THE LEARNING WALL

Q - S

The 3 – 5 MATH Concept Learning Bricks packet is organized alphabetically, with each concept explanation (concept, question, answer, gesture, and examples) listed first and the Concept Learning Brick visual listed behind the explanation. This section contains **36** Concept Learning Bricks from the Q - S section. Please refer to The Learning Wall Introduction and Explanation at www.PEPnonprofit.org for details on how to implement these items in your classroom.

Qq

quadrant, quadrilateral, quart, quarter, quarter hour, quotient

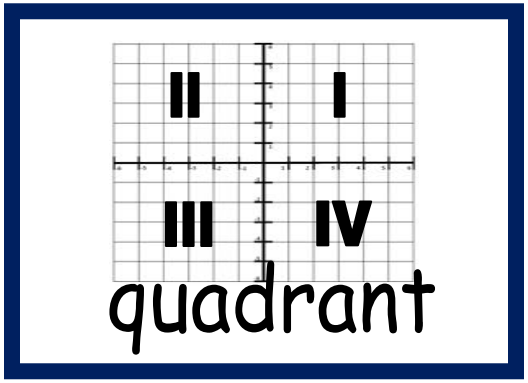
Rr

radius, range, rate, ratio, ray, reciprocal, rectangle, rectangular prism, reflection, regroup, remainder, rhombus, right angle, right triangle, rotation, rotational symmetry, rounding

Ss

scale, scalene triangle, short word form, simplest form, solid figure, sphere, square, square number, standard form, straight angle, subtraction, sum, surface area

Quadrant



Question: What is a quadrant?

Answer: A quadrant is any of the 4 equal areas made by dividing a plane by an x and y axis.

Gesture: Count out on your fingers, one, two, three, and four. Hold your arms in front of you like an X (x axis) and then over your head to form a Y (y axis).

Examples: Draw four quadrants on the playground with chalk, but do not label the four quadrants. Play a riddle game with the kids by asking, I have the coordinates (-5, 7). Which quadrant am I in? Allow students to think about the answer and then go stand in the quadrant they think is correct. You can have students create their own riddles and share with the class. Also, go to www.PEPnonprofit.org and play Coordinate Fours to extend the introduction of quadrants.

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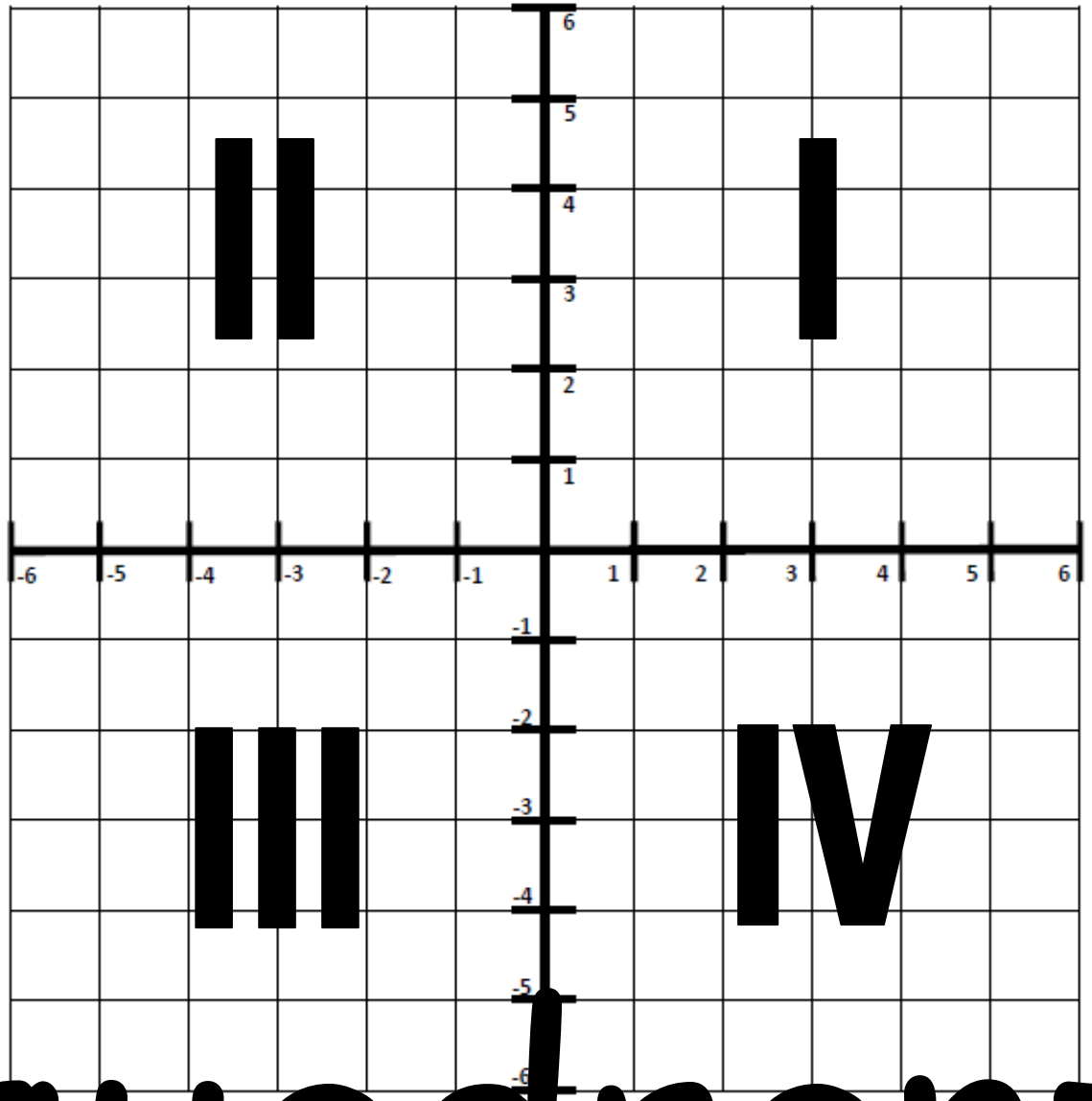


quadrant

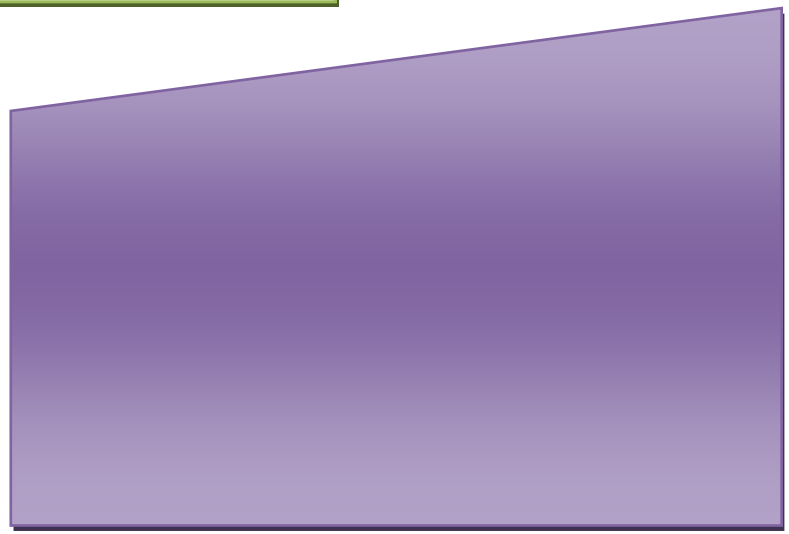
Quadrilateral

Question: What is a quadrilateral?

Answer: A quadrilateral is any four sided polygon.

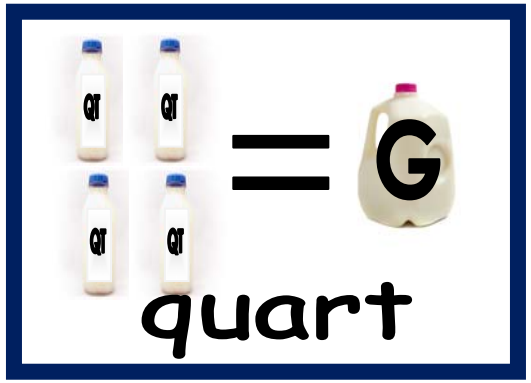
Gesture: Hold up four fingers then draw a variety of four sided shapes in the air.

Examples: Give each student a bag of geometric shapes. Allow the students a few minutes to explore using the shapes. Ask each student to divide the shapes into different categories. Each category should be distinctive. Examples are squares, rhombuses, rectangles, and parallelograms. Ask some questions like: “What does each shape in the category have in common?”, “Do your shapes have any differences?”,”Are the lines on the shapes alike or different?”, “ Are there any quadrilaterals with congruent sides?”, “Are there any quadrilaterals with parallel sides?”, and “Are there any quadrilaterals with 90 degree angles?”



quadrilateral

Quart

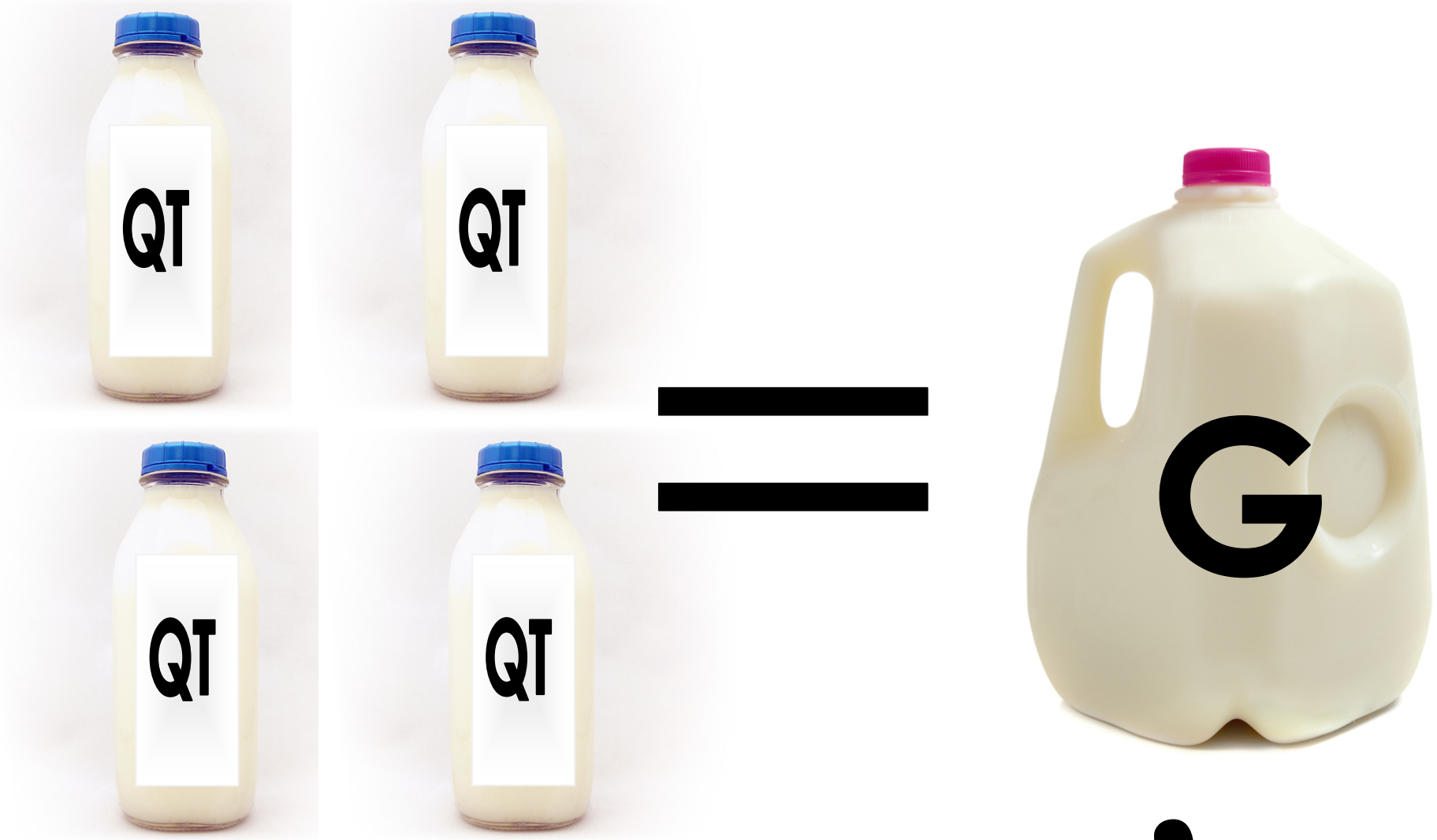


Question: What is a quart?

Answer: A quart measures 32 fluid ounces. When measuring a liquid, there are 4 quarts in a gallon.

Gesture: Touch one arm (held out perfectly straight), then the other arm, then one leg (held out perfectly straight), and finally the second leg. The four quarts, or four straight extremities, equal one gallon.

Examples: Split students into groups of 4/5 (need 4 groups). Each group should have 1 cup measuring cup, 1-quart water with measuring vessel, 1 cup sugar, 3 lemons, and a towel. Each group is going to make 1 quart of lemonade to be added to the gallon. Explain how each group is going to follow the recipe to make a quart. Ask the class, “How many groups do we have?” Then ask, “Why do you think we have four groups? Why didn’t I split you into 6 groups?”



quart

Quarter

quarter

Question: What is a quarter?

Answer: A quarter is worth 25 cents. There are four quarters in one dollar.

Gesture: Pretend to flip a coin and then hold up two fingers on one hand and five fingers on the other hand.

Examples: Show how one quarter can be written 25¢ or $0.25. Put students in groups of two or three. Give each group a cup with an assortment of coins (preferably real coins). Have the groups create money puzzle problems with their coins. For example, I have 7 coins. The total is $0.77. What are my coins? Since we are working on quarters, you must include one quarter in every money puzzle problem.

quarter

Quarter Hour

Question: What is a quarter hour?

Answer: A quarter hour is 15 minutes.

Gesture: Hold your arm straight out to the side (3 on a clock). Hold your arm straight down (6 on a clock). Hold your arm straight out to the other side (9 on a clock). Hold your arm straight over your head (12 on a clock).

Examples: On index cards, write different times, such as 9:00, 9:15, 9:30, 10:00, 10:15, 10:30, etc. You may want to add pictures of clocks with the corresponding times or give picture cards to some students and number cards to others. Then have each student draw an index card out of a box or hat. Explain to students that they will put themselves in time order without talking. You can repeat the activity using A.M. and P.M. times.

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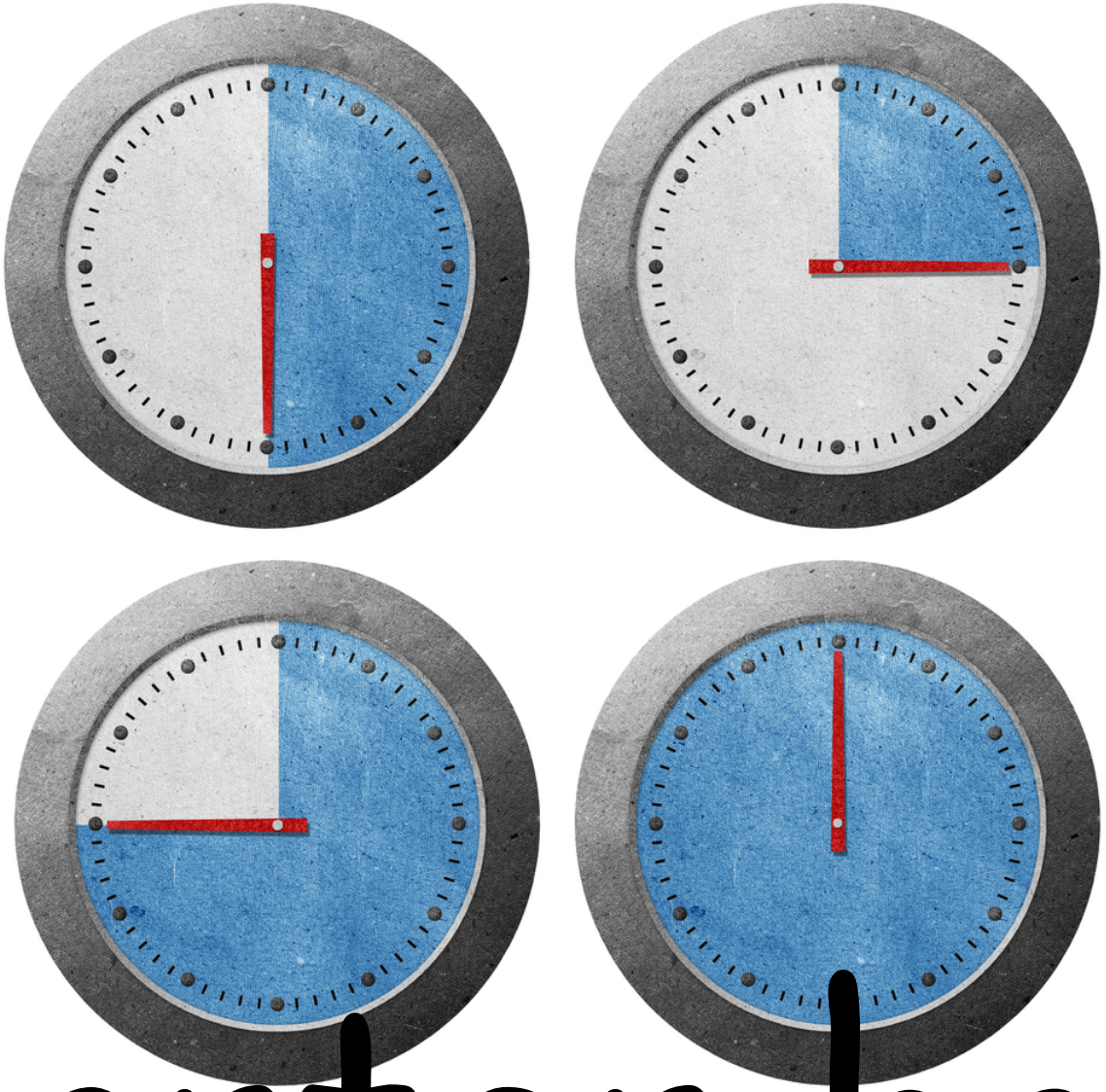
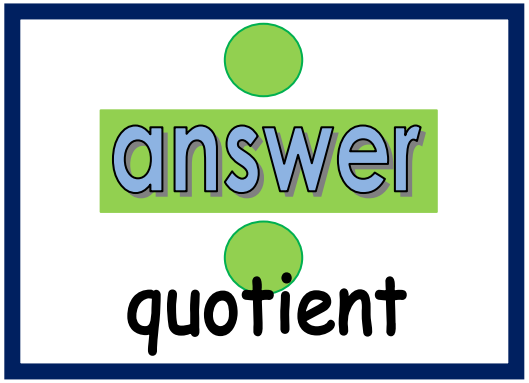


quarter hour

Quotient



Question: What is a quotient?

Answer: A quotient is the answer in a division problem.

Gesture: Hold your hands together. With one hand, pretend to pull from the other hand and distribute equal shares in front of you. (This is the same gesture as long division).

Examples: Review the parts of a division problem (divisor and dividend) for the problem: 54 ÷9 = 6. What does 6 represent for 54 ÷9? It is the quotient, but more importantly, the 6 represents the number of groups you will divide the 54 items into groups to have 9 items in each group. Give a few more examples and have kids explain with partners the quotients and what they represent for each problem.

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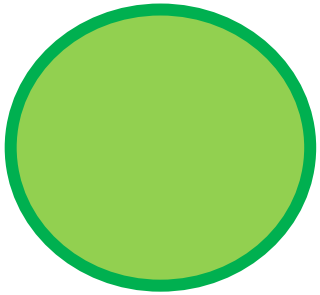
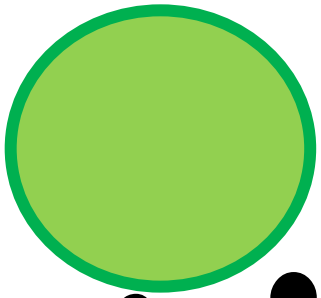
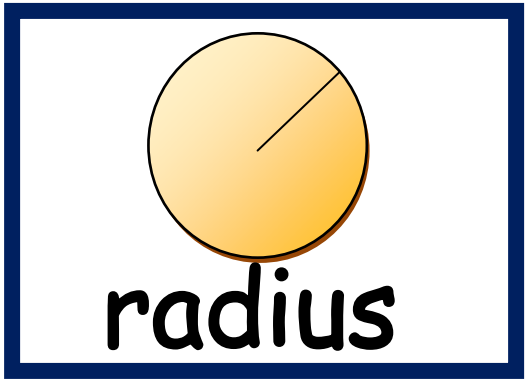


answer



quotient

Radius

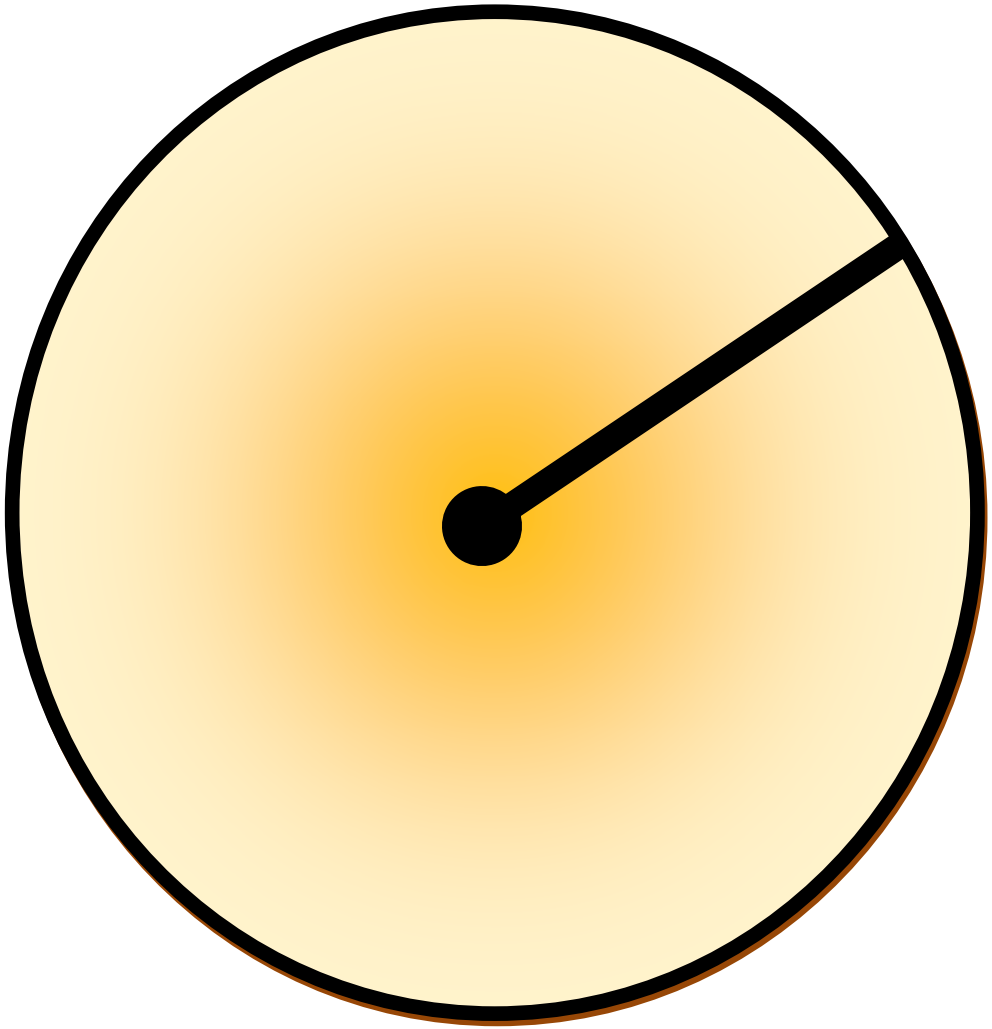


Question: What is a radius?

Answer: A radius is the distance from the center to the edge of a circle. It is half of the circle's diameter.

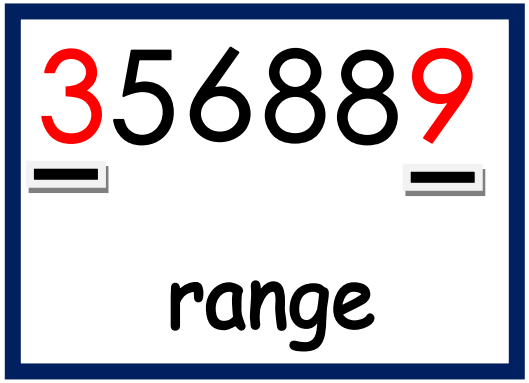
Gesture: Draw a circle in the air with your finger and then draw a line from edge to the center point.

Examples: Take a string and ask your class to stretch it right across the middle of a given circle. Cut off the excess that is hanging over the sides of the circle, if possible. Explain that the distance of that string from one edge of the circle to the other is the diameter. The diameter is the distance across the middle of a circle. Next, take that diameter string and fold it in half. That's how you show them the radius. Tell them that the radius is the distance from the center of the circle to one of the edges, and by showing them with the string, you'll help them remember that the radius is half of the diameter.



radius

Range



Question: What is range?

Answer: Range is the difference between the lowest and highest values.

Gesture: Hold one hand with your fingers close together (lowest value) and hold your other hand with fingers spread far apart (highest value).

Examples: Go to www.PEPnonprofit.org and download Acing Math: One Deck at a Time and play the M & M & Ms game. As the kids get their cards and put them in order, have them raise the lowest and highest cards and determine the range.

3 5 6 8 8 9

range

Rate

Question: What is rate?

Answer: Rate is a ratio that compares two quantities of different units.

Gesture: Point out in a direction (showing distance/miles) and then tap your wrist where you would have a watch (hour).

Examples: Rate is used in many everyday problems, such as grocery shopping, traveling, medicine--in fact, almost every activity involves some type of rate. Miles per hour or feet per second are both rates of speed. Number of heartbeats per minute is called "heart rate." If you ask a babysitter, "What is your rate?", you are asking how many dollars per hour you will be charged. The little word "per" is always a clue that you are dealing with a rate. Unit price is a particular rate that compares a price to some unit of measure. For example, suppose eggs are on sale for $.72 per dozen.
The unit price is $.72 divided by 12, or 6 cents per egg.

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rate

Ratio

Question: What is ratio?

Answer: A ratio is the relationship in quantity, amount, or size between two or more things

Gesture: Hold your two hands out like you're balancing something. Hold up some fingers (quantity, amount) and then hold your hands close to far apart (size between things).

Examples: Give your students this example: at age 12 you have probably spent 8 years in grades K through 7. There is a ratio there, namely, the ratio of "number of years in school" to "number of years in your whole life". For you this ratio is 8:12 or 8-to-12. You could simplify that to 4:6 and further to 2:3.

2 to 11

ratio

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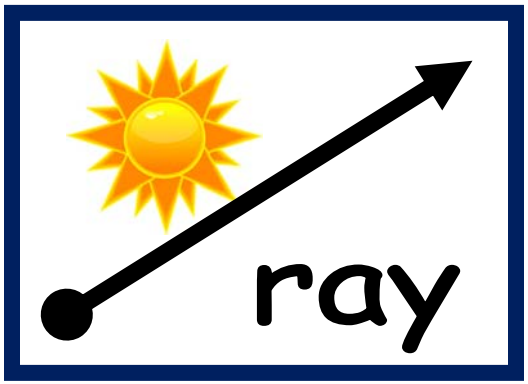
Ray

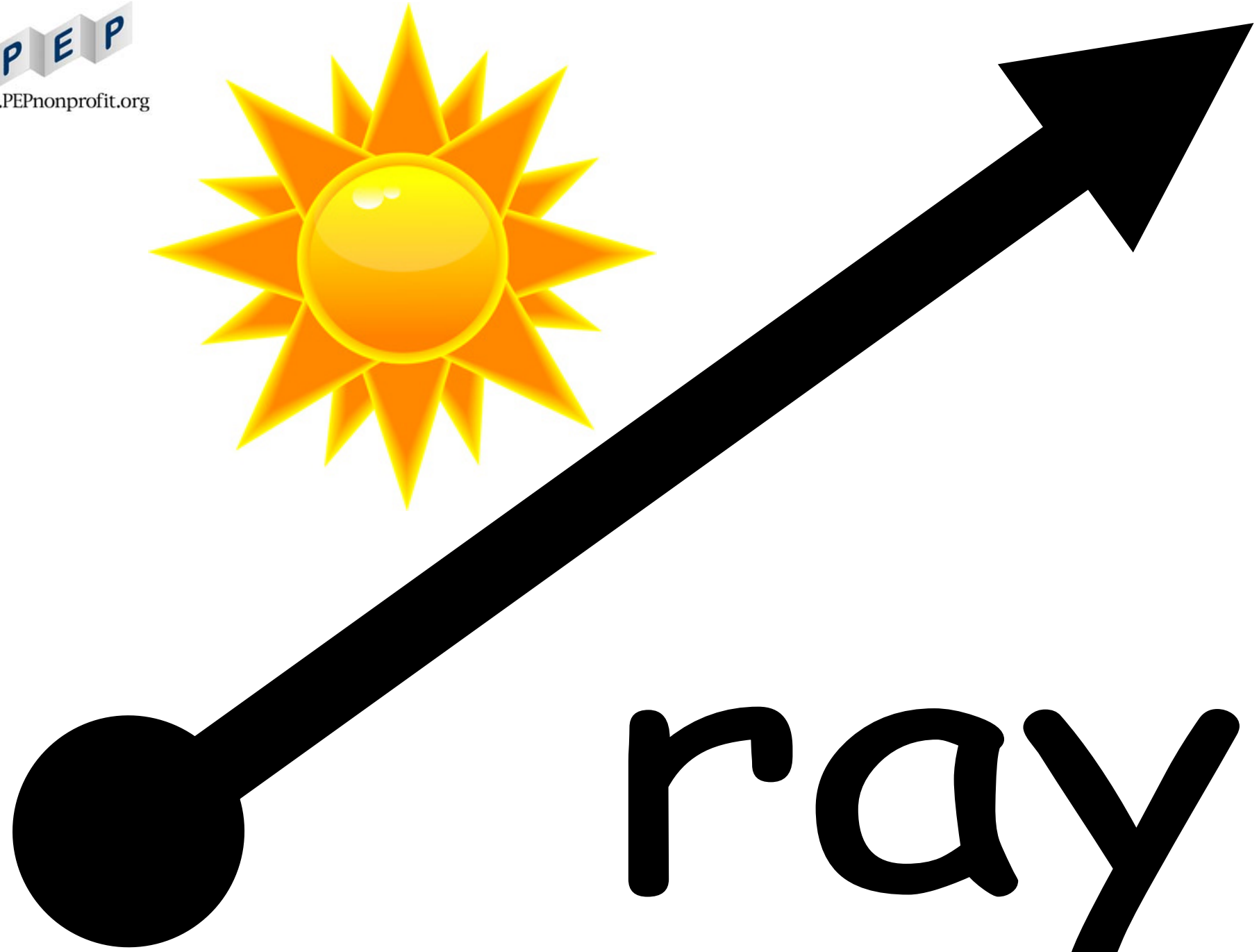


Question: What is a ray?

Answer: A ray is a line with a start point but no end point.

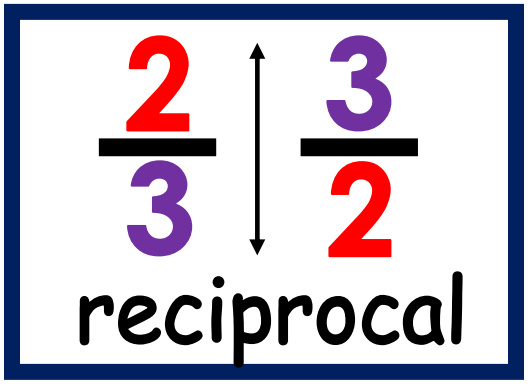
Gesture: Hold one your arm out straight. Tap your shoulder to show that is where the line starts and you are pointing out the direction of the line.

Examples: Have students construct rays by drawing a sun. Think of the sun as being in the end point and all of the sun rays (beams of light) as the lines extending from the sun. This art project will hit home the concept of rays by connecting it to something they see everyday.



ray

Reciprocal



Question: What is a reciprocal?

Answer: A reciprocal is 1 divided by a number. If you are dealing with a fraction, flip it!

Gesture: Hold your right hand directly above your left hand. Then flip your hands so your left hand is directly above your right hand.

Examples: When introducing reciprocals with fractions, have your students pair up with a single deck of cards. Name face cards and ace as follows: K=13, Q=12, J=11, and A=1. Have students shuffle up their cards and make a single pile with all of the cards face down. Have kids take two cards and make a fraction: 8/12 (8/Queen). Let the kids make the reciprocal of this fraction and reduce it to simplest form 3/2. Let the kids explore as they get comfortable with reciprocals.

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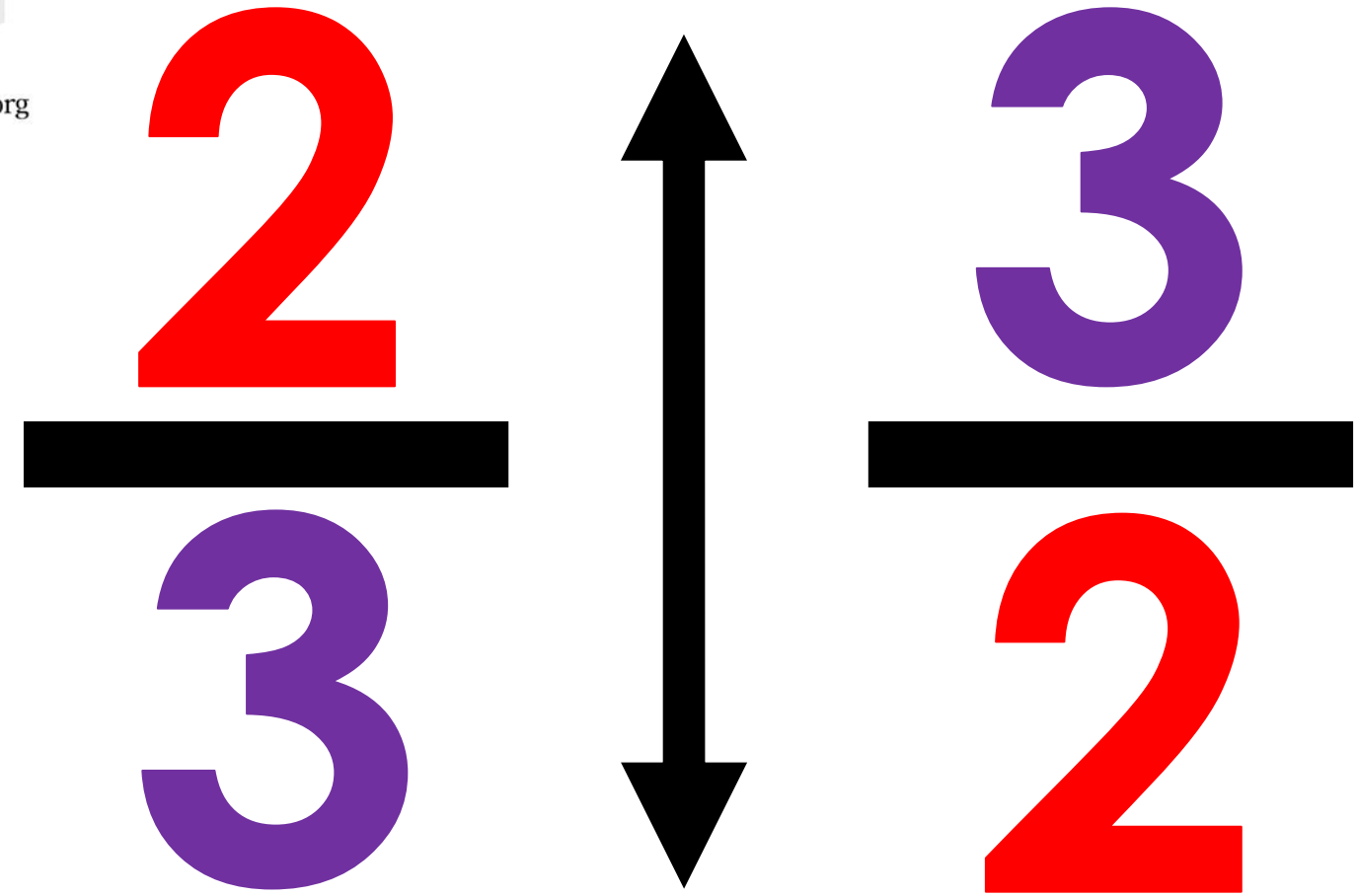
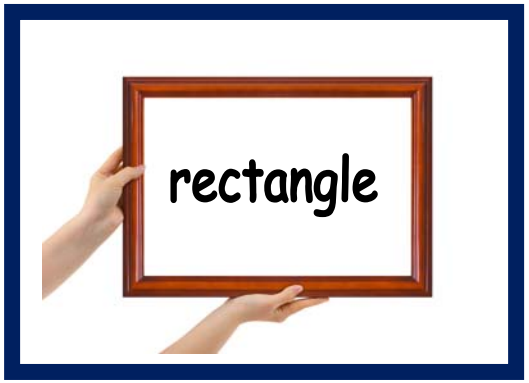


reciprocal

Rectangle



Question: What is a rectangle?

Answer: A rectangle is a four-sided polygon with four right angles and opposite sides equal and parallel.

Gesture: Draw a rectangle in the air with your finger. Hold your forearms up parallel to each other up and down. Then hold your arms parallel to each other side to side.

Examples: Have your students try to find as many examples of rectangles in your classroom. Record how many they collectively find. Now go to the play ground and see if they can find things that fit the class definition of a rectangle. Record how many they find collectively. Now have students go home and see if they can find more than what they found at school (inside and outside).

Rectangular Prism

Question: What is a rectangular prism?

Answer: A rectangular prism is a solid (3-dimensional) object which has six faces that are rectangles.

Gesture: Hold your hands a part top and bottom. Then hold them a part side to side. Finally hold them a part front and back to show the six faces of a rectangular prism.

Examples: Use building blocks of different solid shapes and have your students trace all the faces on a piece of paper. What shapes make up a rectangular prism's faces? What shapes make up a cylinder's faces? Together as a class, make a classifying map (tree map) showing how a solid figure can be broken down into its faces. This will help your students relate three-dimensional solids with two-dimensional plane shapes.

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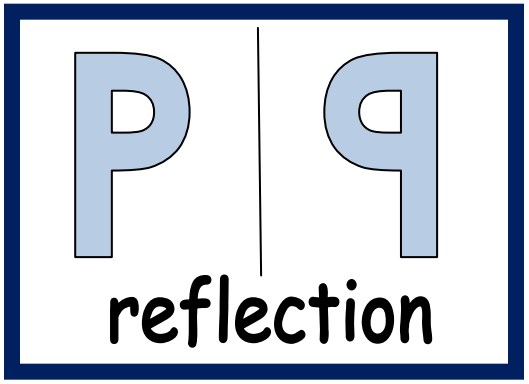
rectangular prism

Reflection

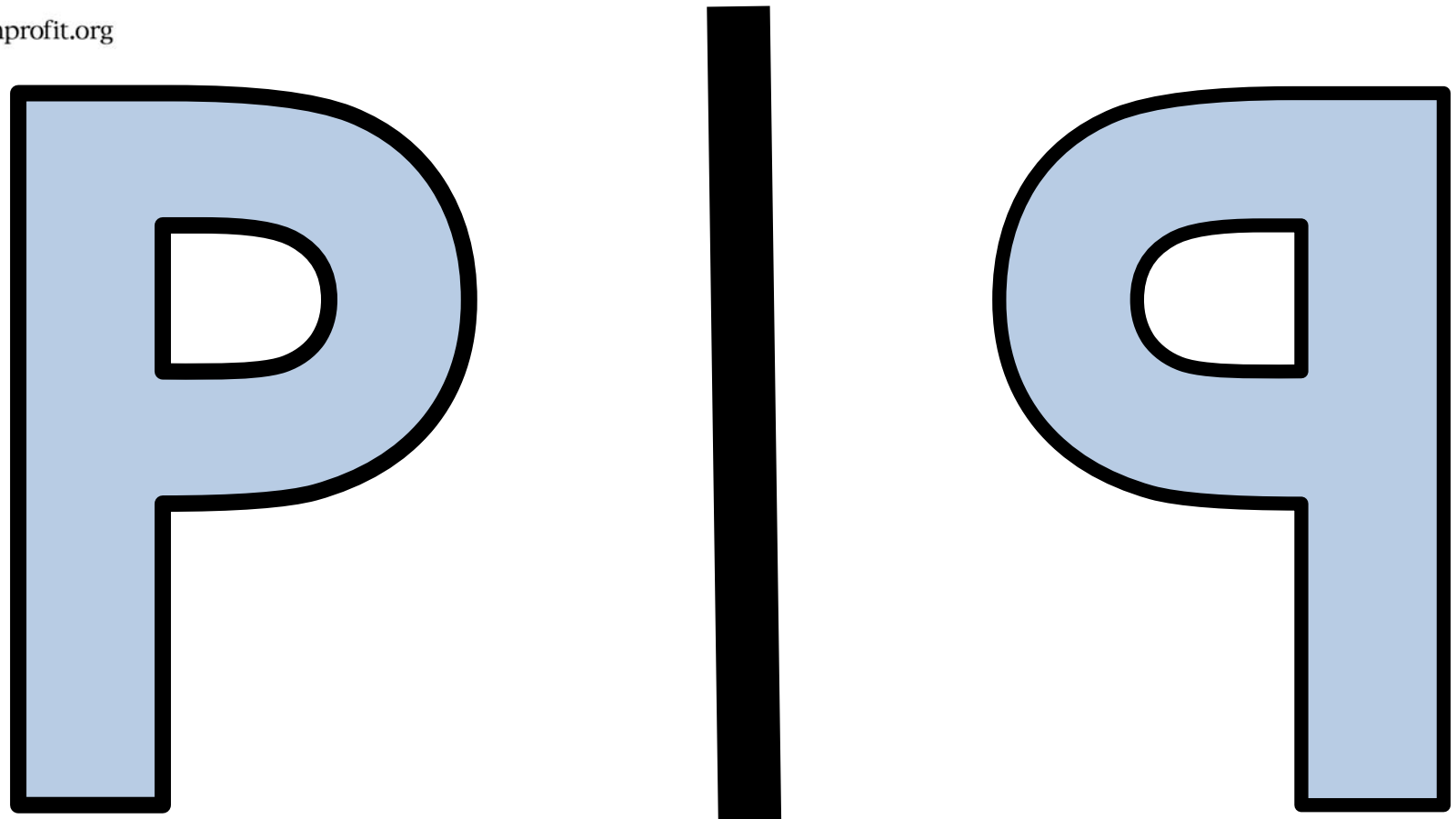


Question: What is a reflection?

Answer: A reflection is a transformation that flips a figure across a line.

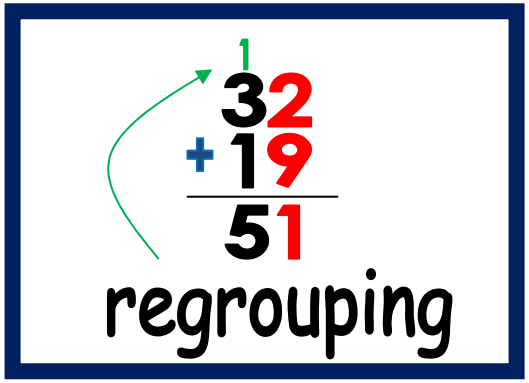
Gesture: Hold your left hand. Place your right hand on top of your left hand. While keeping your left hand still, flip your right hand over so it makes a reflection of your left hand.

Examples: Cut out several geometric figures and position them one at a time so students can see the images in a mirror. Ask the class questions about similarities and differences in the sizes and orientations of the figures and their reflected images. Move the objects closer to or further from the mirror so the students can understand that the figure and it's reflection appear to be the same distance from the mirror.



reflection

Regrouping

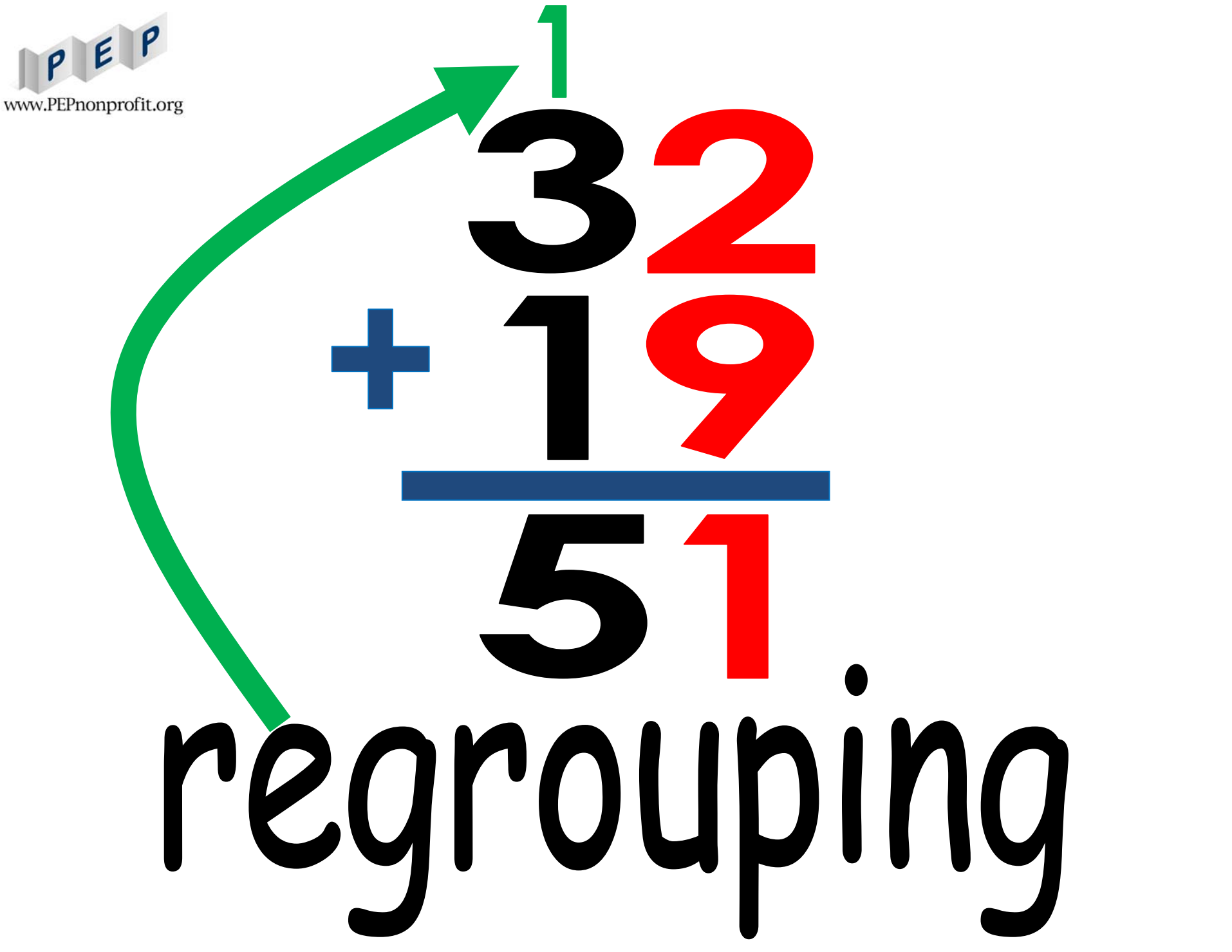


Question: What is regrouping?

Answer: Regrouping is a term used in addition and subtraction when carrying or borrowing is involved.

Gesture: Hold up ten fingers to the left side of your body (tens). Hold up one finger on your right hand (ones). Then move numbers from ones to tens (carrying) or move numbers from tens to ones (borrowing).

Examples: Draw two columns on a large sheet of paper. Label the left column '10s' and the right column '1s.' Then, set up your manipulatives by placing 10 dried beans into mini paper cups. Each paper cup represents 10. Set up your math problem on the paper. As an example, let's use the problem 32 + 19. To represent 32 with manipulatives, use three cups and two beans. If you want to represent 19, use one cup and nine beans. Children can solve the problem by counting 10 beans from the '1s' column and placing them in a cup. Those beans go into the '10s' column.
Now there are five cups and one bean, so the answer is 51.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1
32
+ 19
51
regrouping

Remainder

Question: What is a remainder?

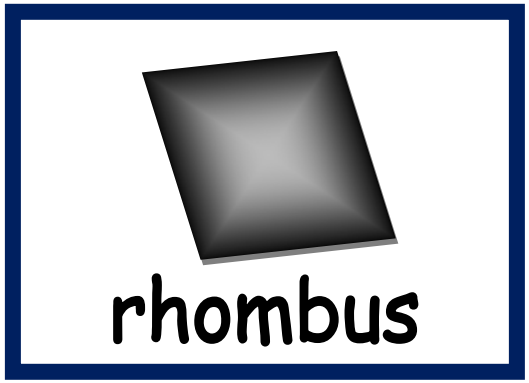
Answer: A remainder is the amount left over after division.

Gesture: With two hands, pretend to divide items into groups. Then hold up one hand and look at it and put it off all by itself, because it doesn't fit into any of the other groups.

Examples: Using hula hoops, teach your kids about a remainder. Place hula hoops around the room on the floor. Each hula hoop is a boat. Tell the kids to find a boat, but there must be an equal number on each boat. They have to work together to divvy up so that there is an equal number on each boat. Any that cannot fit onto the boats are the 'men overboard' (remainders). So, 23 kids divided onto 5 boats equals 4 on each boat with 3 men overboard. Once you've done this, show the students what is looks like as a math equation on the board.

remainder

Rhombus



Question: What is a rhombus?

Answer: A rhombus is a 4-sided flat shape with straight sides where all sides have equal length.

Gesture: Draw a rhombus in the air, then hold up four fingers, and hold out your arms to create an equal sign (all sides have equal length).

Examples: Have students search for as many rhombus shaped objects as they can find your classroom. Create a list of what was located and discuss the attributes that make that item a rhombus.

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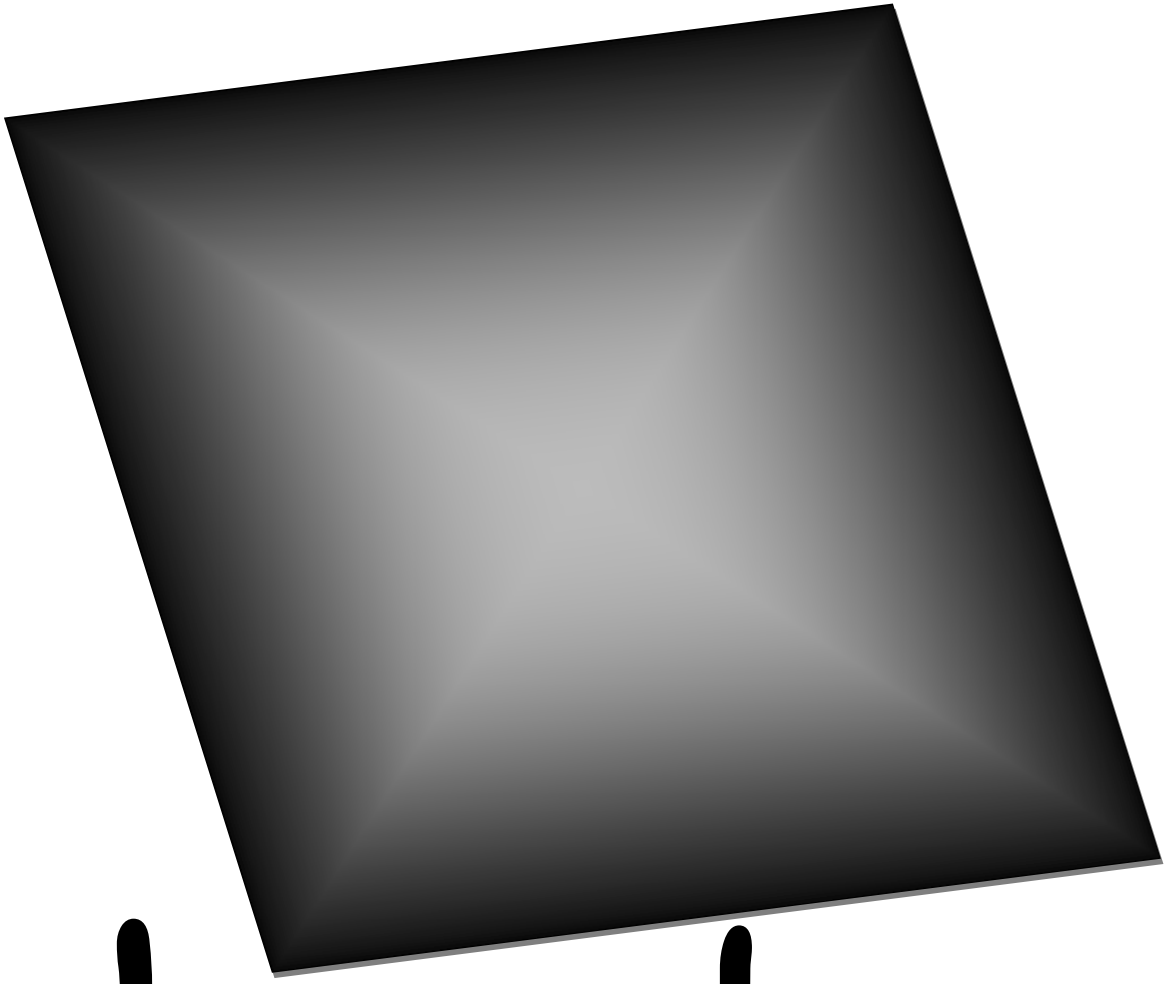

rhombus

Right Angle

Question: What is a right angle?

Answer: A right angle is an angle which is equal to 90°.

Gesture: Hold your two arms out, one up and the other to the side (forming a right angle).

Examples: Pass out index cards and have your students search for angles in the classroom (or even outside on the playground. Have them measure different angles they find against the corners of their index cards (put the right angle marks at the bottom corners), and make a list on the cards of at least two of each type (i.e. bricks, desk corner—right angle; book leaning on the shelf—acute…).

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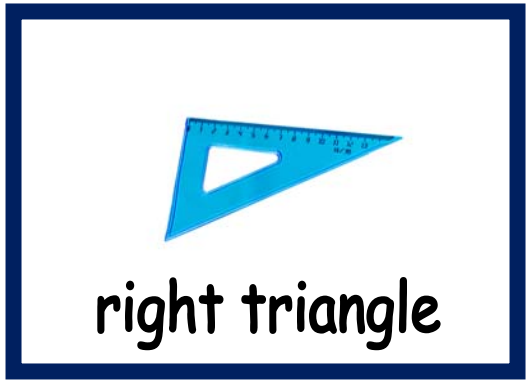
right angle

Right Triangle



Question: What is a right triangle?

Answer: A triangle where one of the interior angles is a right angle (90°).

Gesture: Hold your two arms out, one up and the other to the side (forming a right angle). Next draw a line from hand to hand, completing the triangle.

Examples: Explain that the right triangle is the basis of the gable roof structure (show some examples). Right triangles are used extensively in construction. For example, gable roofs are made by placing two right triangles together. Provide multiple examples of different types of triangles. Have kids sort triangles into proper categories and write reasons why they sorted their triangles the way they did.

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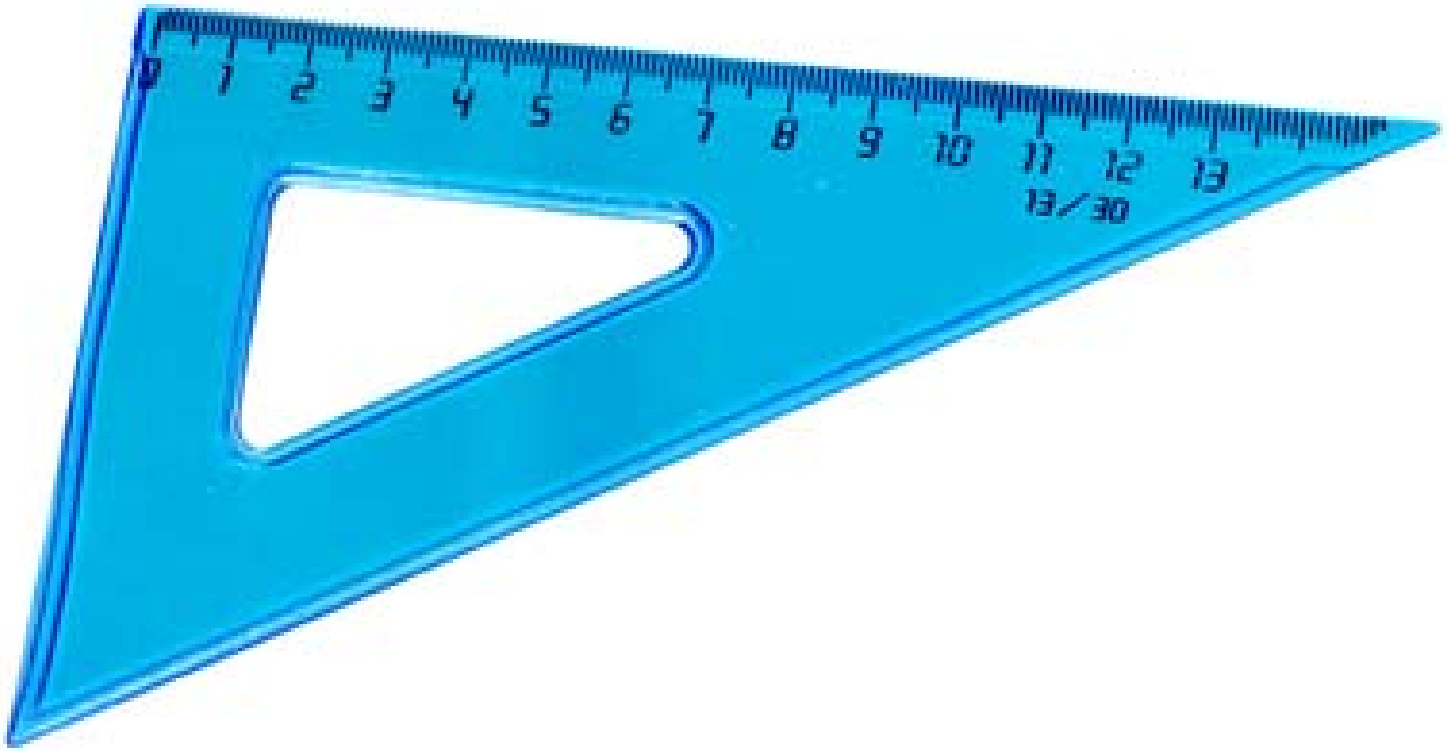

right triangle

Rotation

rotation

Question: What is rotation?

Answer: A rotation is spinning an object around a fixed point known as the center.

Gesture: Pretend to spin a wheel (like on the price is right).

Examples: *When performing rotations, you should ask yourself 3 questions:* Around What Point? What direction? How far? Using a string/jump rope handy, have one student pretend to be the origin, while another student holds the other end of the string/jump rope and rotates around the other student.

rotation

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Rotational Symmetry

Question: What is rotational symmetry?

Answer: Rotational symmetry is when the figure can be rotated and the image is identical to the original.

Gesture: Pretend to hold a wheel in the air. Then pretend to turn it a couple of times.

Examples: Have students create a pinwheel to demonstrate an object with rotational symmetry. After the pinwheel is created, have students compare it to other items you have in class. Examples: windmill, bicycle tire, sea star, and fan. Have your students turn the pinwheels and count out loud how many turns until they get back to the original position.

rotational symmetry

Rounding

Question: What is rounding?

Answer: Rounding is a method used to shorten numbers. Rounding involves either increasing or decreasing a number to the next digit. If the number behind the place being rounded to is a 0-1-2-3- or 4, the place value remains the same (or goes back down to the original number). If the number behind the place being rounded to is a 5-6-7-8- or 9, the place value goes up to the next digit.

Gesture: Hold up one finger at a time, starting at 1 and go up to 4, then point DOWN. Next hold up one finger at a time, starting at 5 and go up to 9, then point UP.

Examples: Give your students a toy car and make a hill like on the front of this Learning Brick. Next give students some problems to round to, for example **87**. If we are rounding to the nearest 10, we have to look at the 7. According to our hill, 7 tells us to go up higher. What about **83**? According to our hill, 3 tells us to go back down. For an additional game to play, go to www.PEPnonprofit.org and download Acing Math: One Deck at a Time! and play the rounding games with an ordinary deck of playing cards.

PEP
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rounding

0 1 2 3 4

5 6 7 8 9

PEP

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Scale

Question: What is a scale?

Answer: Scale is the ratio of the size or length in a drawing (or model) to the size or length of the real thing.

Gesture: Hold your hands close together to the side of you, then move your hands to the other side of you, but have your hands much-much further apart.

Examples: Divide the class into groups of 3 or 4 students. Give each group a ruler, tape measure, yard, or meter stick. Next, give each group at least one hot wheel, matchbox, or model car with a scale factor listed. Decide as a class what units the students will be using to measure their models (cm or inches). After students have completed finding the measurements of their models, have them use proportions to find the actual size of the real life vehicle. After all the groups have completed the computations and found the size of the vehicle, allow them to go to the parking lot and draw an outline of the real life car.

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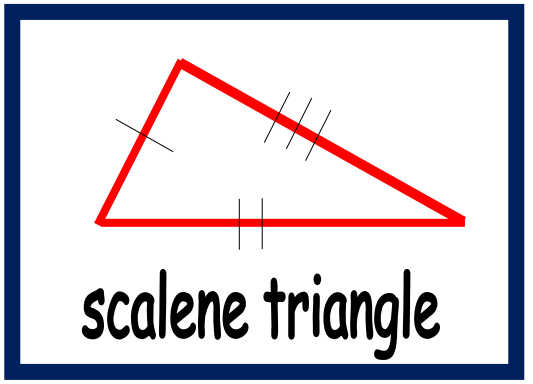
100:1 scale

Scalene Triangle



Question: What is a scalene triangle?

Answer: A scalene triangle is a triangle with all sides of different lengths.

Gesture: Draw a triangle in the air with your finger, then make an X to show that none of the sides are the same length.

Examples: Have your students construct an equilateral, an isosceles and a scalene triangle using precut pieces of straw. Students will then tape their triangles to pieces of construction paper, labeling the type of triangle they made.

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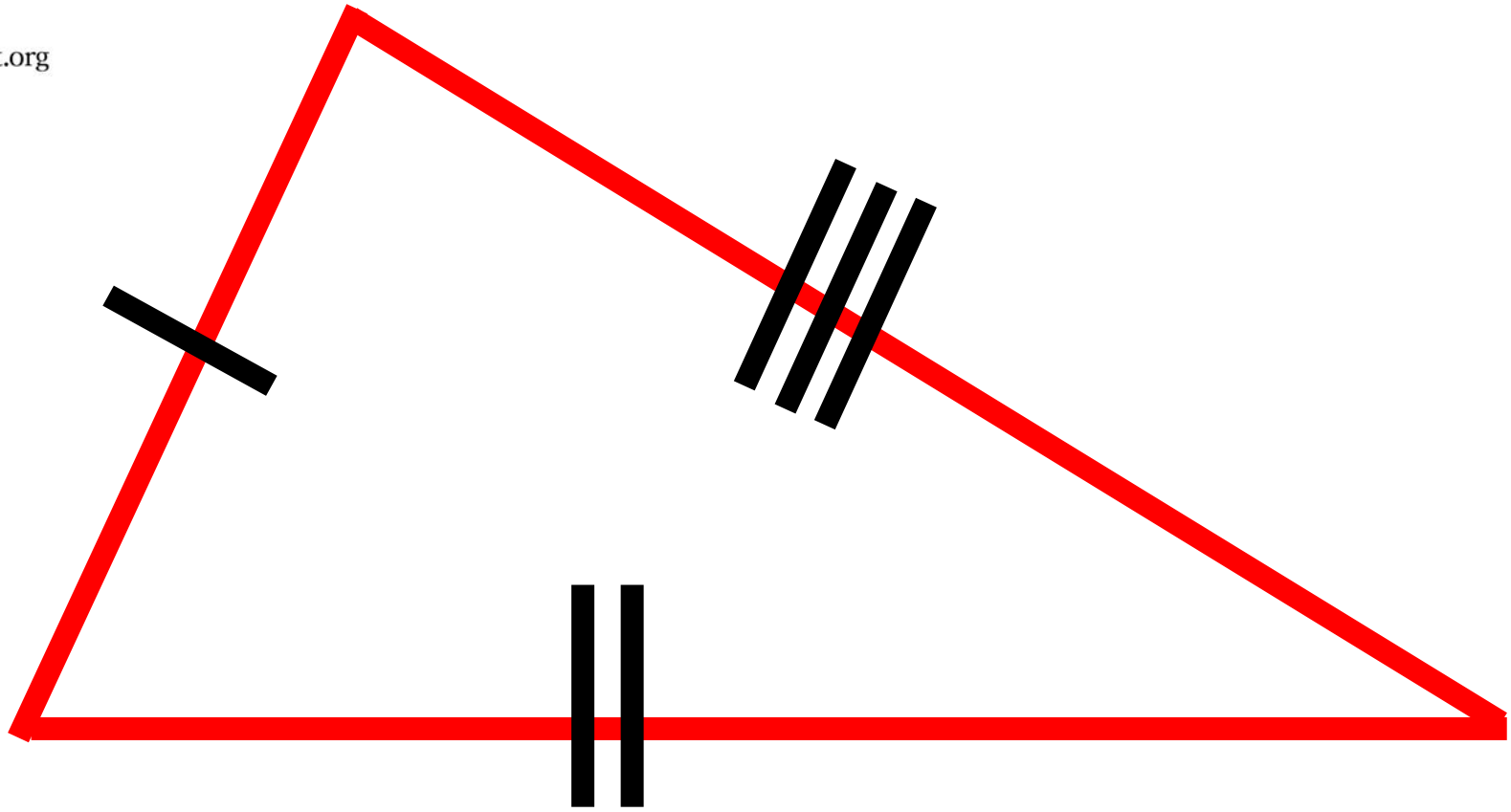
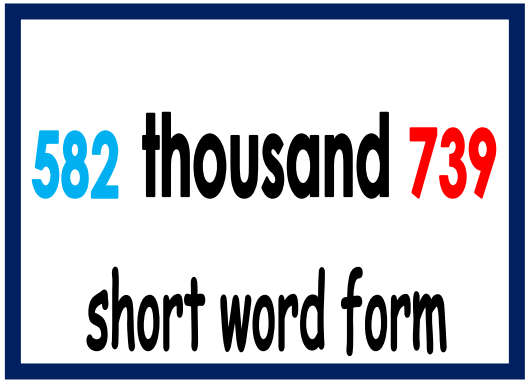


scalene triangle

Short Word Form



Question: What is short word form?

Answer: Short word form is when large numbers are written with a combination of numerals and letters.

Gesture: Hold your hand low to the ground (showing short) and then pretend to write (word form).

Examples: Have numbers written in a variety ways on the board: 500 + 80 + 2, five hundred 82, five hundred eighty two, and 582. Ask students which of these three numbers is the biggest and why? Hopefully they will see that ALL of these numbers are the same, just written in different forms. Have students write in multiple forms (standard, word, expanded, short word) as you call out numbers.

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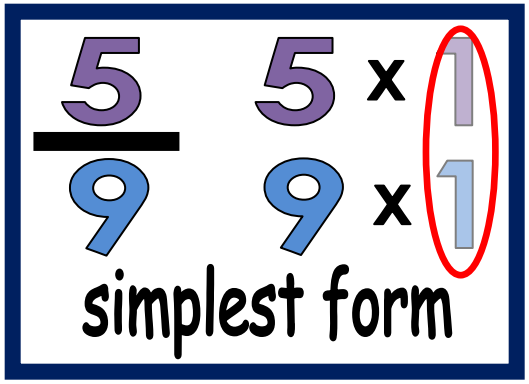
582 thousand 739

short word form

Simplest Form



Question: What is simplest form?

Answer: Simplest form is a fraction in which the numerator and denominator have no common factor except 1.

Gesture: Hold a fist up high (numerator), make a slash with your arm, hold a fist down low (denominator), and finally shake your finger (and head) NO (nothing in common other than one).

Examples: Using an ordinary deck of cards, have students take out all of the 10s and face cards. Aces will be worth one in this game. Have the kids shuffle the leftover cards and then place them face down in a pile. Students can pull two cards and make a fraction (larger of the two cards automatically goes to the bottom). Let the students decide if they made a fraction in simplest form. If they did, they can move that fraction of cards off to the side and play again. The object is to make as many fractions in simplest form as possible.

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$$\frac{5}{9} \quad \frac{5}{9} \times \frac{1}{1}$$

simplest form

Solid Figure

Question: What is a solid figure?

Answer: A solid figure is a three dimensional (3D) shape that has width, depth, and height. Some examples are spheres, cylinders, cubes, and cones.

Gesture: Hold your hand out like a fist to show that it is solid. Then hold your arms wide a part (width), then hold your arms from your stomach to in further in front of you (depth), and finally hold your arms high in the air (height).

Examples: Play the game "I Spy" with the children. The rules are that you can only spy a shape. For example, "I Spy a cylinder." Then the students have to guess what the cylinder is such as a drink can. After the students guess the object, discuss the faces of the object. For an extension, have students write down the names of the solid figures in order of the number of faces it has. beginning with the fewest and ending with the most. Place the number of faces after each name. For example, cone (1), cylinder (2), square pyramid (5), rectangular prism (6), cube (6).

solid figure

Sphere

Question: What is a sphere?

Answer: A sphere is a 3-dimensional object shaped like a ball. Every point on the surface is the same distance from the center.

Gesture: Pretend to spin a ball on your finger, then use both hands to look like you're holding a sphere.

Examples: Bring in different 3D objects (cone, pyramid, sphere, cylinder, rectangular prism, cube) and have the kids sort them into different categories. What similarities do we see between a cube and a rectangular prism? What differences?

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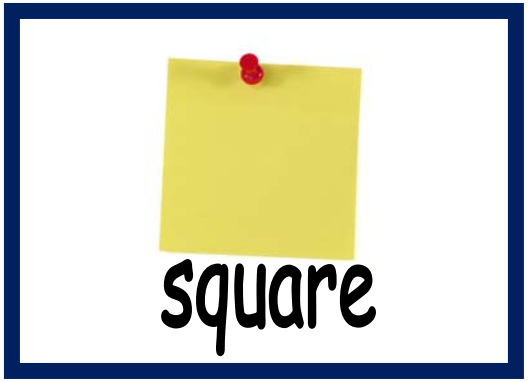
sphere

Square



Question: What is a square?

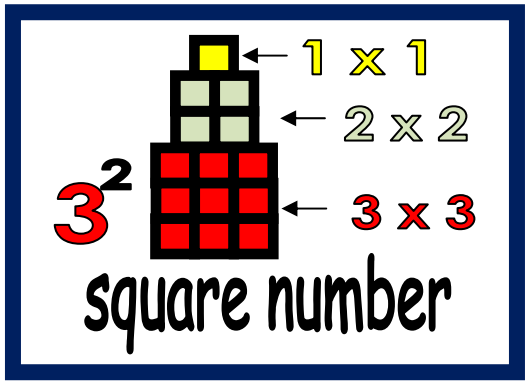
Answer: A square is a four sided polygon with ALL sides equal and all internal angles 90°.

Gesture: Draw a square in the air, then hold up four fingers, and hold up your arms to create a right angle.

Examples: Play **Attribute Grab Bag** from www.PEPnonprofit.org to let students explore different shape attributes and definitions.

square

Square Number



Question: What is a square number?

Answer: A square number is a number you get when you multiply an integer by itself.

Gesture: Hold up 1 finger, make your arms like an x, hold up 1 finger again, then pretend to stack 1 block. Hold up 2 fingers, make your arms like an x, hold up 2 fingers again, then pretend to stack 4 blocks.

Examples: Pass out a small bag of centimeter cubes to each student. Explain that the students are going to make arrays using the cubes. Ask the students to count out nine cubes. Have students share their arrays as they make them and then model them on the overhead. Students should come up with 1 x 9, 9 x 1, and 3 x 3. These numbers represent the factors of nine. Ask the students if they notice anything about the 3x3 array? Explain that nine is a square number. Can anyone tell why it is called a square number? Are there more square numbers? Have students explore the concept of square numbers by making more arrays that represent a square.

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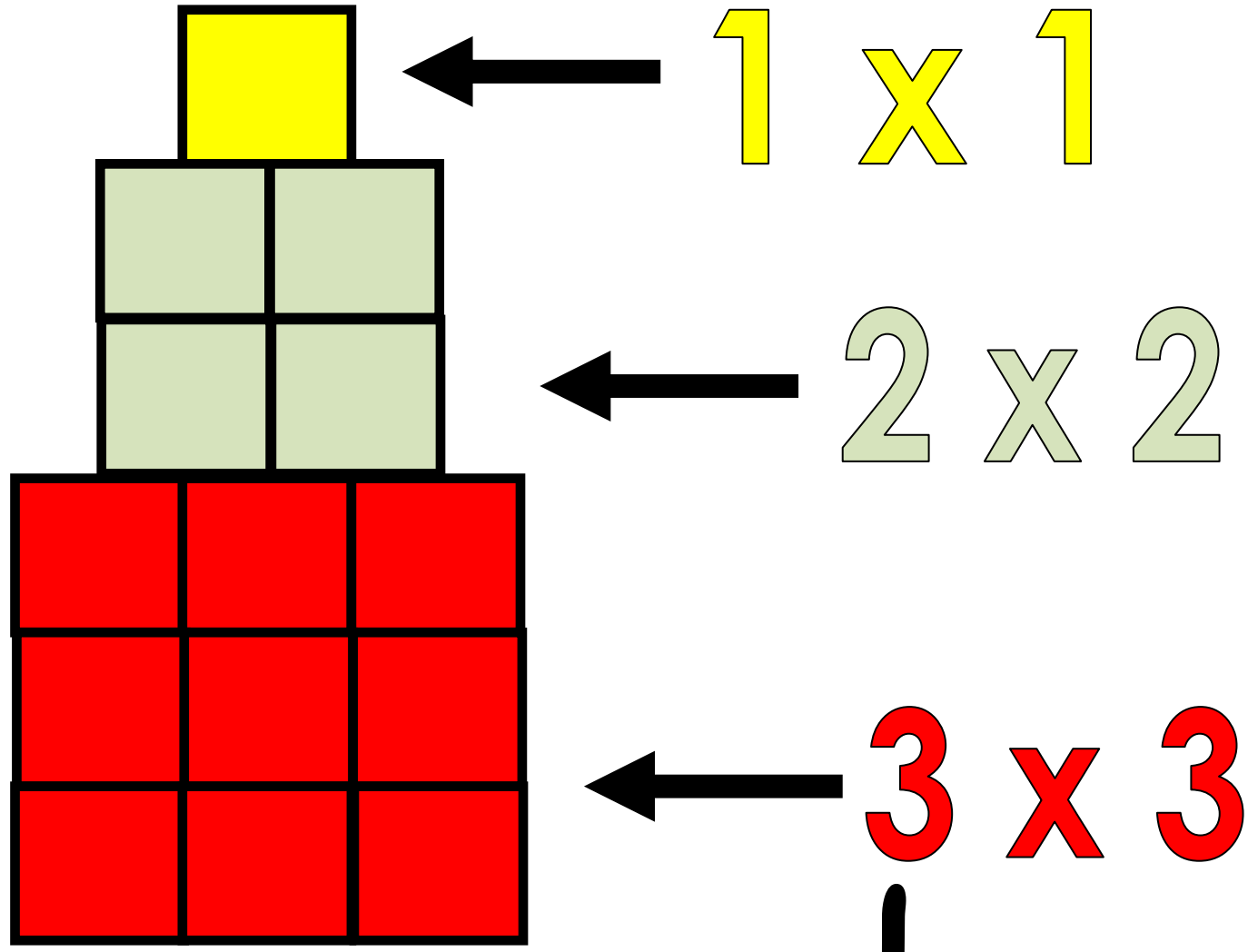

3^2

square number

Standard Form

Question: What is standard from?

Answer: Standard form is a way to write numbers using the digits 0-9.

Gesture: Hold your hands out very closely together (this gesture will make more sense when used with word form, short word form, and expanded form).

Examples: Have numbers written in a variety ways on the board: 500 + 80 + 2, five hundred 82, five hundred eighty two, and 582. Ask students which of these three numbers is the biggest and why? Hopefully they will see that ALL of these numbers are the same, just written in different forms. Have students write in multiple forms (standard, word, expanded, short word) as you call out numbers.

582

standard form

Straight Angle

Question: What is a straight angle?

Answer: A straight angle is an angle that measures exactly 180°.

Gesture: Hold both arms out at your sides creating a straight angle.

Examples: Ask students to brainstorm how angles are used in the world around us. Create a list from the brainstorming session. Some possible examples: A baseball player moves across the field at various angles to catch a ball. Umbrella's can be tilted at an angel in order to stop rain or provide shade. A nurse adjusts a bed to create an angle that is comfortable for a patient. A football player throws a pass at the correct angle for a receiver to catch the ball. A contractor uses angles to build a house, a school, or any structure. A child uses angles to build a skateboard ramp or a bike jump. Using the toothpick models, ask students to create various angles and degrees. Provide students with crayons or colored pencils to turn the toothpick models into images and drawings.

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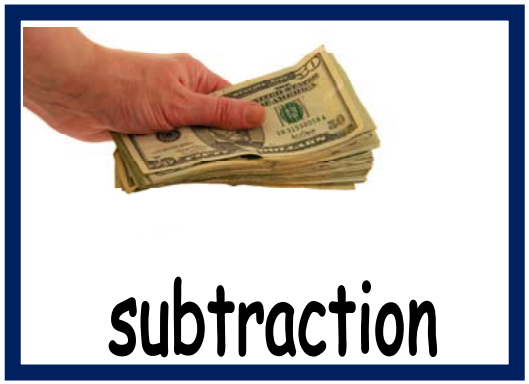
straight angle

Subtraction



Question: What is subtraction?

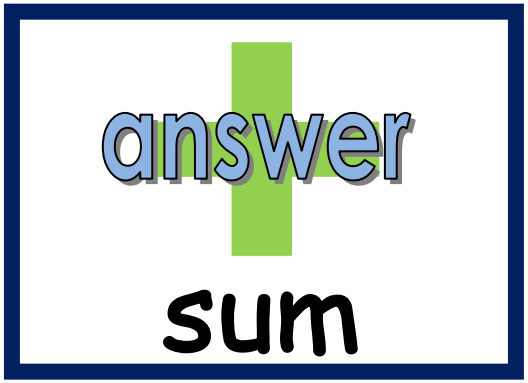
Answer: Subtraction is taking a quantity from a larger number.

Gesture: Hold your arm in front of you horizontally like a subtraction sign.

Examples: A great way to teach subtraction is with money. Give each student a combination of fake bills, 1s, 5s, and 10s should be fine. For a week, have them use their money for things (you can do this with an in class store or by having them buy bathroom passes or pieces of paper). The idea is that they associate subtraction with taking away or giving their money. They had a total of $100 and by the end of the week they have $35. How much money did they subtract from their account?

subtraction

Sum



Question: What is a sum?

Answer: A sum is the answer of an addition problem.

Gesture: Hold your arms in front of you like an addition sign.

Examples: As you introduce some mathematical word problems, have your students look for the words that indicate what operation is needed. This is a good opportunity to introduce the different academic vocabulary words that are associated with an addition problem. Add, sum, total, plus, in all, both, together, increased by, all together

answer

sum

Surface Area

Question: What is surface area?

Answer: Surface area is total area of the surface of a three-dimensional object.

Gesture: With your right hand make a letter L with your thumb and pointing finger (length). Cross both of your arms like an X (multiplication symbol). With your left hand make the letter W with three fingers. Then pretend as if you are holding a cube. With two hands, hold the top and bottom, side and side, front and back.

Examples: Deconstruct actual objects and draw their nets with your students. For a cylinder, use a Pringles can. Cut it vertically and 2/3 of the way around the circumference of the base (so it stays attached) and tape the plastic top to the box to be the top or bottom. For a rectangular prism, use a cereal box. For a triangular prism, use a Toblerone box, which is the oddly-shaped Swiss chocolate bar. Once your students have played with the nets a bit, introduce how to find the surface area for each item.

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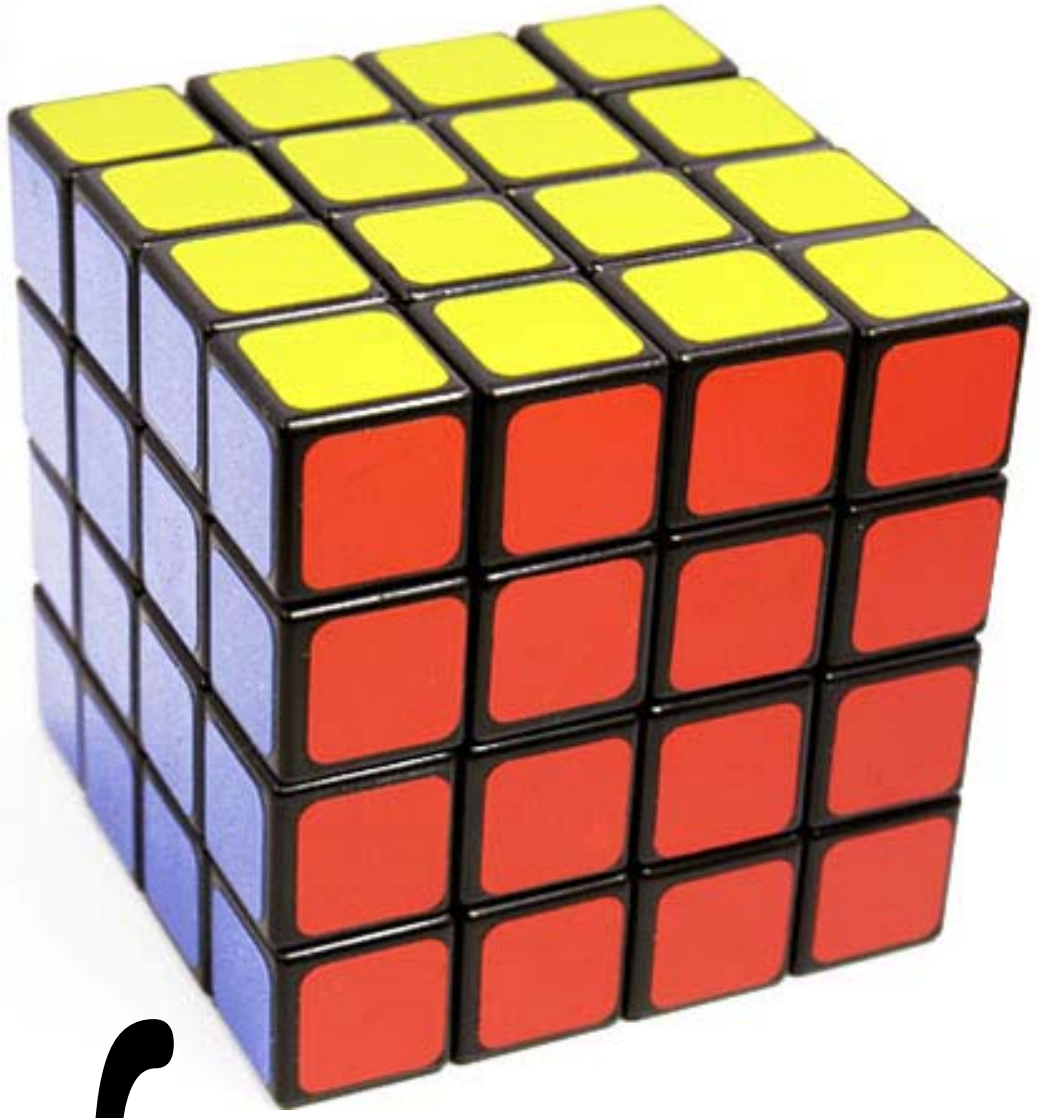

surface area