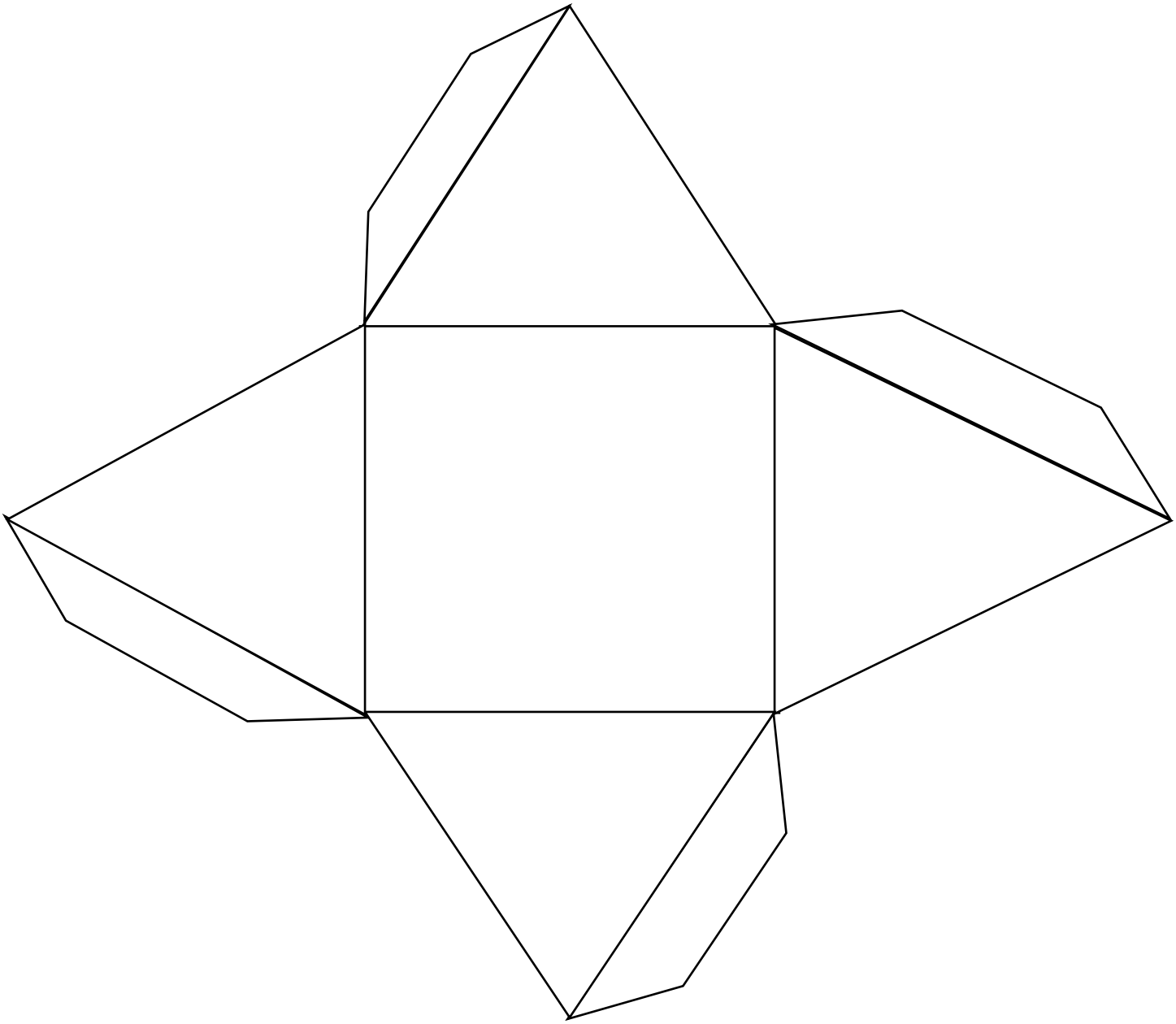




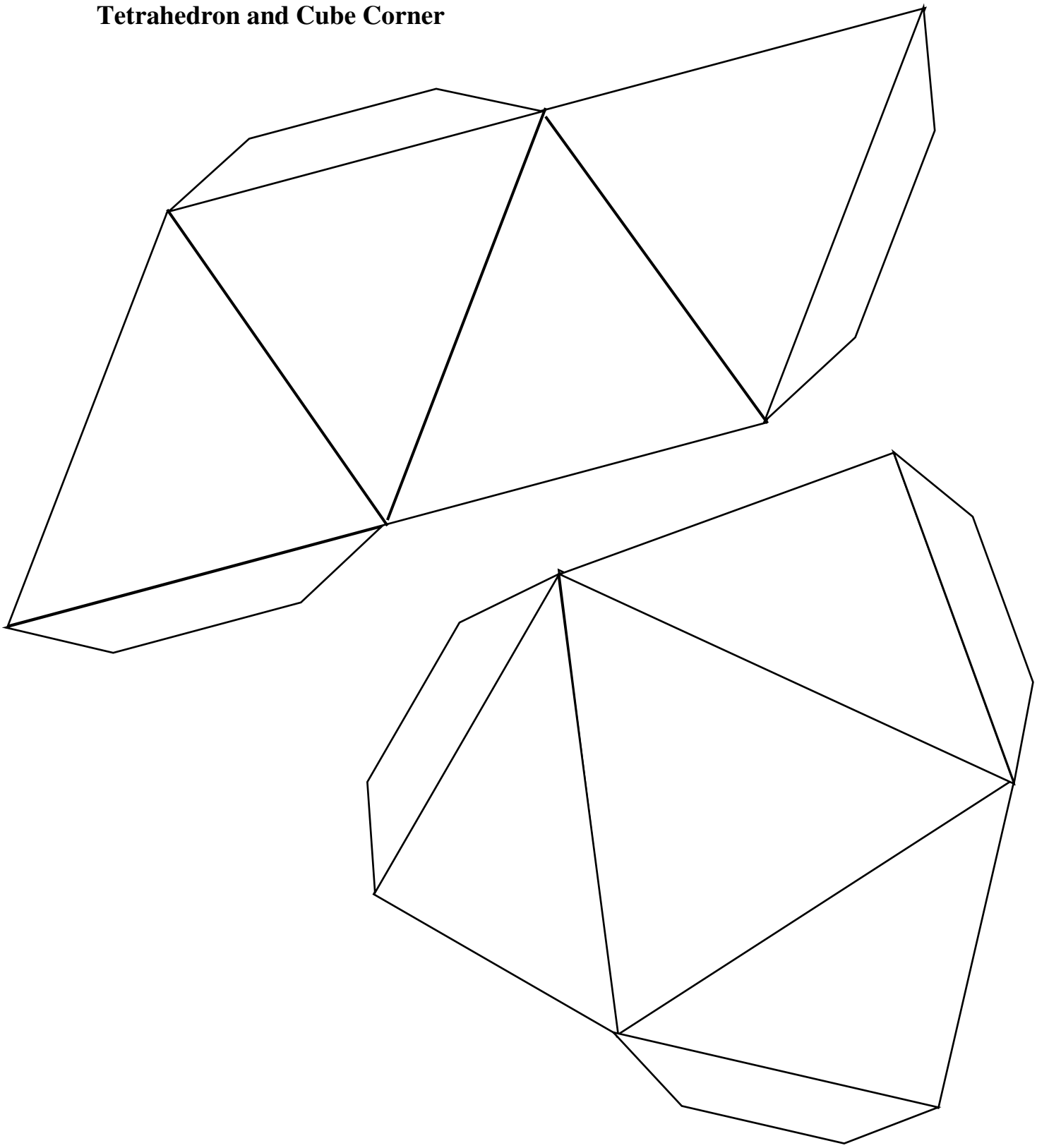


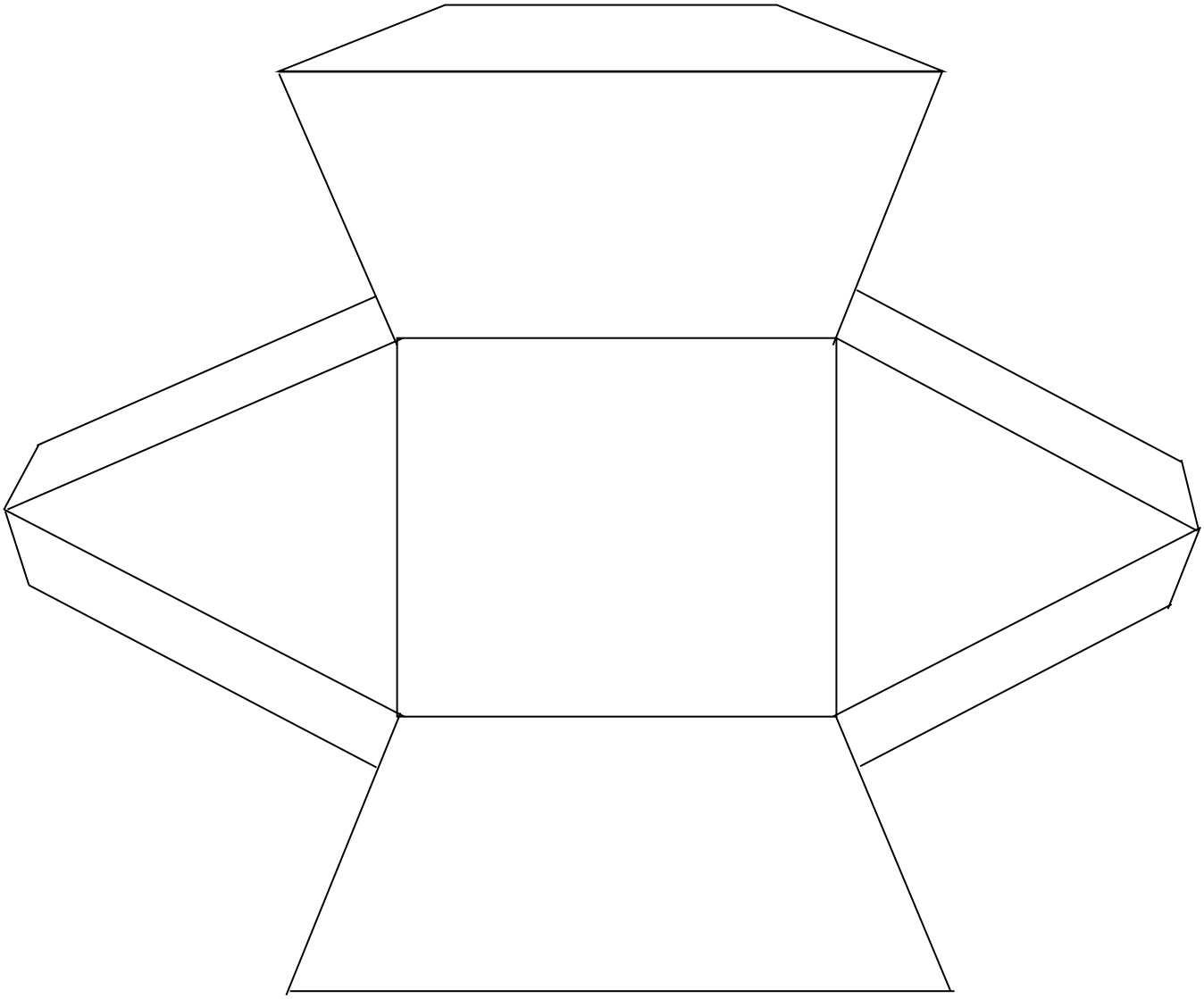


PYRAMID



Tetrahedron and Cube Corner





Triangular Prism

Comparing Shapes

Names _____

The first shape we chose is a _____.

The second shape we chose is a _____.

Here is a picture of the first shape:

Here is a picture of the second shape:

List all the ways these two shapes are alike.

List all the ways these two shapes are different.

Game Day "What's My Name?"
-Day Four-

Materials: Game board (attached to a file folder works best), game pieces, dice

Vocabulary: Review the vocabulary for the week.

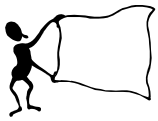
Think More:

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 notes 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:

Have students read the directions for the game. Give about 3 minutes. Ask someone to describe how to play. Let students use their Number Notepads for easy reference to the definitions in the first round. Play again without reference material.

Explain More:



Students are able to identify shapes and use vocabulary correctly. Performance rubric should be used.

What's My Name

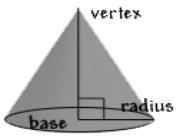
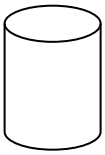
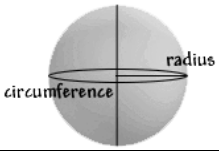
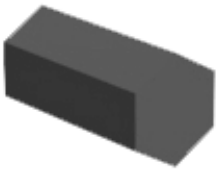
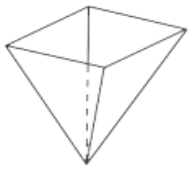
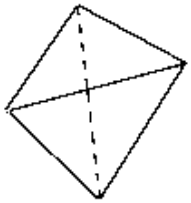
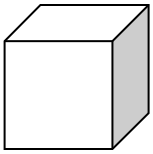
Name _____

MATERIALS: 1 tetrahedron die, game sheet, one marker per player

ORGANIZATION: Groups of two or three

PROCEDURE: Begin by explaining the rules of the game. Hand out a game sheet to each group and describe how to play:

1. The object of the game is to land on the last shape on the game board.
2. The player whose last name contains the most letters plays first.
3. Take turns rolling the die. Move your marker the number of spaces shown on the die. If you can name the figure, the number of vertices, and the number of faces on the item in the box that you land on, you may keep your marker there. If you cannot name these features, you must return your marker to its previous position.
4. The first player to land exactly on the last shape is the winner.

	Cone 2 faces 1 vertex		Triangular Prism 5 faces 6 vertices
	Cylinder 3 faces		Sphere
	Hexagonal Prism 8 faces 12 vertices		Square Pyramid 5 faces 5 vertices
	Triangular Pyramid 4 faces 4 vertices		Square Prism (Cube) 6 faces 8 vertices

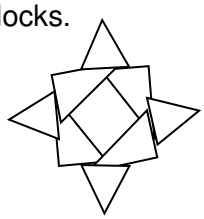
An Environment of Tessellations
-Day Five-

Materials: Box lids, pattern blocks, transparencies of pattern blocks, projector, The Patchwork Quilt book or The Quilt Story, real quilts, pictures of quilts, pattern blocks cut out of colored paper, black paper 6"x 6", scissors, glue, felt patterns and cloth, yarn, hole punch

Vocabulary: Tessellation: A covering of a plane without overlaps or gaps using combinations of congruent figures. Tessellations can combine shapes.
Plane: A flat surface that extends infinitely in all directions.
Congruent: Having exactly the same size and shape.

Think More:

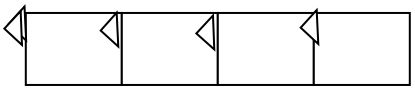
Brainteasers
Display a quilt pattern on the projector. Turn off the projector after students have viewed the pattern. Challenge partners or teams to reproduce the pattern. Vary the difficulty by displaying an incomplete pattern and having students make a complete pattern with their pattern blocks.



Solve More:

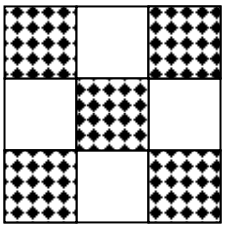
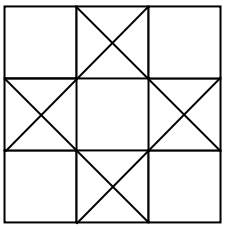
Activity One:

1. Describe a tessellation as a pattern of figures that is repeated to cover a flat surface. Figures must fit together so that none of them is overlapping and there are no gaps. Tessellations can be made from many different polygons.
2. Have students make a tessellation by cutting out a square, and cutting a notch out of the square, and gluing it to the other side of the square. Trace this shape and make four more. Now connect the shapes and you have tessellated!



Activity Four: Tessellation Quilt Patterns

1. Read one of the quilting stories. Display real quilts and pictures of quilts. Tell students that a quilt is a repeated pattern.
2. Have collaborative groups make a tessellation.
3. One student begins a tessellation in the center of a box lid with pattern blocks. Place the lid in the center of the table so that others at the table may add to the pattern by adding blocks. When one pattern is complete, encourage students to create new ones. Table members take turns until the box lid is filled with the repeated pattern.
4. Students can repeat this quilt design with felt pieces previously cut into pattern block shapes or with paper. Glue them onto fabric or the black square paper. Hole punch sides and string together to make your class quilt.
5. One of the simplest quilt patterns is a nine-patch quilt. Students can reproduce traditional quilt designs or create new designs.

	 Nine Patch  Evening Star
Explain More: 	Have students describe their quilt patterns, telling about the color pattern and shape pattern that they used. Math Masterminds: Weekly Culminating Event:
Math Masterminds!	***Quilting Squares*** Dress up as in Colonial Days. Display quilts for parents and invited guests.

Fifth Grade
Algebra Unit
"Environmental Equations"

Standards: Students recognize, understand, and extend patterns.
Students utilize symbols and mathematical expressions to represent mathematical situations.

Objective: At week's end, students will be able to analyze patterns and identify mathematical relationships to pose and solve problems. They also will be able to generalize a pattern, relation or function in words, tables, and or graphs. Students will be able to translate equations and inequalities into verbal and written problems.

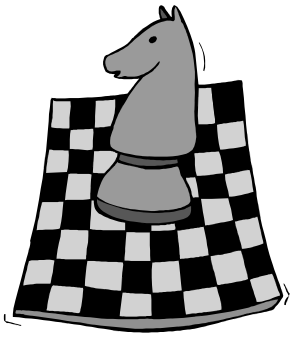
Literature Connections: Anno;s Magic Seeds by Mitsumasa Anno
The King's Chessboard by David Birch
Knowabout Patterns by Henry Pluckrose

Materials: Parent Letter: Cardboard, markers, dice

Teacher Resources: Imagine Schools Curriculum Guide

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:
"Board Games

Environmental Equations
-Day One-

Materials: Document Camera or overhead projector; transparencies of What's My Equation; dry erase boards, markers, and eraser; paper and pencil

Vocabulary:
Expression: A variable or combination of variables, numbers, and symbols that represents a mathematical relationship.
Variable: A quantity that can have different values. A symbol can stand for a variable.
Variable Expression: An expression that represents an amount that can have different values.
Equation: A statement that two mathematical expressions are equal.
Addend: Any number being added.\
Sum: The result of addition
Factors: An integer that divides evenly into another.
Integer: Whole numbers and their opposites
Product: The result of multiplication

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 notes 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:

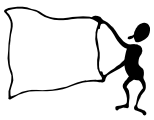
1. Review vocabulary, showing how two expressions that are equal can be an equation. Example: N+5 = 10. N+5 is an expression and 10 is an expression. If they are equal then, N must equal 5.
2. Tell students that when they are writing equations, they need to think about which two quantities are equal to each other. They will then write an "expression" for each quantity.

Activity Two:

1. Show the Environmental Equations transparency. Students copy the steps into their Number Notepads as the teacher explains the steps. Cover up parts of the table to have students generate the answer before you show it.
2. Explain to students that to solve addition and subtraction equations, they need to think about missing addends and sums. If they can't use mental math, review how to use the Guess and Check method (see 4th grade Algebra Encore unit). Once you solve the equation, check the values you found by substituting them back into the equation to be sure that they work. Example: 10+ x = 15 Ask yourself, 10 + what number will give me 15? Since 15-10 = 5, then x must = 5. Check 10 + 5 = 15
3. To solve multiplication and division equations, you can think about missing factors and products. If the solution isn't obvious with mental math, you can use the Guess and Check method. Example: 25s = 100 ask yourself: How many quarters are in a dollar? S = 4. Check 25 x 4 = 100

4. Display “What’s My Equation” on the overhead. Give each table one dry erase board. One person works out the problem and holds up the board. Teams with the correct answer receive a point. Teacher records points on the board for each team. Encourage team members to share answers with their team before holding up their boards. Encourage collaboration.
5. Team members pass the board clockwise to the next player.

Explain More: Have students write their own work problems and exchange them with a friend. Check to see how students understand the story before they get started. Are students able to find the information and use it correctly by transferring the words into an algebraic equation?



What's My Equation?

Materials

- paper and pencil
- dry erase board and dry erase marker or individual slates
- "What's My Equation?" Worksheet (one for each student)
- Projector

Procedures

- The teacher will talk about variables and representing variables in an equation.
- The teacher will use the document camera or use overhead with a transparency ***Show and Tell*** (blackline master provided with lesson).
- Students will be instructed to display equations on dry erase board.

Assessment

- Students will display their answer on the dry erase board.
- Students will complete the "What's My Equation?" Worksheet
- Teacher observation

Extension

Have students write their own word problems and exchange with a partner.

Journal Writing

Have students write their own problem using a variable

What's My Equation?

1. Eight times a number

2. Five fewer than a number

3. Ten more than a number

4. Robert has 7 fewer books than William. If ***w*** stands for the number of books William has, which expression describes how many books Robert has?

   w ÷ 7 　　7 – w 　　w-7 　　7 x w

5. Brian is 2 years older than his sister, Diane. If ***n*** represents Diane's age, how can Brian's age be described?

6. Harold charges $6 for each lawn that he mows. This weekend, he earned $30 mowing lawns. Let ***m*** represent the number of lawns he mowed. Which equation shows how many lawns he mowed?

   30 – m = 6 　　6 ÷ m = 30 　　30 + m = 6 　　6 x m = 30

7. Jamal and Kevin were riding their bikes. Jamal rode has as many blocks as Kevin. Let ***n*** represent the number of blocks that Kevin rode. Which expression could be used to find the number of blocks that Jamal rode?

Answer Key

1. 8 x m or 8m 　2. m - 5 　3. m / 10 　4. w - 7 　5. n / 2 　6. 6 x m = 30 　7. n / 2

What's My Equation?

1. Jose and Mary both collect baseball cards. Mary has three times as many baseball cards as Jose. If the letter ***n*** is used to represent the number of baseball cards that Jose has, which expression describes the number of baseball cards that Mary has?
   A. $3 \div n$
   B. $3n$
   C. $n \div 3$
   D. $n - 3$

2. Carmen lived in North Miami twice as long as Vincent. Let ***g*** represent the number of years that Vincent has lived in North Miami. Which expression shows how many years Carmen has lived in North Miami?
   A. $2 \times g$
   B. $2 - g$
   C. $2 + g$
   D. $2 \div g$

3. Choose the equation represented by the following sentence:
   A number subtracted from 18 is equal to 10 divided by 2.
   A. $18 - n = n \div 2$
   B. $n - 18 = 10 \div 2$
   C. $18 - n = 10 \div 2$
   D. $10 \div 2 = n$

4. What does the following math sentence mean: $3x - 7 = 14$?
   A. The difference of a number and 7 is equal to 14
   B. Seven less than three times a number is equal to 14
   C. Seven minus three times a number is equal to 14
   D. The sum of three times a number is 7 and 14

5. Javier is 6 inches taller than his sister Ana. Let ***h*** represent Ana's height. Which expression represents the total height of Ana and Javier?
   A. $h + 6$
   B. $6h$
   C. $h + (h \div 6)$
   D. $2h - 6$

What's My Equation? Answer Key

1. Jose and Mary both collect baseball cards. Mary has three times as many baseball cards as Jose. If the letter ***n*** is used to represent the number of baseball cards that Jose has, which expression describes the number of baseball cards that Mary has?
   A. $3 \div n$
   ✡B. $3n$
   C. $n \div 3$
   D. $n - 3$

2. Carmen lived in North Miami twice as long as Vincent. Let ***g*** represent the number of years that Vincent has lived in North Miami. Which expression shows how many years Carmen has lived in North Miami?
   ✡A. $2 \times g$
   B. $2 - g$
   C. $2 + g$
   D. $2 \div g$

3. Choose the equation represented by the following sentence:
   A number subtracted from 18 is equal to 10 divided by 2.
   A. $18 - n = n \div 2$
   B. $n - 18 = 10 \div 2$
   ✡C. $18 - n = 10 \div 2$
   D. $10 \div 2 = n$

4. What does the following math sentence mean: $3x - 7 = 14$?
   A. The difference of a number and 7 is equal to 14
   ✡B. Seven less than three times a number is equal to 14
   C. Seven minus three times a number is equal to 14
   D. The sum of three times a number is 7 and 14

5. Javier is 6 inches taller than his sister Ana. Let ***h*** represent Ana's height. Which expression represents the total height of Ana and Javier?
   A. $h + 6$
   B. $6h$
   ✡C. $h + (h \div 6)$
   D. $2h - 6$

Environmental Equations

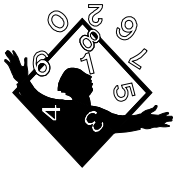
Problem	Word Equation	Algebraic Equation
How many trees are in the forest if I see 10 pine trees and an acre more?	Acre + 10 = Trees	A + 10 = T
How many trees are left after 100 are cut down from the acre?	Acre – 100 = Trees	A - 100 = T
How many trees are in 3 acres?	Acre x 3 = Trees	3A = T (The number comes first when writing multiplication without the x symbol)
How many trees will five lumber jacks get if each of them “equally shares” an acre?	Acre ÷ 5 = Trees	A ÷ 5 = T

Environmental Inequalities
-Day Two

Materials: Scales, paper lunch bags, cubes

Vocabulary:
Expression: A variable or combination of variables, numbers, and symbols that represents a mathematical relationship.
Variable: A quantity that can have different values. A symbol can stand for a variable.
Variable Expression: An expression that represents an amount that can have different values.
Equation: A statement that two mathematical expressions are equal.
Inequality: A mathematical sentence that compares two unequal expressions using one of the symbols $<$, $>$, $\leq$, $\geq$, $=$, $\neq$

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 notes 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:

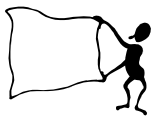
Activity One:

1. Put scales on each table (cooperative activity). Prepare bags of cubes. Students are to find out what is in the bag by using the scale.
2. Example: Table 1 gets a bag containing 4 cubes and 3 extra cubes to put on one side of the balance scale and they put cubes on the other side of the scale to make it balance (7). Now they have to figure out how many cubes are in the bag to make the equation $b + 3 = 7$. They will figure out that 4 cubes are in the bag. They write they guesses and corrections in their Number Notepads and pass their mystery bag to the next table. (The students may discover that the bag weighs something. How will they take account of this.)

Activity Two:

1. Now have students create inequalities with their cubes and bag.
2. Example: Table 1 again gets the bag with 4 cubes. They put 1 cube on the other side and write an equation for this situation. $B \neq 1$ or B> Do not tell students how to do this. They should be able to brainstorm an equation with their team.
3. Share their answers. Have students who came up with the $<$ or $>$ explain their meaning to those who have forgotten.
4. Continue by rotating the bags.

Explain More: Check to see that students are comfortable with the signs ($=, \neq$ and $<, >$) Make a note of students who are using the signs incorrectly. Observe the conversation at the tables. Are students using mathematical vocabulary? Are they taking turns? Are they recording their guesses and answers in their number notepads?



Points on a Line
-Day Three-

Materials: Number line, Post it notes, Points on a Line, projector

Vocabulary:
Expression: A variable or combination of variables, numbers, and symbols that represents a mathematical relationship.
Variable: A quantity that can have different values. A symbol can stand for a variable.
Variable Expression: An expression that represents an amount that can have different values.
Equation: A statement that two mathematical expressions are equal.
Inequality: A mathematical sentence that compares two unequal expressions using one of the symbols $<$, $>$, $\leq$, $\geq$, $\neq$
Multiple: The product of a whole number and any other whole number.

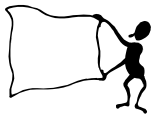
Think More: Brainteasers

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 notes 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. Display number line across the front of the room. Students draw a number line in their Number Notepads from 0 to 20.
2. Display the inequality $x \leq 10$.
3. Ask students to identify what numbers x could be. (0-10)
4. Have students come up to the number line and put a Post-it note on a number that could be correct.
5. Now write this on the board: x = an even number.
6. Students now have to eliminate some numbers. Have students come up to the number line and take off the Post-it notes that would not work for x. Have them explain why they took off the numbers.
7. Now write: x = a multiple of 3. There will now be only one answer: x = 3. Make sure the student who answered this correctly explains what a multiple is.
8. Continue working with the number line and inequalities from the Points on a Line that is projected.

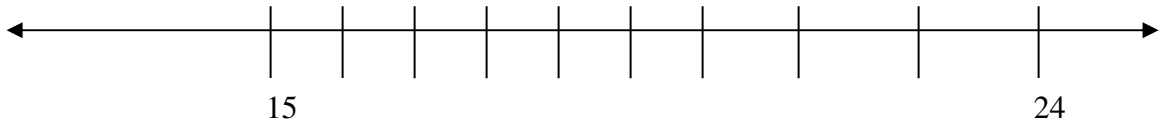
Explain More: Students should be familiar with the symbols and terms. Take anecdotal notes on student conversations. How easily are they manipulating the numbers when they hear the clues and see the symbols?



Points on a Line

1. You must be a t least 18 years of age to vote. Display this inequality in algebraic terms. Complete the number line that could represent the inequality.

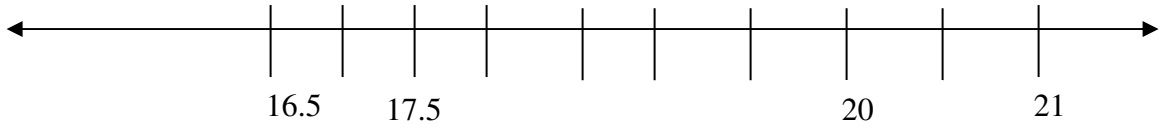
   Algebraic inequality _____



2. Look at the inequalities below.

   $N \geq 17.5$ *and* $n \leq 19$

Complete the number line that n could represent to make the inequality true.



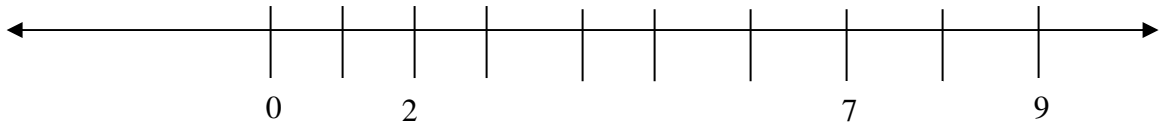
3. If $n \geq 17.5$ which of the following pairs of numbers could both be n?

   a) 16.5 and 19
   b) 17.6 and 18.3
   c) 17 and 18.4
   d) 17.1 and 19.5

4. Look at the inequality shown below.

   $N < 8$

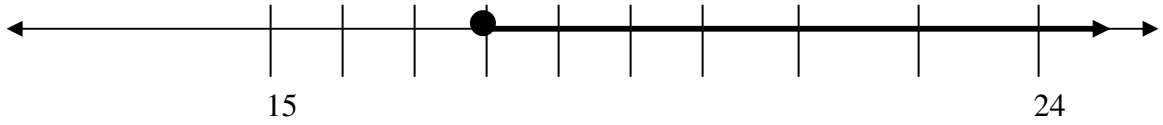
On the number line below, draw dots to show all the whole numbers greater than 0 than n could represent to make the inequality true.



Points on a Line Answer Key

1. You must be a t least 18 years of age to vote. Display this inequality in algebraic terms. Complete the number line that could represent the inequality.

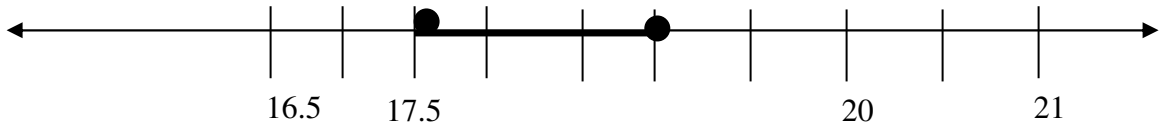
   Algebraic inequality $n \geq 18$



5. Look at the inequalities below.

   $N \geq 17.5$ *and* $n \leq 19$

Complete the number line that n could represent to make the inequality true.



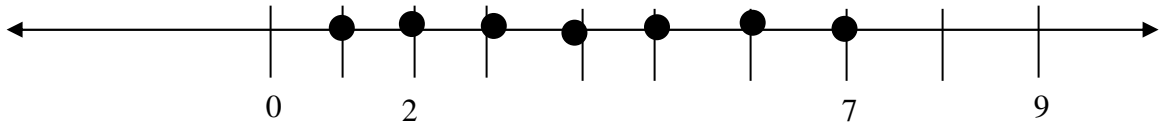
6. If $n \geq 17.5$ which of the following pairs of numbers could both be n?

   b)17.6 and 18.3

7. Look at the inequality shown below.

   $N < 8$

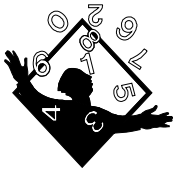
On the number line below, draw dots to show all the whole numbers greater than 0 than n could represent to make the inequality true.



Pattern Dots
-Day Four-

Materials: Dot worksheet
Vocabulary: Review this week's vocabulary.

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 notes 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: Dot Patterns (see attachment)

1. Put the dot pattern transparency on the overhead. Instruct students to continue this pattern.
2. Now try this with square pattern blocks. Direct students to use the square pattern blocks to build larger and larger squares. Have them record their results using drawings and a table. Have them describe the pattern.
3. Repeat this activity with triangles.

Activity Two: Quilting Bee Patterns (see attachment)

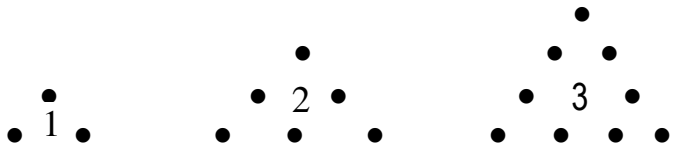
5. Follow the directions on the quilting Bee Design paper.
6. Attach each student's quilt to the class quilt bulletin board.
7. Explain how to find the 'total' number of squares in the quilt each time the class adds a new border of squares.

Explain More: Were students able to make patterns by adding the same shape around and around the original shape? How many students like to do puzzles? This could be an extra item you set out today.

Dot Patterns

Name _____

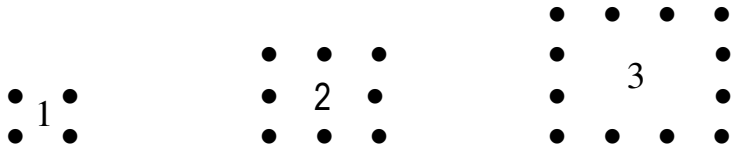
Look at the dot triangles below.



How many dots will the sixth triangle have? Look for a pattern and complete the table. Then draw the sixth triangle in the series above.

Triangle	1	2	3	4	5	6
Dots in All	3					
Dots on a Side	2					

Now look at the series of dot squares. Draw the sixth square in the series.



Look at your sixth square. How many:

dots in all? _____ dots on a side? _____

Square and Triangular Patterns

Materials

- Pattern Blocks
  - squares
  - triangles
- Centimeter paper / dot paper

Activity

- Students work in small groups
- Review the attributes of a square.
- Direct the students to use the square pattern blocks to build larger and larger squares.
- Have them record their results using drawings and a table.
- Have them describe the pattern.
- Repeat the activity using the triangles.
- **Questions to Ask**
  - What is the smallest square made?
  - How many pattern blocks does it take to make this square?
  - What is the largest square?
  - How many pattern blocks does it take to make this square?
  - What patterns did you find?
  - Did anyone use patterns to write an equation?
- **Table**

Square	Number of Tiles Used	Number of Tiles Added

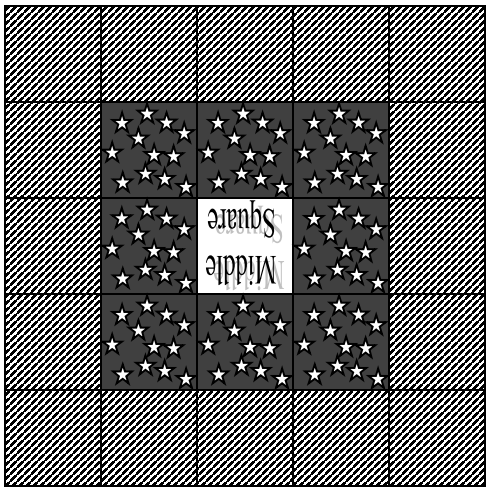
Quilting Bee

Materials

- Squares cut out of different colored constructions paper OR square color tiles
- Centimeter paper

Activity

- Students work in pairs to construct a quilt design.
  - The quilt grows larger each time a new border is added around the outside of the quilt.
- Students should complete a quilt that has 4 borders around the middle square.
- Students should complete the table.



Finish the table below to find how many squares the class will need to complete a quilt that has four borders around the middle square.

Border Pattern

Number of Borders Around Middle Square	1	2	3	4	5
Number of Squares on One Side	3	5	7		
Total Number of Squares in Quilt	9	25			

Explain how to find the *total* number of squares in the quilt each time the class adds a new border of squares.

Game Day
-Day Five-

Materials: Colorful Figures game board, cardboard, game markers
Vocabulary: Review the week's vocabulary.

Think More: Brainteasers

Select from the Math Mazes in the back of this packet. The packet contains riddles, tricks, and puzzles. Students use their number notes 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 Two: Colorful Figures

1. This activity calls for real thinking? Color the geometric shapes on the game board.
2. Color and cut out the geometric shapes on the bottom of the page.
3. Arrange the pieces on the game board so that there is one of each color and each shape in the columns going down and in the rows going across.
4. Once you get the pattern, glue in your shapes.

Explain More: What strategy did students use to figure out this problem?

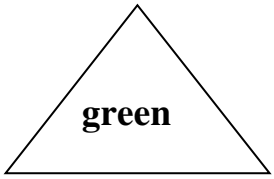
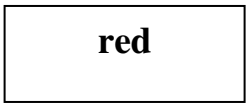
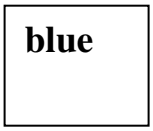
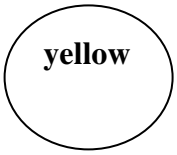
Math Mastermind!

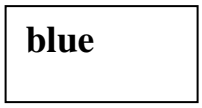
Create game boards that show strategies for critical thinking. Think of the skill you want your game to address. Gather the supplies in order to make the game. Construct all the components (e.g. board, moving markers, cards). Write the rules of the game. Play the game with your peers at your table for a test group. What did your classmates tell you about your game? Revise it if necessary. Package it attractively.

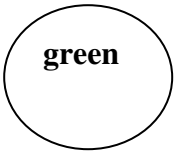
Invite neighbors to your game day or sell your game boards to other classes on a hobby day.

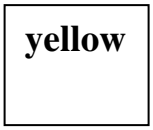
Colorful Figures

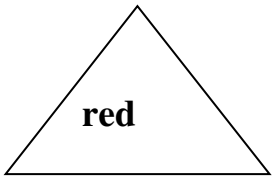
Name _____

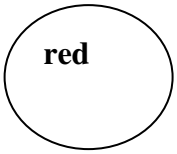
			
			
			
			

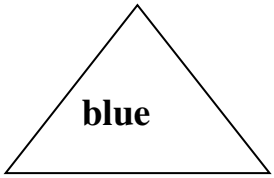


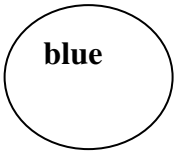


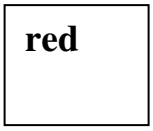


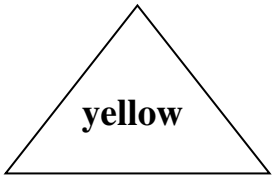












Fifth Grade
Number Sense Unit

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

Objective: At week's end, students will know that two numbers in different forms are equivalent or non-equivalent, using whole numbers, decimals, fractions, mixed numbers, and percents.

Literature Connections: Arithmetic Pie by Babs Bell Hajdusiewicz
Pezzettino by Leo Lionni
Gator Pie: by Louise Mathews

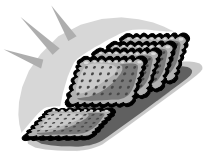
Materials: Parent Letter

Teacher Resources: Imagine Schools Curriculum Guide

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 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.



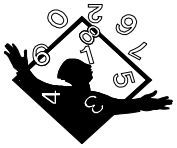
Culminating Project:
"Crunchy Calculations"

Butterfly Place Value
-Day One-

Materials: projector

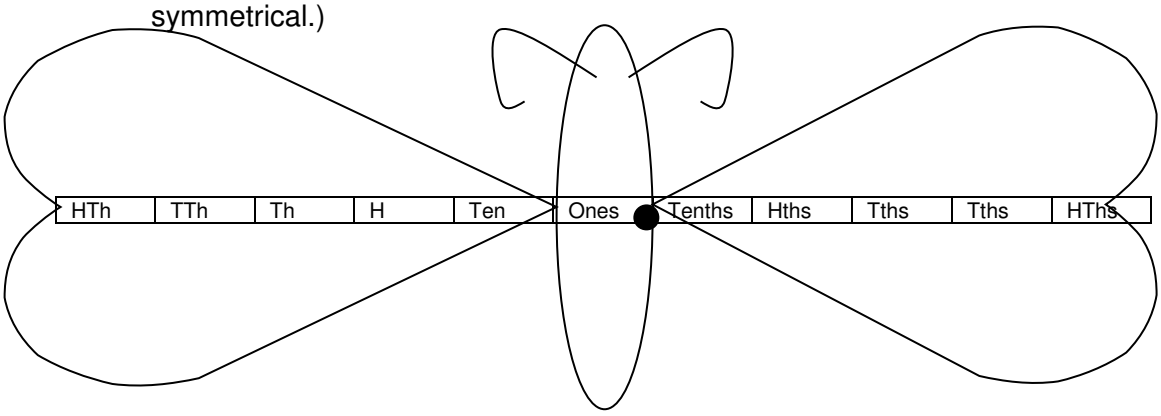
Vocabulary: Fraction: A way of representing part of a whole or part of a group by telling the number of equal parts in the whole and the number of those parts you are describing.
Decimal: A number written using base ten. A number containing a decimal point.
Decimal Point: A dot separating the ones and tenths places in a decimal number.
Percent: A special ratio that compares a number to 100 using the symbol %. The word percent means hundredths or out of 100.

Think More: Brainteasers
Select from the Math Mazes in the back of this packet



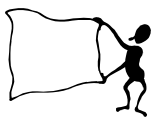
Solve More: Activity One:

1. Create decimal place value butterflies.
2. Take a piece of construction paper and fold it in half.
3. Cut out one side of a butterfly.
4. Open up the paper and make a body section down the middle.
5. Label that section the ONES
6. Make 5 columns through the left wing and 5 columns through the right wing.
7. Label the columns. Do the children notice anything? (Each column is symmetrical.)



8. Decorate and display.

Explain More: Could children follow directions? Could they do this without a model?



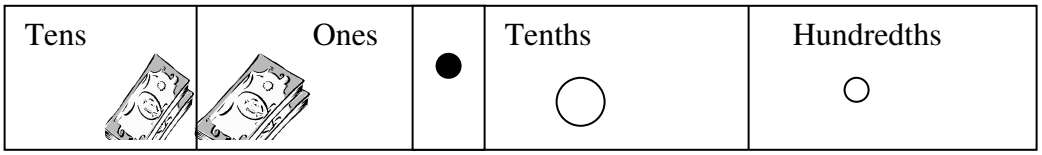
Decimal Dollars
-Day Two-

Materials: Money manipulatives (dimes, dollars and pennies), place value grids
Vocabulary: Review Day One's vocabulary.

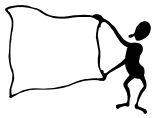
Think More: Brainteasers
Select from the Math Mazes in the back of this packet

Solve More: Activity One:

1. Ask students what fractions and decimals have in common? (They are both less than one.)
2. Tell students that today they will be working with 'rich' decimals. Tell students that they can think of money to help them understand decimals and their place values.
3. $1.00 will equal one whole, a dime will equal a 10^{th} of the whole because it takes 10 of them to make a whole and a penny will equal a 100^{th} of a whole. Ask students why that would be the case.
4. Lay the hundreds grid on the dollar, the 10 strip on the dime and the single cube on the penny. Count out the strips to double check our calculations.
5. Make a flip book with the money value on the cover and the decimal value underneath the flip.



Explain More: How are students working together? Is everyone is participating?



Decimal Speaking
-Day Three-

Materials: Number Notepads
Vocabulary: Review the week's vocabulary

Think More: Brainteasers
Select from the Math Mazes in the back of this packet

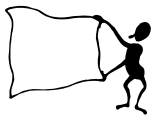
Solve More: Activity One: Reading and Writing Decimals

1. Teach students how to read fractions. Say *and* when you come to the decimal point.
2. Students line up in two lines facing the board. They are going to have a team board race.
3. The teacher says a decimal and the two students in the front of the line proceed to the board and write the number. If they are correct they go to the end of their line, if they are incorrect they sit down.

Activity Two: Make up a Decimal Rap

1. Students take the rules for decimals and put them in a rhyming chant.
2. Students perform their chant for the class.

Explain More: How are students working together? Is everyone is participating?



Percent - ally
-Day Four-

Materials: Pipe cleaners
Vocabulary: Review the week's vocabulary

Think More: Brainteasers

Select from the Math Mazes in the back of this packet

Solve More:

Activity One: Pipe Cleaner Percents

1. Ask students to remind you how much a penny stands for when using base ten. (100 because 100 pennies make a whole). Tell them that percent means per hundred. If they can remember that 100 = cent, so percent = per 100.
2. The symbol for percent is made up of 100 also.
3. Have students make a percent sign out of pipe cleaners and glue a paper penny behind each bend.
4. Percents represent number in the 100ths place.

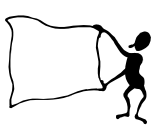
Activity Two: Conversions

1. Draw a tic tac toe frame on the board.
2. Put Fraction, Decimal, and Percent in the squares.
3. Have students stand a few feet back and toss a beanbag (or soft ball) at one of the squares.
4. Pick a card from a pile with any of these types of number clues:
   7 out of100, 33 out of 100, 61 out of 100 and so on.
5. Students must write on the board the correct way to show their number depending on where their bean bag hit.
6. For example: if they hit the word decimal with their bean bag, they would have to write 7 out of 100 as .07, a percent would be 7%

Activity Three: Flying Fractions

1. Students construct 2 different paper airplanes to use in the activity.
2. They put masking tape down on the floor in four quadrants that resemble the one on the recording sheet.
3. Students fly their airplanes into the quadrant from an established marked distance.
4. Students record results on the data recording sheet (or make this sheet in their Number Notepad).
5. Students report their results in percentages, decimals and fractions.

Explain More: Are students able to see the difference in these three ways to write numbers?



Data Recording Sheet

Directions: Throw each airplane 10 times. Keep a tally of where it lands. Color the circle graph after you have counted the tallies for each color. Be ready to talk about the percent, decimal and fraction for your results.

Design One
Flight Results

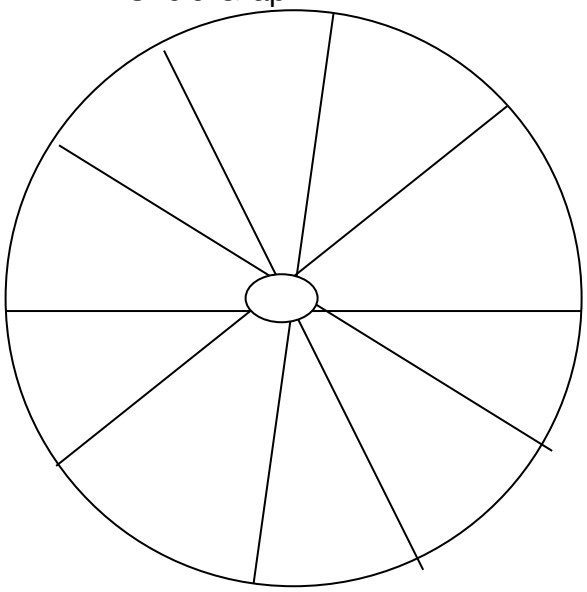
Section A
Tally & Color Red

Section B
Tally & Color Blue

Section C
Tally and Color Green

Section D
Tally & Color Yellow

Design One
Circle Graph:



Design Two
Flight Results

Section A
Tally & Color Red

Section B
Tally & Color Blue

Section C
Tally and Color Green

Section D
Tally & Color Yellow

Design Two
Circle Graph:

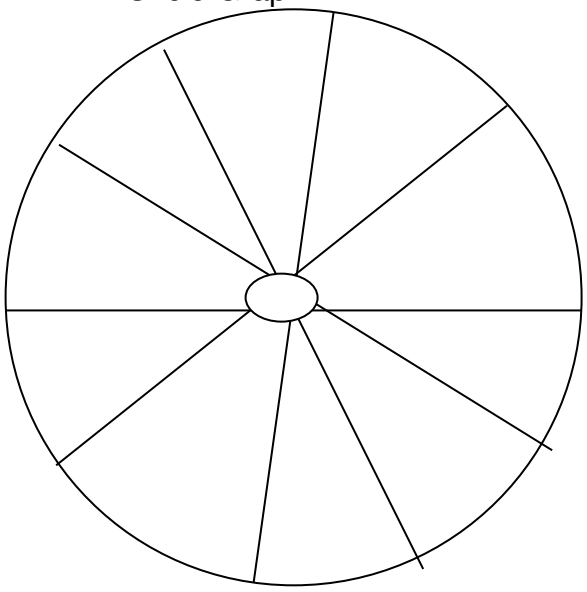


Table of Data for Test Flights

Area	Number of Landings	Total Flights (10)	Fraction	Decimal	Percent
Section A					
Section B					
Section C					
Section D					

Real World Parts
-Day Five

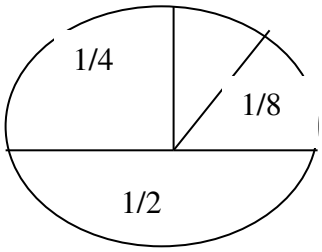
Materials: Graphs from the newspaper, bags of chips
Vocabulary: Survey: To examine a condition.

Think More: Brainteasers
Select from the Math Mazes in the back of this packet

Solve More: Activity One:

1. Students will look through the newspaper to find pie graphs that show information related to fractions, decimals or percentages.
2. Students will identify the amount of people surveyed and come up with a comparison chart that converts the fraction into the decimal into the percent.

For example:
½ of 100 would be 50% or .50
¼ of 100 would be 25 % or .25



Activity Two: Crunchy Calculations

1. Students will share different kinds of chips. They will have to count the chips and separate them into groups of 10. They will need to calculate what percent, decimal and fraction of their whole pile of chips, are a certain kind or someone's favorite. Each group needs a plan on how to relay this information to the group from their pile of chips.

Explain More: How are students working together? Is everyone is participating?

Math Mastermind! Have a Salsa Party and invite other classes. Prepare a skit on the 'Three Amigos' fractions, percents and decimals.

Fifth Grade
Game Week

Objective: At week's end, students will be able to play cooperatively with their classmates and gain mastery on basic skills and operations.

Teacher Resources: Core Math Program Games and/or Manipulatives

Materials: Parent Letter: Chess, checkers, Chinese checkers, Battleship, Monopoly, Life

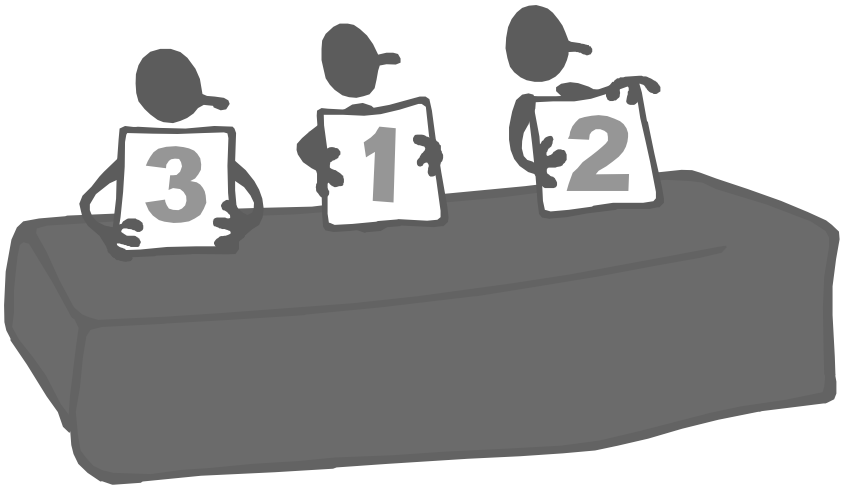
Teacher Resources: Imagine Schools Curriculum Guide

Background:
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 a gracious winner and loser, 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 where students take turns to make it around the board and some are card games where 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, and 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 and board 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 not 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.

Assessment and Communication



for the
Encore Mathematics 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 notes, interest inventory, 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 Notes	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 response. 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

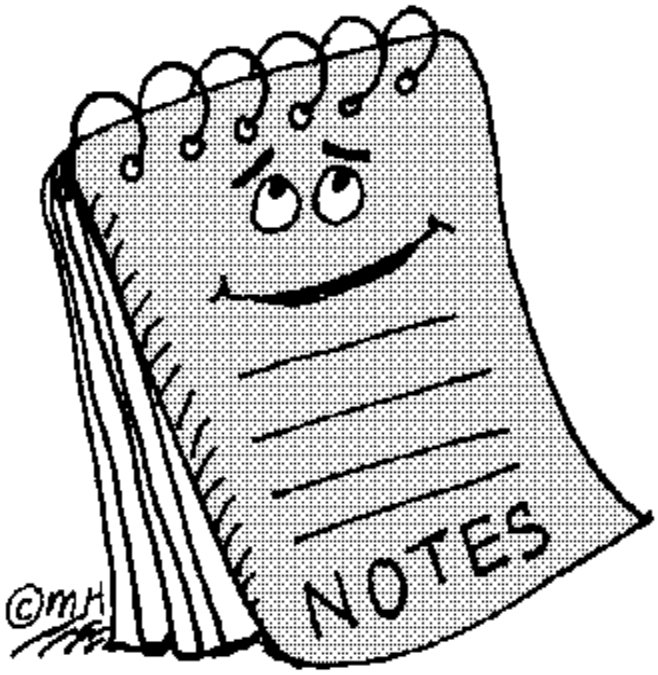
Directions: Design a rubric to assess a daily skill and/or concept you expect students to mastered in this unit.

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

Number Notepad

Students can make 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. Here is an example of a Notepad. Students can make these with regular paper and a cover sheet for each week of the program.

Number Notepad



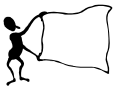
Problems Solved by _____

Think More!

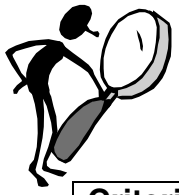
Solve Math Mazes Here:

Date_____

Explain More!



Explain Your Learning Here:



Observation Checklist

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

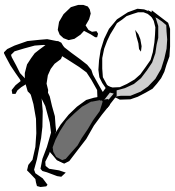


Table _____ Student's Name _____

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 Evaluation

Encore Program _____

Evaluation of Contents	Write in the earned score and total at the bottom to calculate the student's report card grade.			
	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

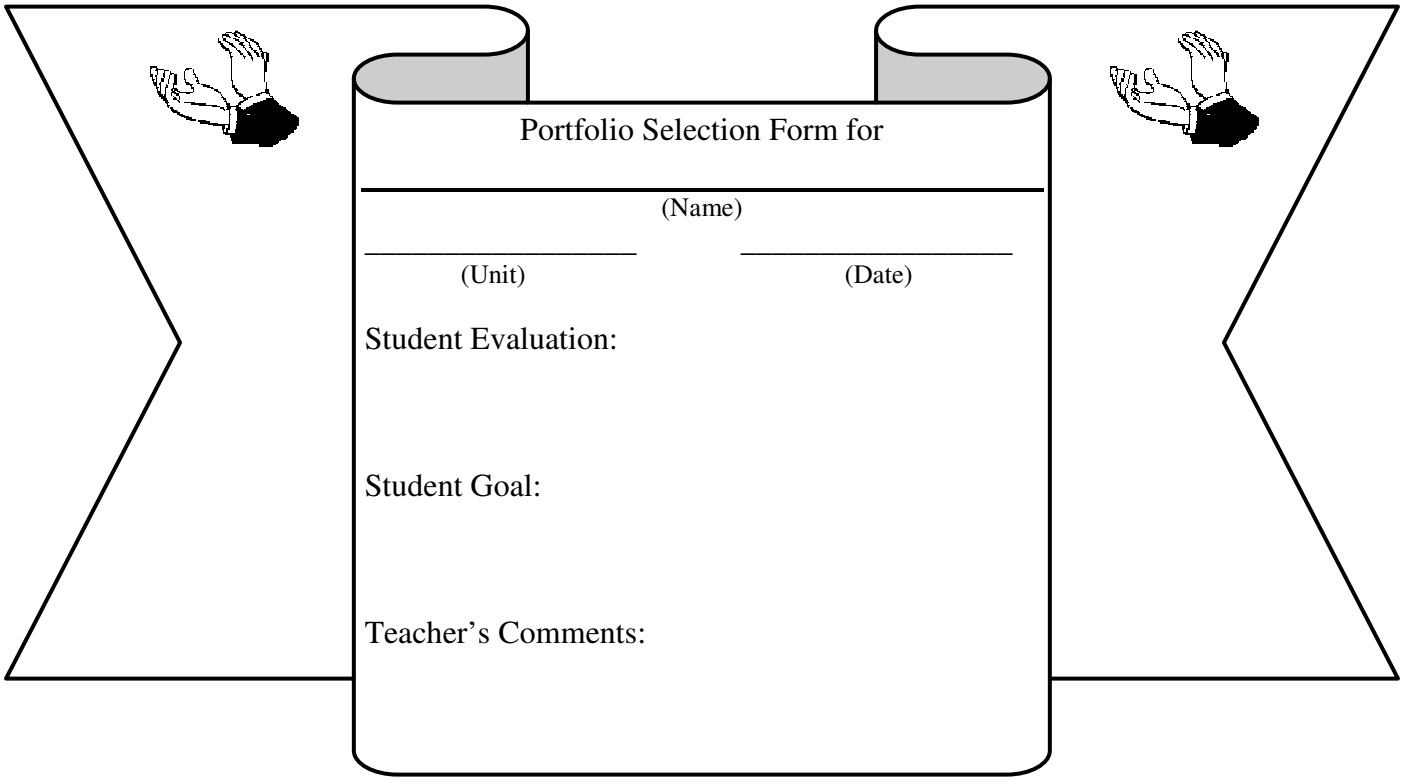
Directions: Students attach this form to the inside right hand side of their portfolio folder.

_____'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

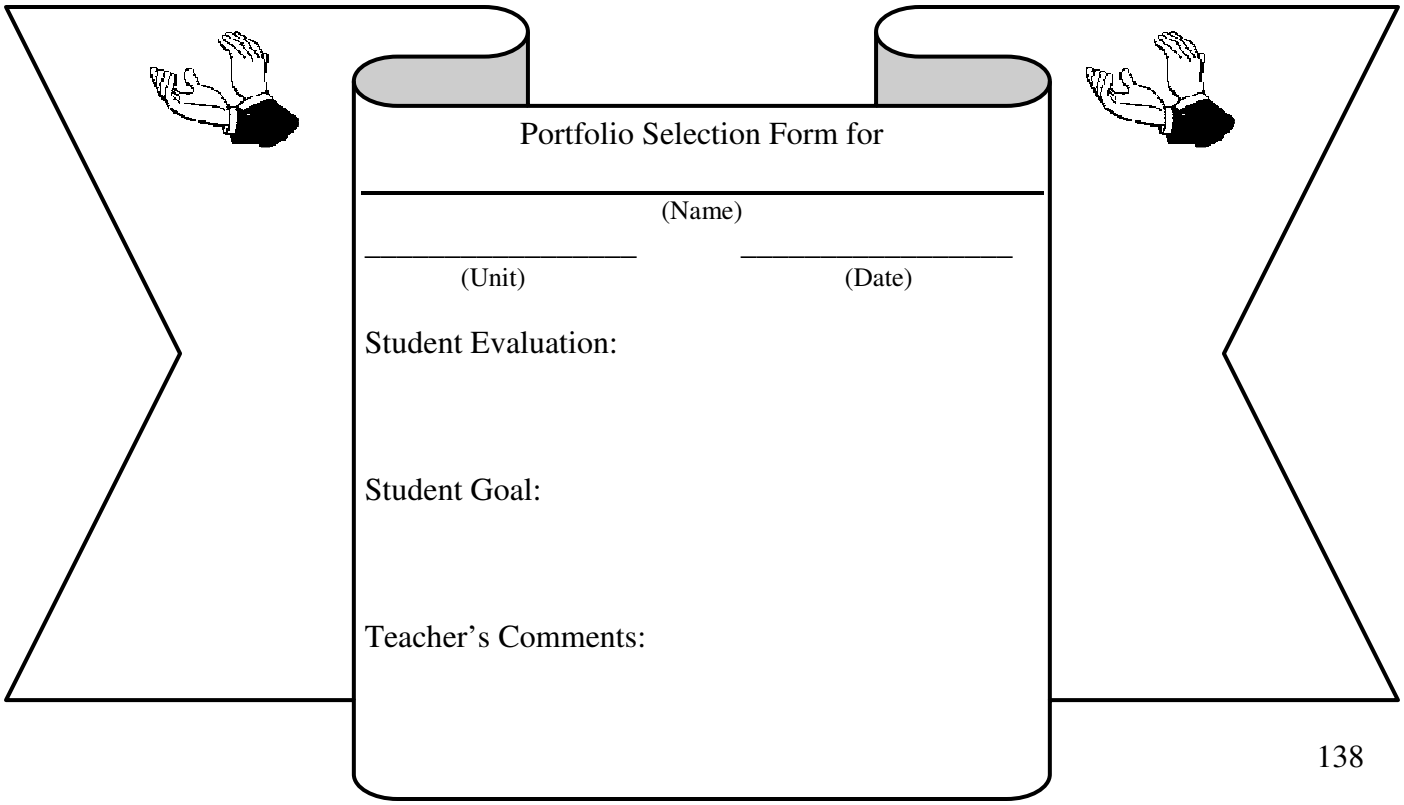
_____
(Name)

_____ _____
(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.

The thing I do best in math is……..

When I solve a math problem I feel…

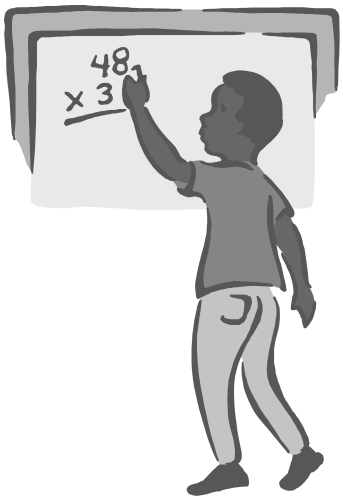
When I compete against others in math games I feel……..…..

When I work with others, 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.

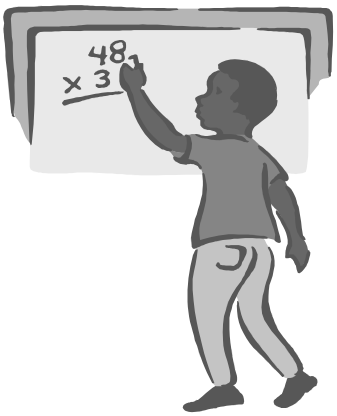
You helped our group by:

Signed by:

I like the way you:

One thing you might want to know is……..

I noticed that you ……



_____

Name of Mathematicia

Intermediate Interest Inventory

Name_____ Class_____

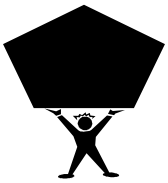
How do you feel about math?

Circle as many answers as you like.

I like to:

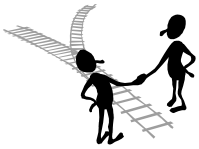
Play Games

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	2	3	4	5	6	7	8	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 Activities.

Mathematics Encore Program Parent Communication:

Dear _____,

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

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 Activities

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 Activities

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, you have enough information to know if the answer makes sense.

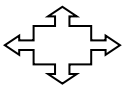
Tip: Guess and Check should not become a substitute for thinking. Use only when there is a good reason behind every guess.

Use Easier Numbers (2, 5,10)

Big numbers may discourage students. Have them rewrite the problem with friendlier numbers. Use "Easier Numbers" by changing confusing numbers, substituting 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 material's 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 zip lock 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 situations 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 2 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 inventory 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 members might have:

- Recorder: Writes the group answers, summarizes discussions, and may be the person who requests the teacher's 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 winner 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, and 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 and board games.

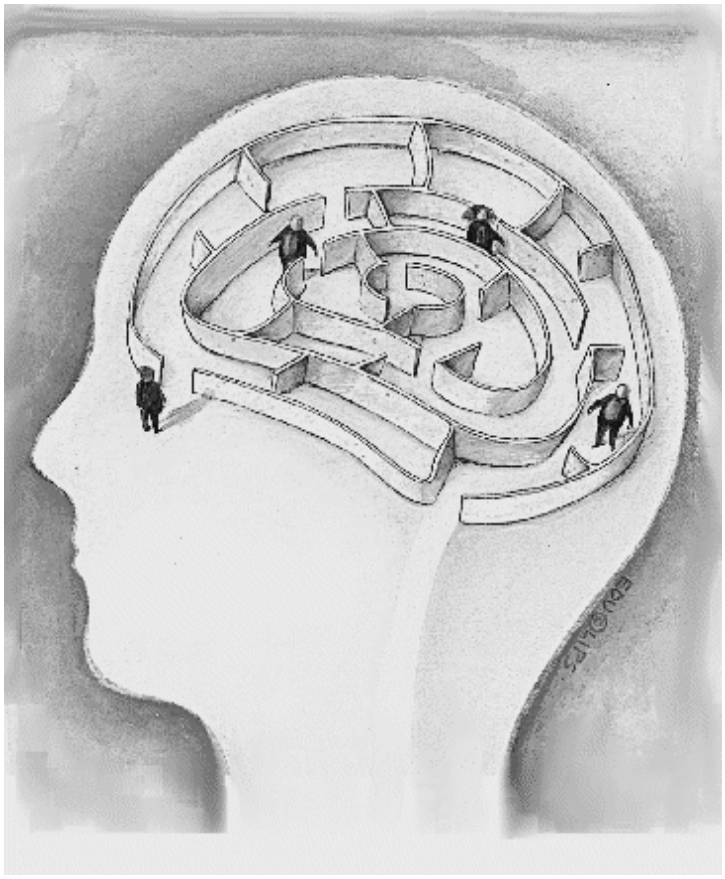
    Teachers should select games to be used according to the needs and levels of the students. The focus of the game should be on the skill being practiced rather than winning or losing. Students need to be aware of the purpose of the game, the rules of the game, and the appropriate way to conduct themselves 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.

Resources

For the Encore Mathematics Program

Math Mazes



A Intermediate 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 shown on a 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), and then *share* their answers with the class (for 5 minutes). These are fun and not meant to be lessons in reviewing skills, but rather in critical thinking and problem solving.

Geometry

Algebra

Number Sense

Time

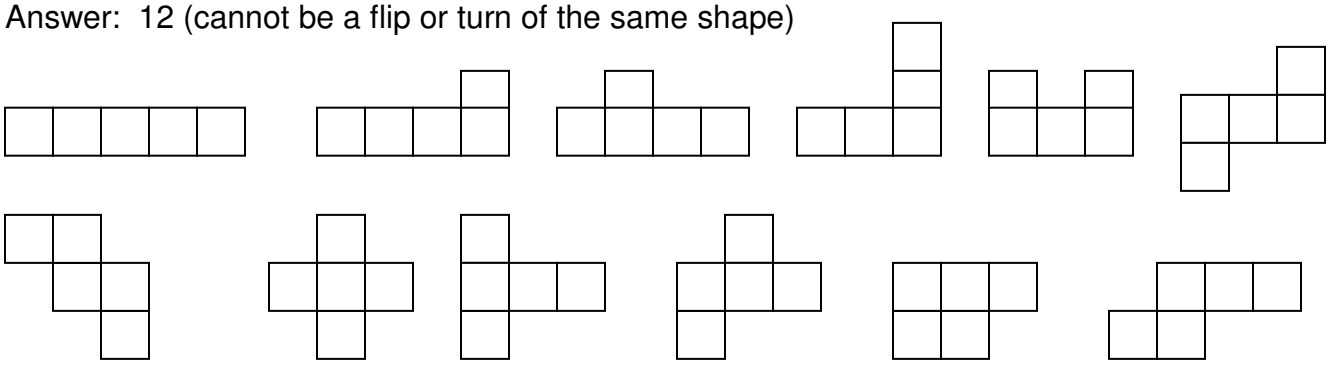
Geometry

Graph Paper Challenges

- Students use graph paper to solve these puzzlers.

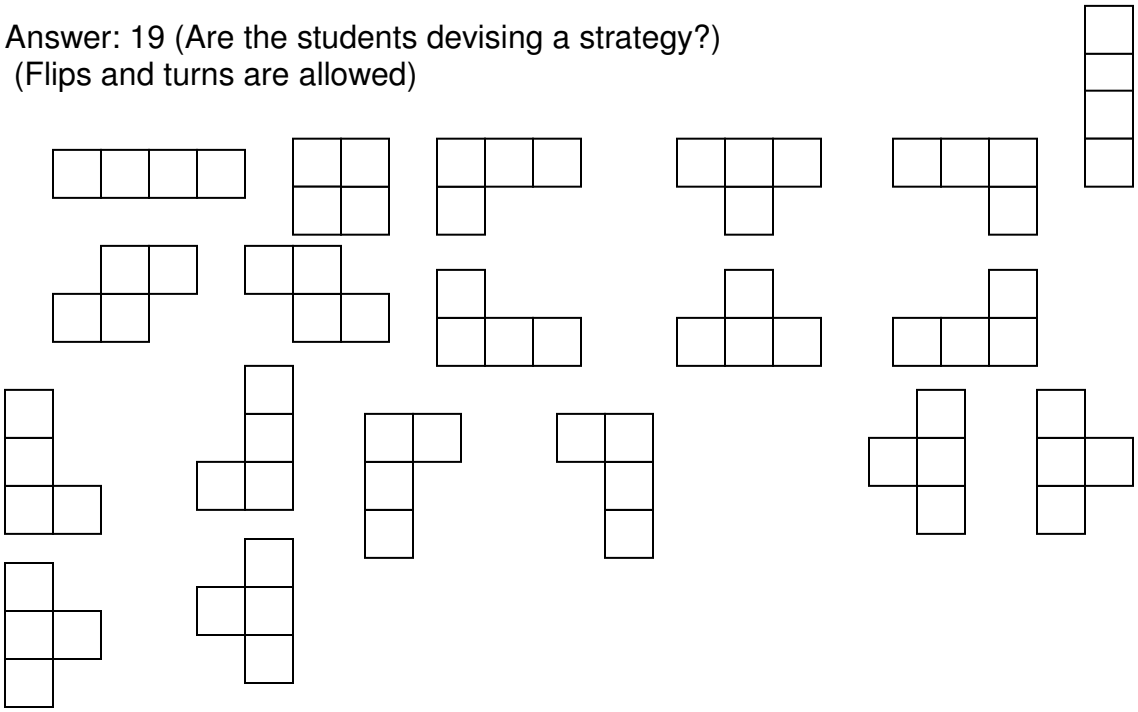
1. Use the graph paper to draw all the different pentominoes (a set of squares connected side-to-side, not corner to corner) that can be made by connecting five squares. How many can you create?

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



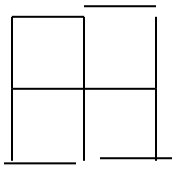
2. Draw all the ways you could buy four attached stamps.

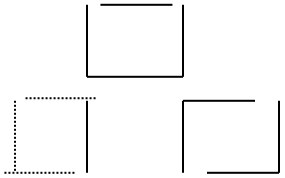
Answer: 19 (Are the students devising a strategy?)
(Flips and turns are allowed)



Using Toothpicks:

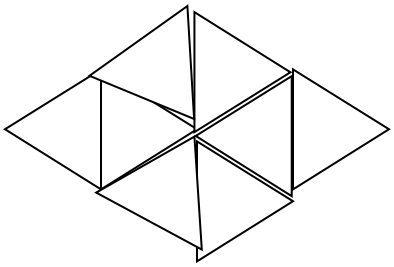
1. Make this shape with your 12 toothpicks. Move 3 toothpicks to other spots to make 3 equal (congruent) squares.

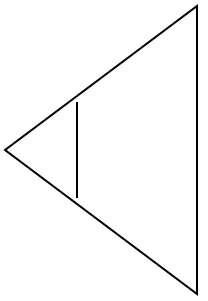




Answer: dotted lines are the moved toothpicks

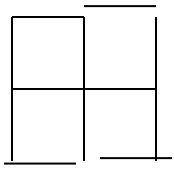
2. Remove nine toothpicks to get 2 triangles. They are not congruent.

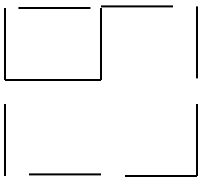




Answer

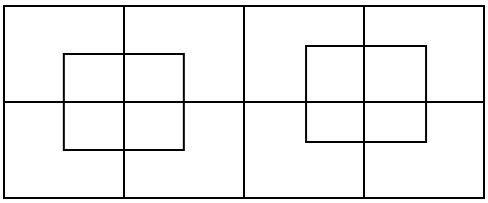
3. Take away two toothpicks to leave 2 squares. (They are not congruent).





Pattern Shape Puzzlers

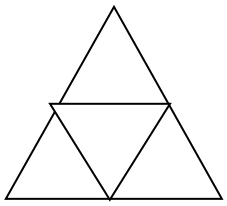
1. How many squares are in this figure? Answer: 21



2. Move one toothpick to make a true statement. Answer: VI + IV = X

   V + IV = IX

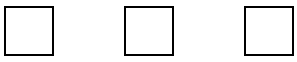
3. How many triangles are there? Answer: 5 (4 small and 1 large)



4. Move one toothpick to make this sentence true. Answer: III + II = V

   II + II = iV

5. Take away 1 toothpick, move some others and leave 1.



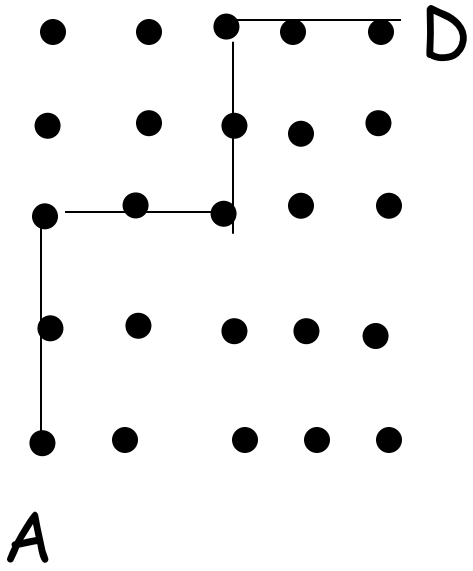
Answer: O N E

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



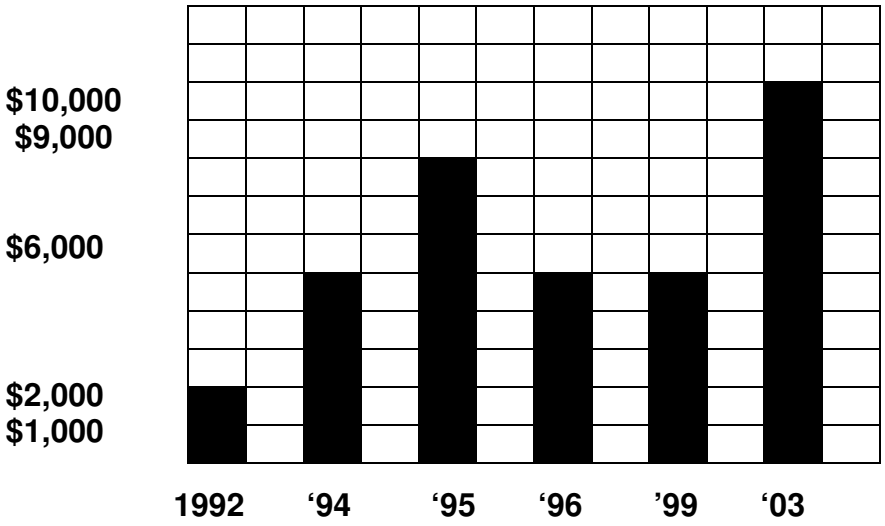
Write your own problems. Use lower numbers to make it easier or higher numbers to make it harder.

1. In a school election, 520 students voted. Bob received half the votes. Tim received one fourth of the votes. Mary received 130 votes.

2. An 8 oz. jar of pickles costs $0.98. A 16 oz. jar of pickles costs $1.49.

3. House plants are on sale at 3 for $10.00 or $3.99 each.

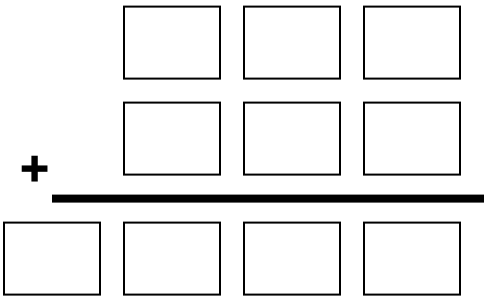
Use the graph to make up some word problems of your own.



Write your own word problem for the equations.

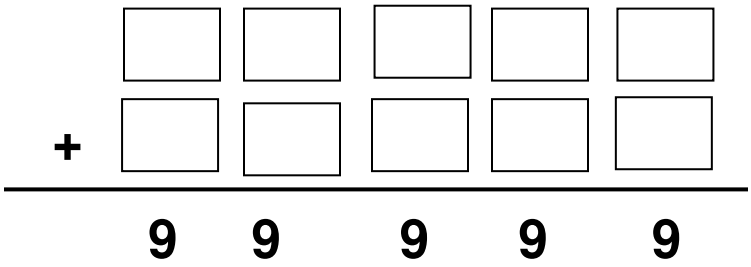
1. Use numbers 0-9 to make a true equation. Do not use 0 in the thousand column. Can you find 10 solution sums?

Answers: 1089, 1602, 1206, 1098, 1503, 1205, 1053, 1035, 1062, and 1026



2. Use numbers 0 – 9 to make an addition problem in which the sum is 99,999.

Answer: There are over 1,900 possible solutions.



Can you keep up? Students will solve multiple problems in this section. Leave out some of the steps to make a problem easier or add some steps to make the problems harder.

1. Take the number of fingers on one hand. Multiply by the number of nickels in a quarter. Add the number of players on a baseball team. Add the number of centimeters in a meter.

Answer: 5x5+9+100=134

2. Take the number of oranges in a dozen. Add the number of inches in a yard. Subtract the number of months in a year. Divide by the number of quarts in a gallon.

Answer: (12+36-12)/4 = 9

3. Take the number of sides in a triangle. Multiply by the number of minutes in an hour. Divide by ½ dozen. Subtract the number of blackbirds baked in a pie. Add the number of wheels on a bicycle.

Answer: (3x60)/6-24+2=8

4. Take the number of hours in a day. Divide by ½ dozen. Multiply by 2 pairs. Subtract the number of noses you have. Add the number of strikes to be "out" in baseball.

`Answer: (24/6) x 4 –1 +3 =18

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

7. What kind of tires do math teachers put on their cars?
   Answer: Multi--ply—tires

8. What do geometry teacher do when they travel?
   Answer: Fly planes

9. Where do math teachers shop?
   Answer: At deci-malls

10. What is the favorite food of math teachers?
    Answer: Math potatoes

11. What do you call a leg perpendicular to a foot?
    Answer: Right ankle

12. Why was the right angle in the triangle smiling?
    Answer: It was beside a (a)cute angle!

Can you figure it out? If you can't explain it, tell why.

1. A hunter proudly said that he returned with 27 heads and 78 feet. If he brought back only ducks and rabbits, how many of each did he have?

Answer: 12 ducks, 15 rabbits

2. Use 26 coins to make a dollar. Can you do it with 3 kinds of coins? Can you do it with 4 and 5 kinds?

Answer: 6 dimes, 5 nickels, 15 pennies
1 quarter, 2 dimes, 8 nickels, 15 pennies
Can't do with 5 coins

3. Use the number 0-9 so each row and column totals 22 (not diagonals).

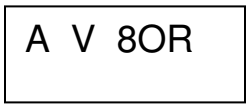
		7	
	7		4
8			
	9		8

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

License Plates

You probably have noticed some of the personalized license plates on cars. Some might give you information about the driver's career. In this activity, your group will brainstorm to think of license plates that tell about a person's job. You may use a total of seven letters, numbers, or spaces. You have five minutes to brainstorm. You will then have two minutes more, and at the end of the time you should have all the license plates designed.

For Example:



Look at these jobs and try to think of license plates for someone with each job. For extra credit, make up one of your own.

Mechanic (MRFIXIT)

Dentist (DRILL-R)

Policeman (IAM4LAW)

Exterminator (BUGSRUS)

Golfer

Photographer

(UP2PAR) (SAYCHEEZ)

Musician (DOREME) Principal (KIDPAL)

What do these license plates spell?

H8-2-W8 GETINL9

C-UL8TR W8-4-ME

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!

6. If you stand on the scale with both feet and weigh 75 pounds, what will you weigh standing on the scale on only foot?

   Answer: 75 pounds

7. If an empty barrel weights 20 pounds, what can you put in that barrel to make it weigh less?
   Answer: Holes, so something in it runs or falls out causing it to weigh less.

8. Why is a giant's hand only 11 inches long?
   Answer: One more inch and it would be a foot.

9. Do you know how many feet are in a yard?
   Answer: It depends upon how many people are standing in the yard.

10. If you take 5 coins from a piggy bank containing 17 coins, how many coins would you have?
    Answer: The 5 coins you took.

11. Bozo has 2 coins in his pocket that total 15 cents. One coin is not a dime. What are his two coins?
    Answer: A dime and a nickel. One coin is not a dime, but the other one is.

12. Decide which is worth more – a new ten dollar bill or an old one?
Answer: A new ten dollar bill is worth 9 dollars more than the old ONE.

13. How much money would you have if you had 2 female pigs and 2 male deer?
Answer: Two sow n' bucks ($2,000 bucks)

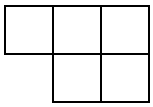
Using Tangrams

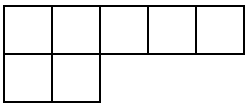
1. All 26 letters of the alphabet can be constructed with the seven tangram pieces. Use all seven pieces to form a letter. How many other letters can you make with the pieces? Trace them in your Number Notepads.

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

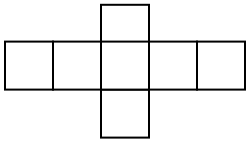
Graph Paper (inches)

1. Use any number of squares to make a figure with a perimeter of 20 inches.

Possible answer: 

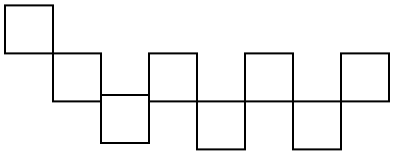
2. Use any number of squares to make a figure with a perimeter of 28 inches. 

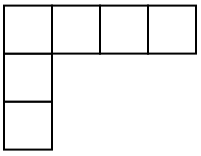
3. Use 7 squares to make a figure with a perimeter of 32 inches.

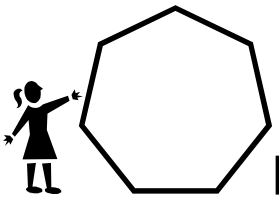


4. Use 7 squares make a figure with the greatest perimeter possible.

Answer: 56 inches



5. Use 6 squares to make a figure with a perimeter of 28 inches. 



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 a multiple of 5)
4. 16, 8, 18, 11 (Possible answer: 8 is not between 10 and 20)
5. 112, 22, 12, 104 (Possible answers: 104 doesn't have a 2)

3/7 4/6 2/5 4/9 (Possible answer: 4/6 is not in lowest terms)

2 3 5 8 (Possible answer: 8 is not prime)

Good At Math
In this activity encourage your students to think of examples of things that are "good at math" because of a word or phrase that is associated with them.

For example, cells are good at math because they can divide.

Directions: Groups should think of as many people, creatures, or objects that are "good at math" because of words associated with them. You will have five minutes to brainstorm and two more minutes to finalize your answers, and at the end of the time, you should have many ideas from your group.

Write on the board:

_____ are good at math because they _____.

Possible solutions:

Plants	take root	Fans	arrive in great numbers
Rabbits	multiply	Carpenters	build additions to houses
Actors	know their lines	Records	go around in circles
Men and women	are equal	Pills	take away pain
Center strips	divide highways	Corners	have angles
Musicians	play numbers	Ice	comes in cubes