MATHEMATICS

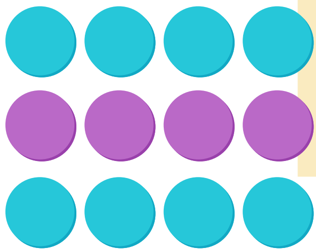
In fourth grade, your child will focus on three critical areas. The first is developing understanding and fluency with multi-digit multiplication and developing understanding of dividing to find quotients involving multi-digit dividends. Your child will also focus on developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers. The third focus area is understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

Activities in these areas include:

- Solving multiplication and division word problems that involve an unknown product, an unknown group size, and/or number of groups unknown.
- Writing multi-digit whole numbers in expanded form (e.g., 2,436 = 2,000 + 400 + 30 + 6).
- Rounding multi-digit whole numbers up to the millions place.
- Finding the product of up to a four-digit by a one-digit number and dividing up to four-digit numbers that will result in whole numbers and remainders.
- Plotting, labeling, and identifying fractions on a number line.
- Creating equivalent fractions by finding common denominators.
- Decomposing and composing fractions.
- Defining and recognizing examples of the following: point, line, line segment, ray, angle, acute angle, right angle, obtuse angle, perpendicular, and parallel lines.
- Constructing examples of angles and triangles that are acute, right, or obtuse.
- Constructing examples of points, lines, line segments, and parallel and perpendicular lines.

Your child can interpret a multiplication equation as a comparison (e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5). Your child can represent verbal statements of multiplicative comparisons as multiplication equations.

- Use models, drawings, and repeated addition to show that multiplication fact problems can be seen as comparisons of groups (e.g., 24 = 4 × 6 can be thought of as 4 groups of 6 or 6 groups of 4).



3 × 4 = 12

HELP AT HOME

- Arrange pennies into different arrays and have your child write the multiplication fact for the array (e.g., arrange 4 pennies across the top and 3 pennies going down which would represent 3 groups of 4 and your child would identify that 3 groups of 4 would represent 3 × 4 = 12).

Your child can multiply or divide to solve word problems involving multiplicative comparisons (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison).

- Use drawings or equations to solve for unknown in word problems requiring multiplication and/or division.
- Multiply or divide to solve word problems by using drawings or writing equations with a symbol for a missing number.

HELP AT HOME

- Give your child problems with missing numbers, such as N × 4 = 12 or N ÷ 4 = 3 and have him use blocks to figure out the missing number.
- Remind your child that if he knows multiplication he can figure out division.

Your child can solve multi-step word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Your child can represent these problems using equations with a letter standing for the unknown quantity and assess the reasonableness of answers using mental computation and estimation strategies including rounding.

- Solve addition, subtraction, multiplication, and division multi-step word problems involving whole numbers.
- Check answers for reasonableness using mental math and estimation.

RESOURCES

T-CHART

T-Charts are used to organize information in order to help students solve problems. Below is an example T-chart used to solve a word problem about elapsed time.

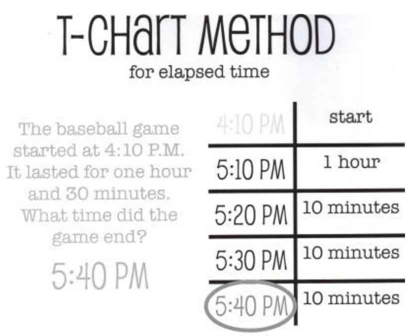


Image from http://teacherweb.com/AZ/Pueblodel-Sol/Gojkovich4th/time-T-Chart-method.jpg

HELP AT HOME

- After reading a word problem, have your child mentally estimate what the answer should be. Have him write down the estimate. After solving the problem, look back at the estimation and discuss if the estimate was close to the answer or determine why the estimate was wrong.
- Work on solving multi-step problems, one step at a time, through the usage of T-Charts to better organize information.
- Provide your child with a dry erase marker and a plastic plate. Have your child practice solving multi-step word problems, one step at a time, on the plate.
- Talk about the importance of reading the question carefully and marking out unimportant information. Ask questions such as, "What is the problem really asking?" and "What do I already know before I start working?"

Your child can find all factor pairs for a whole number in the range 1–100. Your child can recognize that a whole number is a multiple of each of its factors. Your child can also determine whether a given whole number (1–100) is a multiple of a given one-digit number, and whether a given whole number (1–100) is prime or composite.

- Obtain a product (answer to a multiplication problem) by multiplying a factor (number).
- Know that a multiple is a product of two factors.
- Be fluent with finding factors and multiples and recognize that a whole number is a multiple of each of its factors.
- Know that a prime number has exactly two factors: the number one and itself.
- Know that a composite number has three or more factors.

HELP AT HOME

- Take your child on a multiplication scavenger hunt. There are numbers all over your house or in the grocery store. Have your child find 2 factors and determine if each number is prime or composite. Then, multiply the factors to find the product before being able to find the next set of factors.

VOCABULARY

FACTORS are numbers that can be multiplied together to get another number (e.g., 2 and 3 are factors of 6, because $2 \times 3 = 6$).

A **PRIME NUMBER** can be divided evenly only by 1 or itself (e.g., 7, 13).

A **COMPOSITE NUMBER** can be divided evenly by numbers other than 1 or itself (e.g., 6, 12).

Your child can generate a number or shape pattern that follows a given rule. Your child can identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Your child can explain informally why the numbers will continue to alternate in this way.

- Practice with patterns involving numbers or symbols which either repeat or grow.
- Create and extend number and shape patterns.

HELP AT HOME

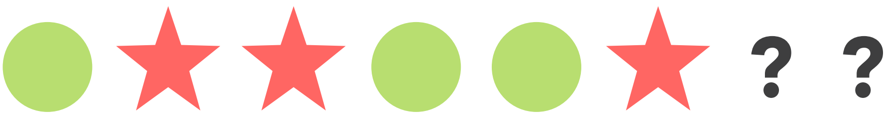
- Provide your child with a sheet of patterns already drawn or written. Then, provide him with graph paper. Have him extend each pattern by the next 5 shapes or numbers.

VOCABULARY

A **PATTERN** is a sequence that repeats the same process over and over.

A **RULE** dictates what that process will look like.

Patterns are one of the most important ways to develop a student's mathematical thinking process. When he begins seeing patterns, sequences, and order in equations, he will have a stronger understanding of how to answer mathematical problems.



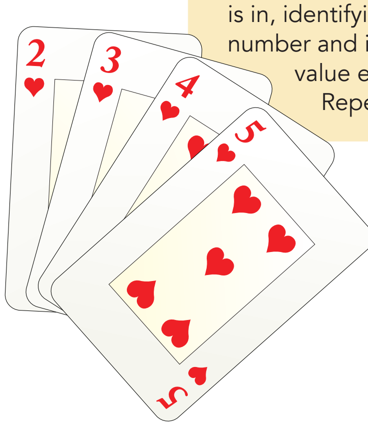
1 4 7 10 13 ? ?

Your child can recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.

- Know place value positions of whole numbers to one million.
- Know the value of each digit in a given number to one million.
- Know that multiplying by 10 increases a number's value and shifts its place one position to the left.
- Know strategies for multiplying by 10.
- Explain the relationship of the place value positions in whole numbers to one million.
- Explain that a digit in one place represents 10 times what it represents in the place to its right.

HELP AT HOME

- Provide your child with a deck of cards. Take a cardboard box and draw 7 rectangles on the cardboard to represent each place value position (e.g., ones, tens, hundreds, thousands, ten thousands, hundred thousands, millions). Have your child create 7 digit numbers using the deck of cards. Have him use the same 7 cards and exchange the place value position each is in, identifying the new number and its different value each time. Repeat.



Your child can read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Your child can also compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

- Know place value positions to the millions place.
- Know the value of a digit in a given number up to one million.
- Understand and correctly read the symbols < (less than), > (greater than), and = (equal to).
- Compare two numbers up to one million.
- Use the symbols <, >, and =, to record the correct relationship between two numbers up to one million.
- Read and write whole numbers up to one million in base-ten numerals, expanded, and word form.

VOCABULARY

STANDARD FORM: 354
EXPANDED FORM: 300 + 50 + 4
WORD FORM: three hundred fifty-four

HELP AT HOME

- Play a place value game! Cut up small sheets of paper with the words "expanded form," "word form," "identify number," and "compare numbers" on the paper. Place in a bowl. Then, provide your child with a dice or number cube. Have your child roll the cube 7 times to create a 7 digit number and then 7 more times to create a second 7 digit number. Your child then draws one of the small sheets of paper out of the bowl and performs the task on the paper to the created numbers. For example, if he draws "compare numbers" have him compare the created numbers using the <, >, or = symbols.

RESOURCES

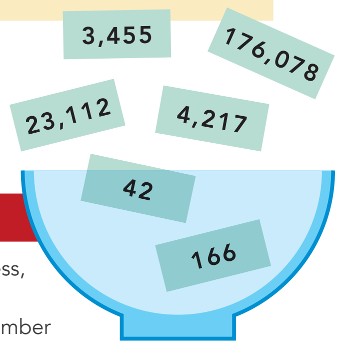
PLACE VALUE

Your child can use place value understanding to round multi-digit whole numbers to any place.

- Know whole numbers from zero to one million.
- Know the names and values of the digits in any given place value position up to one million.
- Know the rules for rounding to any selected place value up to one million, beyond just the leading digit.
- Determine whether the digit being rounded goes up by one or stays the same based on the value of the digit to the right.
- Use place value models to reason about numbers.

HELP AT HOME

- Write several numbers ranging from 10 - 1,000,000 on small pieces of paper. Fold them up and put them in a bowl. Have your child draw a number from the bowl. Then, have him round the numbers to a variety of place values (e.g., to the nearest 10, 100, 1,000, 10,000, 100,000). Repeat until all the numbers have been drawn.



RESOURCES

Teach your child the saying, "4 or less, let it rest; 5 or more, up the score."
It is a fun way for your child to remember the rounding rules.

Your child can fluently add and subtract multi-digit whole numbers using the standard algorithm.

- Know basic addition and subtraction facts.
- Know how to add and subtract with regrouping.
- Understand how the base-ten system works.
- Connect the standard algorithm for addition and subtraction to strategies based on place value and/or non-standard algorithms.
- Explain how and why the standard algorithm for addition and subtraction works.
- Check answer for reasonableness.

HELP AT HOME

- Play Monopoly or another board game involving money with your child. Monopoly is a great way for your child to practice adding and subtracting money.

VOCABULARY

STANDARD ALGORITHM is the specific method for solving an addition or subtraction problem.

Your child can multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Your child can also illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

- Multiply a whole number of up to four digits by a one-digit whole number.
- Multiply two two-digit numbers.
- Illustrate and explain calculations by using equations, rectangular arrays, and area models.

HELP AT HOME

- Using a number cubes (dice), create a number with two to four digits. Write it down. Roll again. This time create a number with one or two digits. Multiply the two numbers. Work the problem separately from your child, then compare answers. Repeat this game until your child has created numbers with two, three, and four digits, and multiplied them by one and two-digit numbers.

Your child can find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Your child can illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

- Know division can be derived through repeated subtraction.
- Know multiplication and division have an inverse relationship.
- Use models, such as rectangular arrays and area models, to show division concepts and solve division operations.
- Know what the remainder means in a division problem.
- Know how to check an answer to see if it is reasonable.
- Use the properties of operations to solve division problems.
- Illustrate and explain which strategy or model was used to find the quotient.

HELP AT HOME

- Provide your child with a jar of pennies and a division problem (e.g., 30÷5). Have your child create an array of 30 pennies in rows of 5. Ask, "If you have 30 pennies arranged in groups of 5, how many groups of pennies do you have?" The answer would be 6 because 30÷5 = 6. Repeat with other equations.
- Have your child practice creating different arrays with the pennies and identifying the resulting division and multiplication problems.

VOCABULARY

A **QUOTIENT** is the answer to a division problem.

A **DIVIDEND** is the number being divided in a division problem.

A **DIVISOR** is the number that you are dividing by in a division problem.

Your child can explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Your child can use this principle to recognize and generate equivalent fractions.

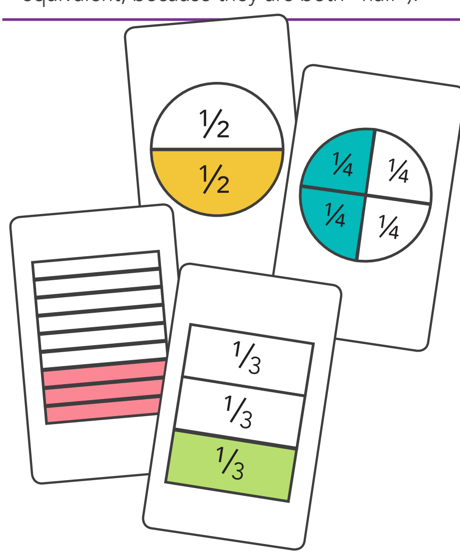
- Use visual fraction models appropriately.
- Know when a denominator increases, the number of pieces it is divided into increases and the size of each piece decreases.
- Know two fractions can be equivalent even though the numerators and denominators are different numerals.

HELP AT HOME

- Draw visual representations of fractions on index cards and then draw a matching equivalent fraction on another index card. Scatter the index cards on the floor in front of your child and have him sort the cards, matching up the equivalent fractions. For example, $\frac{1}{2}$ would match up with $\frac{2}{4}$.

VOCABULARY

EQUIVALENT FRACTIONS are fractions which have the same value, even though they may look different (e.g., $\frac{1}{2}$ and $\frac{2}{4}$ are equivalent, because they are both "half").



Your child can compare two fractions with different numerators and different denominators (e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as ½). Your child can recognize that comparisons are valid only when the two fractions refer to the same whole, and can record the results of comparisons with symbols >, =, or <, and justify the conclusions (e.g., by using a visual fraction model).

- Know how to use fraction models to show equivalent fractions.
- Know how to create equivalent fractions.
- Know the larger the denominator, the smaller the partitions of the whole.
- Know comparisons of fractions are only valid if the whole is the same size.

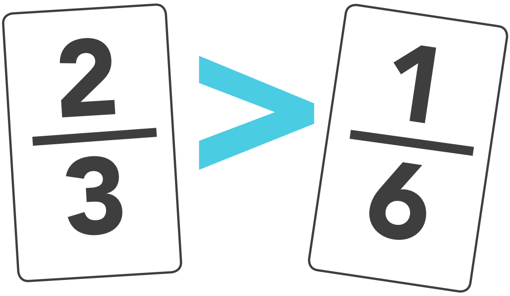
HELP AT HOME

- Create different fractions on note cards and place the note cards face down on the floor. Have your child flip over two cards and determine if he has a common denominator and what it is. Then compare the two fractions using the symbols <, >, or =.

VOCABULARY

NUMERATOR (top number in a fraction) - the number of parts counted or separated.

DENOMINATOR (bottom number in a fraction) - equal pieces of a whole.



Your child can build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

- Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
- Decompose (break down) a fraction into a sum of fractions with the same denominator in more than one way.
- Record each decomposition by an equation.
- Add and subtract mixed numbers with like denominators.
- Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators.
- Use visual fraction models and equations to represent a problem.

HELP AT HOME

- Provide your child with a sheet of fractions. Have your child break down each fraction into a simpler form. Continue to have your child practice composing (building) and decomposing (breaking down) different fractions.

RESOURCES

COMPOSING FRACTIONS

$$\frac{1}{5} + \frac{2}{5} = \boxed{\frac{3}{5}}$$

DECOMPOSING FRACTIONS

$$\boxed{\frac{7}{10}} \rightarrow \frac{4}{10} + \frac{3}{10}$$

Your child can apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

- Understand the fraction ¾ is a multiple of ¼ and use this understanding to multiply a fraction by a whole number.
- Solve word problems involving multiplication of a fraction by a whole number.
- Use visual fraction models and equations to represent a problem.

HELP AT HOME

- Provide your child with different fractions written on note cards. Have your child roll a dice or number cube to get a whole number. Then, draw a fraction from the note cards. He will then take the whole number and multiply it by the fraction card. Repeat until all note card fractions have been multiplied.

Your child can express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.

- Know that fractions should be seen and treated as regular numbers.
- Know that the denominator represents the number of parts that comprise the whole and the numerator represents the number of parts that are being identified.
- Use a variety of visual models (e.g., number line, base-ten blocks) to represent a decimal.
- Write a fraction that has 10 or 100 on the bottom as a decimal.

HELP AT HOME

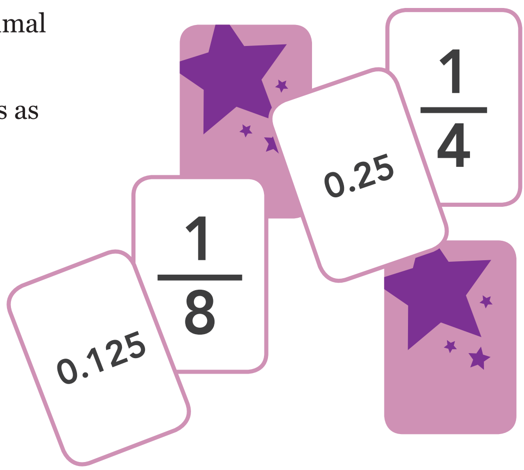
- Have your child use coins to compare different amounts (e.g., 30 pennies = 3 dimes; 10 dimes = 1 dollar). It's good for your child to get a better understanding that different coins can equal the same amount.

Your child can use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; and locate 0.62 on a number line diagram.

- Know that decimals can be written as fractions and fractions can be written as decimals.
- Know that fractions with a denominator 10 or 100 are called decimal fractions.
- Generate equivalent decimal fractions.
- Properly name fractions and decimals (e.g., 7/10 and .7 are "seven tenths").
- Add fractions with like denominators and decimal fractions.
- Write decimal fractions as decimals in a variety of situations.

HELP AT HOME

- Play a matching game. Have fractions written on note cards and have the matching decimal written on another note card. Place them all face down and have your child flip two over. If they match, he collects the cards. If they don't match, flip them back over and continue. Repeat until all matches have been made.



Your child can compare two decimals to hundredths by reasoning about their size. Your child can recognize that comparisons are valid only when the two decimals refer to the same whole. Your child can also record the results of comparisons with the symbols >, =, or <, and justify the conclusions (e.g., by using a visual model).

- Compare two decimals by reasoning about their size.
- Justify conclusions about the comparison of decimals using visual models and other methods.
- Relate a decimal to a whole number.
- Use what is known about fractions to help compare decimals.

HELP AT HOME

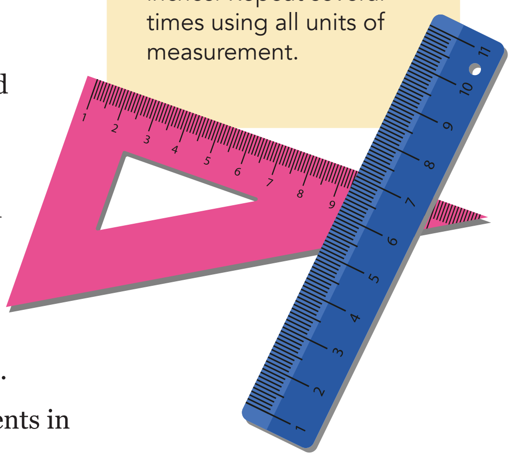
- Create a number line using string and clothespins. Write different decimals (up to the hundredths place) on index cards. Have your child practice comparing decimals by placing the cards on the number line in order from least to greatest.

Your child can identify, explain, and describe relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, your child can express measurements in a larger unit in terms of a smaller unit. Your child can record measurement equivalents in a two-column table. (For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), …)

- Know length is measured with meters (m), kilometers (km), centimeters (cm), millimeters (mm), inches (in), feet (ft).
- Know volume is measured with liters (l), milliliters (ml).
- Know mass is measured with grams (g), kilograms (kg), ounces (oz), pounds (lb).
- Know time is measured with hours (hr), minutes (min), and seconds (sec).
- Reason about the measure of objects using benchmarks and mental images of the sizes of measurement units.
- Express and record larger units in terms of smaller units.
- Record measurement equivalents in a two-column table.

HELP AT HOME

- Using a measuring stick or tape measure, have your child measure different items around the house. If the item is measured in inches, have him convert the length to feet. If the item is measured in feet, have him convert feet to inches. Repeat several times using all units of measurement.

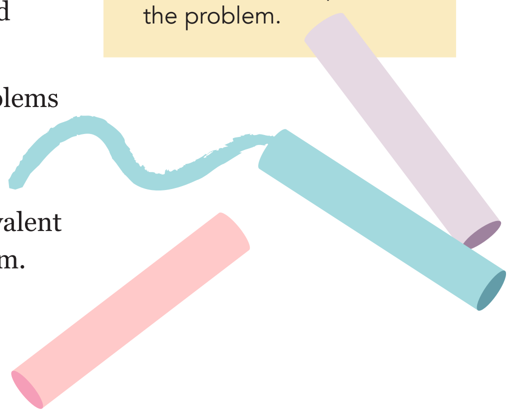


Your child can use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Your child can represent measurement quantities using diagrams, such as number line diagrams that feature a measurement scale.

- Know there are different ways to display measurements.
- Know different tools and strategies that can be used to solve measurement problems.
- Understand that measurement concepts help him communicate mathematically and make sense of real-life situations.
- Use +, -, ×, and ÷ to solve word problems.
- Solve measurement word problems that include whole numbers, fractions, and decimals.
- Convert larger units into equivalent smaller units to solve a problem.

HELP AT HOME

- Provide your child with word problems based on measurement. Have your child solve the problems, with chalk, on a set of steps or sidewalk outside your house. This will encourage the child to work step by step to solve a word problem, and help him visualize the parts of the problem.



Your child can apply the area and perimeter formulas for rectangles in real-world and mathematical problems. For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.

- Apply the area formula (Length × Width) to find the area of a rectangle.
- Apply the perimeter formula (Side + Side + Side +Side) to find the perimeter of a rectangle.
- Apply formulas to real-world and mathematical problems.

HELP AT HOME

- Have your child use a tape measure and walk around the house measuring different size rectangles (e.g., refrigerator, T.V., windows). After collecting the measurements, have your child use formulas to determine the area and perimeter of each shape.

Your child can make a line plot to display a data set of measurements in fractions of a unit (½, ¼, ⅛). Solve problems involving addition and subtraction of fractions by using information presented in line plots. For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.

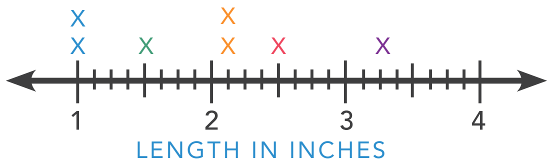
- Add fractions using information presented in line plots.
- Subtract fractions using information presented in line plots.
- Measure objects up to ⅛ of a unit.
- Know how to make a line plot.
- Represent a "data set" on a line plot.
- Add and subtract fractions based on the information represented on the line plot.

HELP AT HOME

- Provide your child with several different pieces of string measuring different lengths (e.g., 2 ⅛ inches, 3 ¼ inches, 1 ½ inches). Make sure that some pieces are the same length. Provide your child with a ruler and have him measure each piece of string and record his findings. Then, have your child create a line plot based on the information recorded through measuring the pieces of string.

RESOURCES

SAMPLE LINE PLOT

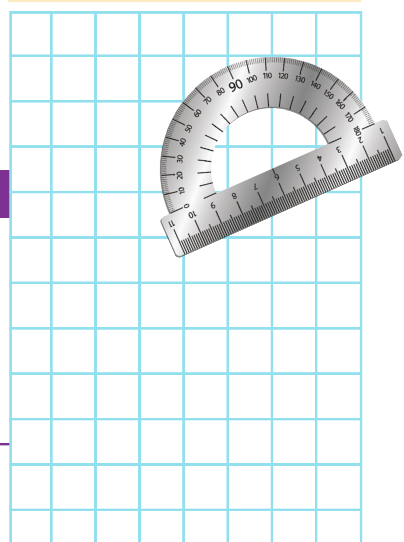


Your child can recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement.

- Measure an angle with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle.
- Know that an angle that turns through 1/360 degrees of a circle is called a "one-degree angle," and can be used to measure angles.
- Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

HELP AT HOME

- Provide your child with graph paper and a protractor.
- Have your child go on an "Angle Walk," sketching the different angles he sees. After sketching the angles, have your child go back and measure each angle using a protractor.



VOCABULARY

An **ANGLE** is what is formed by two intersecting rays.

A **RAY** has an endpoint and extends endlessly in the other direction.

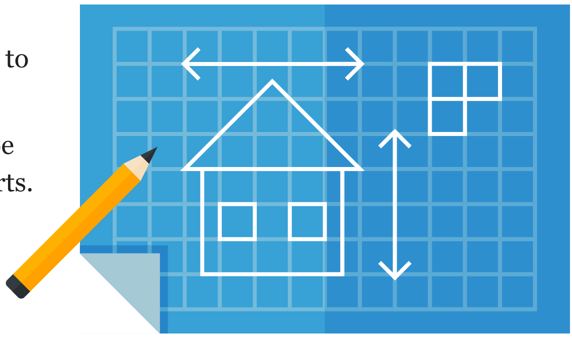
A **POINT** is a particular spot.

Your child can recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Your child can solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems (e.g., by using an equation with a symbol for the unknown angle measure).

- Know non-overlapping angle segments can be added to find the total sum of the angle measures.
- Know to use addition and subtraction to find the unknown angles.
- Know the interior angles (inside angles) of a triangle add up to 180 degrees.
- Know the interior angles (inside angles) of a quadrilateral add up to 360 degrees.
- Know an angle can be decomposed into parts.
- Know the whole angle is the sum of the angle parts.
- Recognize angle measures as additive.

HELP AT HOME

- Provide your child with a ruler and protractor. Have your child design and draw a blueprint of his dream treehouse. After drawing the blueprint, have your child use the protractor to go back and find the measurement of all the angles in the blueprint.



Your child can draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

- Know that points, line segments, and angles can be classified by their properties as well as basic foundations of geometric shapes.
- Know that polygons can have similar features and still be unique because of the characteristics of the elements that were used to create them.

HELP AT HOME

- Provide your child with popsicle sticks. Have him practice building different geometric shapes with the popsicle sticks. Help him locate and discuss points, lines, line segments, rays, angles, and perpendicular and parallel lines.

Your child can classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Your child can recognize right triangles as a category, and identify right triangles.

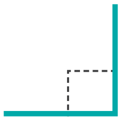
- Know that two-dimensional figures can be categorized based on certain characteristics (lines and angles).
- Analyze two-dimensional figures to determine the presence or absence of certain characteristics.

HELP AT HOME

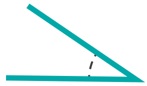
- Take your child on a "Geometry Walk." Locate and identify parallel and perpendicular lines and different degree angles (e.g., right angles, acute angles, and obtuse angles).

VOCABULARY

A **RIGHT ANGLE** has two rays that meet to form a 90 degree angle.



An **ACUTE ANGLE** has two rays that meet to form an angle that measures less than 90 degrees.



An **OBTUSE ANGLE** has two rays that meet to form an angle that measures greater than 90 degrees.

Your child can recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Your child can identify line-symmetric figures and draw lines of symmetry.

- Create a symmetrical figure by drawing in the missing half of the figure.
- Draw in all of the lines of symmetry in a figure.
- Identify symmetrical figures.

HELP AT HOME

- Cut out several geometric shapes from paper (e.g., rectangles, triangles, squares, circles, hearts). Then, cut the shapes in halves and tape the halves to graph paper. Have your child draw the missing halves to the shapes.
- Discuss how many lines of symmetry each shape has. Practice folding the shapes at the lines of symmetry.

VOCABULARY

A **LINE OF SYMMETRY** divides a shape into two congruent (equal) parts. A figure can have one line of symmetry, more than one line of symmetry, or none at all.