

**Utah State Office of Education  
Parent Guides  
Utah Core State Standards for Mathematics  
Grades K-6**





Utah State Office of Education  
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# MATH Kindergarten

## In the Utah Core State Standards for kindergarten there are two critical areas.

The critical areas define what students should know and understand (conceptual understanding), and be able to do (procedural understanding and fluency).

### CRITICAL AREA ONE: By the end of kindergarten, students should:

- 1**
1. Use numbers, including numerals (the symbols for numbers) to:
    - a. Represent quantities (how many items there are).
    - b. Solve problems involving quantities such as counting objects in a set, counting out a certain number of objects, comparing one set with another or one numeral with another.
    - c. Solve problems by modeling such as joining sets of objects together (addition) and separating them (subtraction).
    - d. Solve problems by using simple equations, such as  $5 + 2 = 7$  and  $7 - 2 = 5$ .
  2. Choose and apply effective strategies for answering questions involving quantities, including:
    - a. Quickly recognizing how many objects are in a set (cardinality).
    - b. Counting and making sets of given sizes.
    - c. Counting the number of objects in combined sets.
    - d. Counting the number of objects that remain in a set after some are taken away.
  3. Fluently add and subtract within 5.



#### Examples:

1. Students are given several sets of random quantities from 0–20. Students are asked to identify the quantity of each set and match a numeral card to show the value of each set.
2. Hyrum has 7 gumballs. Lucy has 6. Mario has 7. Which students have the same number of gumballs?
3. Olivia has 3 lollipops and her friend Sophie has 2 lollipops. How many lollipops do they have all together? Students draw a picture or place objects in sets and then combine them to solve the problem. The teacher then models the equation  $3 + 2 = 5$  and relates it to the sets the students combined.
4. Carlos had 10 pieces of gum. He gave 4 of them to his friends. How many does he have left? Students draw pictures or place objects in a set to solve the problem by separating. The teacher then models the equation  $10 - 4 = 6$  and relates it to the set the students separated.



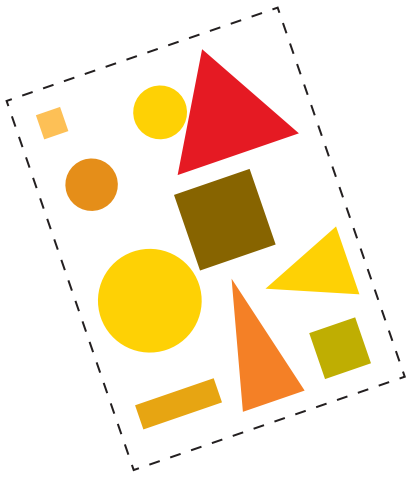
### CRITICAL AREA TWO: By the end of kindergarten, students should:

- 2**
1. Describe their world using shapes, orientation (how is the shape turned or positioned), and spatial relations (e.g., above/below, right/left).
  2. Identify, name, and describe basic two-dimensional shapes, such as squares, triangles, circles, rectangles, and hexagons in a variety of ways, e.g., with different sizes and orientations.
  3. Identify, name, and describe basic three-dimensional shapes, such as cubes, cones, cylinders, and spheres in a variety of ways, e.g., with different sizes and orientations.
  4. Use basic shapes and spatial relations to model objects in their environment and to construct more complex objects.

#### Examples:

1. What shape is the whiteboard? If I turn this square like this, is it still a square? What is under the art table? What is above your heads? What shape is it? Find an object in the room that is shaped like a (circle, rectangle, etc.). What is next to it?





2. Given a piece of paper with different shapes drawn on it, students can circle or color all examples of the same shape, regardless of size or orientation. When given a list of attributes describing a shape, students can point to the correct shape.

## TIPS FOR FAMILIES – HOMEWORK HELP

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- ▶ **Help your child see that the mathematics he is learning is very much a part of everyday life.** From statistics in sports to the sale price of clothing to the amount of gas needed to travel from one city to another, mathematics is important to us every day. Help your child to link his "school" math to practical events.
- ▶ **Show your child that you like mathematics.** Letting your child see that you use math—and that you aren't afraid of it—will go much further to building positive attitudes than just telling her that she should learn it.
- ▶ **Set high standards for your child in mathematics achievement.** Challenge your child to succeed in math and encourage his interest by finding mathematics in books, on television, in movies, at the playground, or anywhere else you see the opportunity.

(Adapted from Helping Your Child Learn Math, <http://www2.ed.gov/parents/academic/help/math/index.html>)

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# MATH

## Grade



### In the Utah Core State Standards for first grade there are four critical areas.

The critical areas define what students should know and understand (conceptual understanding), and be able to do (procedural understanding and fluency).

#### CRITICAL AREA ONE: By the end of first grade, students should:

1. Develop strategies for adding and subtracting whole numbers based on their work in kindergarten with small numbers.
2. Model addition and subtraction strategies such as add-to, take-from and put-together, take apart with objects and length based models (e.g., cubes connected to form lengths), and compare situations to understand the operations of addition and subtraction.
3. Develop strategies to solve arithmetic problems with addition and subtraction.
4. Understand the connection between counting and addition and subtraction.
5. Use properties of addition (commutative and associative) to add whole numbers and to create and use strategies to solve problems within 20. Students do not need to use the names of the properties at this point.
6. Build their understanding of the relationship between addition and subtraction.



#### Examples:

1. **Add to:** Two bunnies sat on the grass. Three more bunnies hopped over. How many bunnies are on the grass now?  
 **$2 + 3 = ?$**

**Take from:** Five apples were on the table. I ate two apples. How many apples are on the table now?  
 **$5 - 2 = ?$**

**Put Together/Take Apart:** Five apples are on the table. Three are red and the rest are green. How many apples are green?  
 **$3 + ? = 5, 5 - 3 = ?$**

2. There are three students in Ms. Arnstein's class who have a total of 15 pencils. If Maria has 4 pencils and Anna has 5 pencils, how many pencils does Charlie have? Students may use any strategy to solve the problem, including using objects, drawings, and equations.

3. Commutative property of addition:  
Example:  **$4 + 2 = 6$**   **$2 + 4 = 6$**

Associative property of addition:  
Example:  **$5 + 5 + 2 = 10 + 2$**  or  **$5 + 7$**

4. Find three ways to solve this problem: Jenny has 4 toy cars, 5 teddy bears, and 5 dolls. How many toys does Jenny have?

Possible solutions:  
Use objects.  
Draw the groups and add them.  
Use addition:  $4 + 5 + 5 = 14$

Use the associative property of addition:

$$4 + 5 + 5 =$$

$$4 + 10 = 14$$

Use the commutative property of addition:

$$4 + 5 + 5 =$$

$$5 + 5 + 4 =$$

And then the associative property of addition

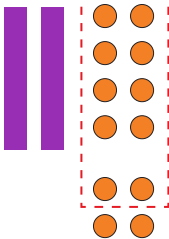
$$10 + 4 = 14$$

**CRITICAL AREA TWO: By the end of first grade, students should:**

- 2**
1. Use efficient and accurate methods to add within 100 and subtract multiples of ten.
  2. Be able to compare numbers (e.g., greater than, less than, equal to, more, less) and solve problems using that comparison.
  3. Understand whole numbers between 10 and 100 as tens and ones, especially recognizing numbers between 11 and 19 as a ten and some ones.

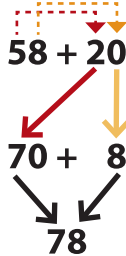
**Examples:**

1. 
$$\begin{array}{r} 28 \\ +4 \\ \hline \end{array}$$



2 tens plus 0 tens is 2 tens.  
Count the ones and find another ten plus 2 ones.  
 $20 + 10 = 30 + 2 = 32$

$$\begin{array}{r} 58 \\ +20 \\ \hline \end{array}$$



5 tens plus 2 tens equals 7 tens,  
8 ones plus 0 ones = 8 ones,  
70 tens plus 8 ones equals 78.

2.  $43 > 32$  because 4 tens is more than 3 tens,  $65 < 68$  because 6 tens and 5 ones is less than 6 tens and 8 ones. Use linking cubes to show the comparisons.
3. On Halloween night Meg and Troy count their Halloween candy. Meg has 64 pieces of candy and Troy has 59. Who has less candy? Explain how you know this.

**CRITICAL AREA THREE: By the end of first grade, students should:**

- 3**
1. Understand the meaning of measurement.
  2. Know and use methods of measurement, such as comparing objects to estimate their size.
  3. Measure the length of an object using smaller objects of equal size lying end to end with no overlaps or gaps.

**Examples:**

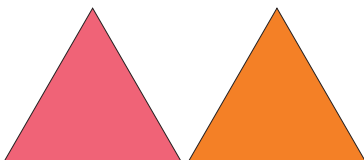
1. You got a new book from the library. It is 10 paperclips tall and 8 paperclips wide. Will the book fit in your backpack? How do you know?
2. Johnny, Sally, and Juan are students in first grade. Johnny is taller than Sally. Sally is shorter than Juan. Juan is taller than Johnny. Who is the tallest? Who is not the tallest and not the shortest? How do you know?

**CRITICAL AREA FOUR: By the end of first grade, students should:**

- 4**
1. Be able to compose (put together) and decompose (take apart) shapes.
  2. Build their understanding of part-whole relationships through composing and decomposing shapes.
  3. Recognize newly composed shapes from different orientations and perspectives.
  4. Describe the shapes geometrically.
  5. Determine how the shapes are alike and different.

**Examples:**

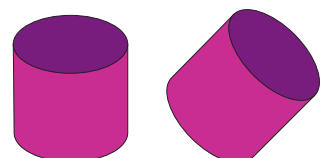
1. What shapes can you compose with these two triangles?



2. Decompose this shape into squares.



3. Are these shapes alike or different? How are they alike (or different)?



4. What shapes were composed to make this shape? Use a physical box for this problem so that students can look at it from different orientations and find the shapes.



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# MATH

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The critical areas define what students should know and understand (conceptual understanding), and be able to do (procedural understanding and fluency).

### CRITICAL AREA ONE: By the end of second grade, students should:

1. Count by fives, tens, and hundreds.
2. Understand the value of each digit in a four-digit number (e.g., 432 is 4 hundreds + 3 tens + 2 ones).
3. Compare three-digit numbers using the  $<$ ,  $>$ , and  $=$  symbols.



#### Examples:

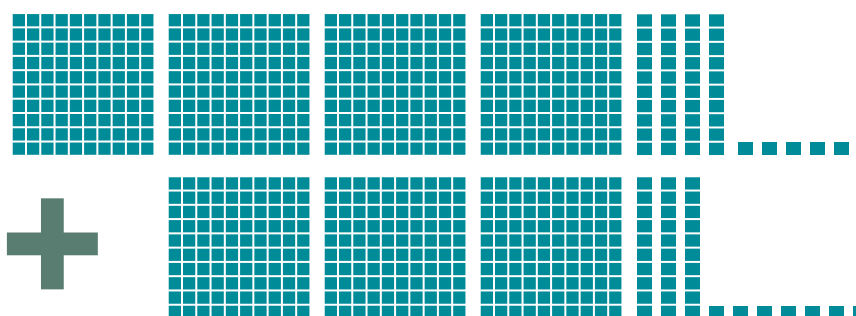
1. Count by fives: 5, 10, 15...1000
2. Write the number 876 in expanded form ( $800 + 70 + 6$ ). Write the value of each digit (8 hundreds + 7 tens + 6 ones).
3. Compare 432 or 446. Which number is greater in value? Show the greater value using the correct symbol ( $446 > 432$ ). Which number is lesser in value? Show the lesser value using the correct symbol ( $432 < 446$ ).
4. What symbol do we use to compare 532 and 532? ( $532 = 532$ ). What does "equal" mean? (532 has the same value as 532.)

### CRITICAL AREA TWO: By the end of second grade, students should:

2. Become fluent with addition and subtraction within 100.
2. Solve problems within 1,000.
  - a. Use models.
  - b. Develop and use efficient, generalizable (can be used in many problems) and accurate methods.
  - c. Use their understanding of place value and properties of operations.
3. Apply appropriate methods to mentally calculate sums and differences for numbers with only 10s or only 100s.

#### Examples:

1. Use mental strategies to fluently add and subtract within 20. By the end of the grade know from memory all sums of two one-digit numbers ( $5 + 7 = 12$ ,  $4 + 9 = 13$ , etc.). "Fluently" means to add and subtract problems quickly, flexibly, accurately, and appropriately.
2. Add:



# 3

- The second grade collected 235 cans for the food drive. The third grade collected 137 cans. How many cans did the second and third grades collect all together? How many more cans did the second grade class collect than the third grade? How many more cans do they need to get to 500? Justify your answer.

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## CRITICAL AREA THREE: By the end of second grade, students should:

- Recognize the need for standard units of measurement (e.g., centimeter and inch).
- Use measurement tools like rulers, yardsticks, and meter sticks.
- Understand that measuring length (linear measure) may require using measurement tools iteratively (over and over until the entire object is measured).
- The smaller the unit of measure (centimeter versus inch) the more times the unit must be used to cover a given length.

### Examples:

- Measure the table in centimeters. Now measure the table in meters. How does your measurement relate to the size of centimeters and meters?
- Measure how tall your chair is in inches and then measure how tall your chair is in feet. Which measurement required more units?
- We need to decorate for our party. How much ribbon will we need to go across four desks placed side by side? Be sure to include your tool and unit of measure. Why did you use that unit?

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## CRITICAL AREA FOUR: By the end of second grade, students should:

# 4

- Describe and analyze shapes by examining their sides and angles.
- Investigate, describe, and reason about decomposing (taking apart) and combining shapes to make other shapes.
- Build, draw and analyze two- and three-dimensional shapes in order to gain a foundation for understanding area, volume, congruence, similarity, and symmetry in later grades.

### Examples:

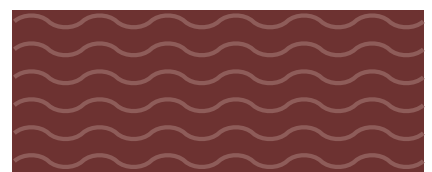
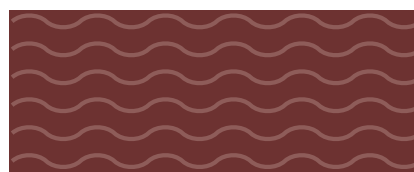
- Look at the shapes below. Name the shape and identify the number of sides and angles on the shape.



- Partition the rectangle into 2 equal rows and 3 equal columns. Record the total number of squares.



- Alex has a candy bar he wants to share with his three friends. He divides the candy bar into equal shares. Show two different ways Alex can partition the candy bar. How many equal pieces will Alex need to share with his friends?





## AT HOME

Parents should act as resources and supports for homework help. They should never do the homework themselves. The tips below come from the National Council of Teachers of Mathematics Homework Tips webpage (<http://www.nctm.org/resources/content.aspx?id=2876>).

### TIPS FOR FAMILIES – HOMEWORK HELP

#### Math Homework Is Due Tomorrow—How Can I Help?

Homework causes trouble in many households. Relax—remember whose homework it is! Think of yourself as more of a guide than a teacher. Don't take over for your child. Doing that only encourages him or her to give up easily or to ask for help when a problem becomes difficult.

The best thing you can do is ask questions. Then listen to what your child says. Often, simply explaining something out loud can help your child figure out the problem. Encourage your child to show all work, complete with written descriptions of all thinking processes. This record will give your child something to look back on, either to review or to fix a mistake, and can also help the teacher understand how the problem was solved.

#### Asking the following kinds of questions can help you and your child tackle the challenges of math homework:

- What is the problem that you're working on?
- Are there instructions or directions? What do they say?
- Are there words in the directions or the problem that you do not understand?
- Where do you think you should begin?
- Is there anything that you already know that can help you work through the problem?
- What have you done so far?
- Can you find help in your textbook or notes?
- Do you have other problems like this one? Can we look at one of those together?
- Can you draw a picture or make a diagram to show how you solved a problem like this one?
- What is your teacher asking you to do? Can you explain it to me?
- Can you tell me where you are stuck?
- Is there someone you can call to get help? Can you discuss the problem with a classmate?
- Would using a calculator help you solve the problem?
- Would it help to go on to another problem and come back to this one later?
- Is there a homework hotline at your school? What is the phone number for it?
- Why don't we look for some help on the Internet?
- If you do only part of a problem, will the teacher give you some credit?
- Can you go in before or after school for help from the teacher?

#### Remember, *support homework—don't do it!*

- ▶ Besides supporting your child on homework, show the importance of learning math by helping your child **connect math with daily life**.
- ▶ Point out **your own activities that involve mathematics**, such as deciding whether you have enough money to buy items on a shopping list, estimating how long it will take to make a trip, determining how much carpet or wallpaper to buy for a room, or developing a schedule to complete a series of tasks.
- ▶ Talking about these everyday situations will give you a chance to increase your child's **appreciation for the usefulness of mathematics**.

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# MATH

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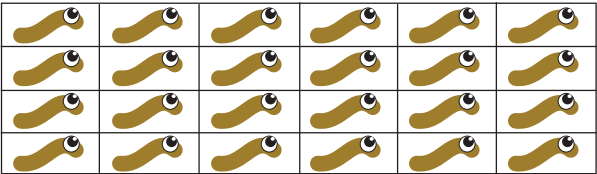
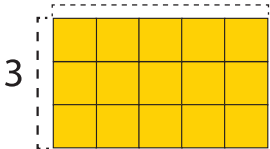
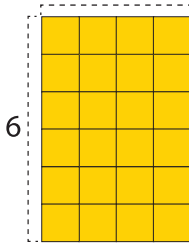
The critical areas define what students should know and understand (conceptual understanding), and be able to do (procedural understanding and fluency).

**CRITICAL AREA ONE: By the end of third grade, students should:**

1. Understand the meaning of multiplication and division.
2. Work through activities and problems involving equal-sized groups, arrays, and area models.
3. Understand the relationship between multiplication and division.

**Examples:**

1. Multiplication is finding an unknown product.  $3 \times 5 = \underline{\quad}$   
Division is finding an unknown factor.  $\underline{\quad} \times 6 = 24$  (same as  $24 \div 6 = \underline{\quad}$ )

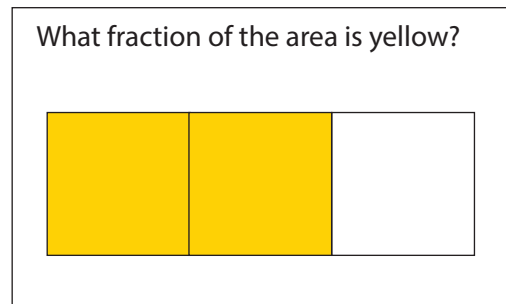
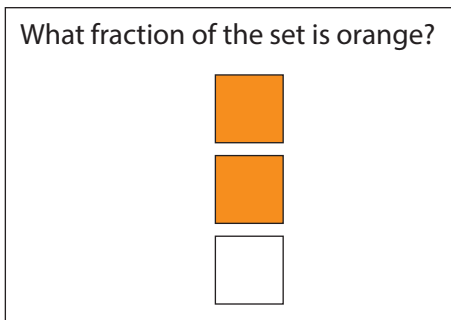
	MULTIPLICATION	DIVISION
Equal-sized groups	<p>The product of 3 groups of 5 objects <math>3 \times 5 = \underline{\quad}</math> 3 hands with 5 fingers on each hand, models a product of 15 total fingers.</p>	<p>The missing factor of 24 objects shared with 6 groups <math>\underline{\quad} \times 6 = 24</math> (same as <math>24 \div 6 = \underline{\quad}</math>) Rodrigo has 24 cupcakes. He wants to evenly divide them into six boxes. How many cupcakes will he put in each box?</p>
Arrays (organized patterns like rows and columns)	<p>The product of objects evenly distributed into 3 rows and 5 columns:</p>  <p><math>3 \times 5 = \underline{\quad}</math> 3 rows of apples with 5 in each row models the product of 15 apples.</p>	<p>The missing factor of 24 objects placed in 6 equal-sized columns: Darla is arranging a display for her teacher. There are 24 worm pictures in the display. Her teacher wants 6 pictures in each row. How many columns of pictures will she need to create? Draw an array to represent the problem, and then create an equation. <math>\underline{\quad} \times 6 = 24</math> (same as <math>24 \div 6 = \underline{\quad}</math>) Possible array: 4 rows of 6 pictures each = 24 pictures</p> 
Area models (using the area of a rectangle to model multiplication)	<p>The product of square units distributed into 3 rows and 5 columns:</p>  <p>Square tiles positioned 3 up and 5 across models the product of 15 total tiles. <math>3 \times 5 = \underline{\quad}</math></p>	<p>The missing factor of 24 total tiles in 6 equal rows: <math>\underline{\quad} \times 6 = 24</math></p>  <p>24 tiles positioned in 6 rows models the missing factor of 4 in each row. <math>6 \times \underline{\quad} = 24</math> (same as <math>24 \div 6 = \underline{\quad}</math>)</p>

**CRITICAL AREA TWO: By the end of third grade, students should:**

1. Develop understanding of fractions with denominators limited to 2, 3, 4, 6, 8.
  - a. Start with unit fractions.
  - b. Non-unit fractions are built of unit fractions.
  - c. Use fractions and visual models to represent parts of a whole.
  - d. Understand that the size of a fractional part is related to the size of the whole.
2. Use fractions to represent numbers equal to, less than, and greater than one.
3. Be able to solve problems comparing fractions.

**Examples:**

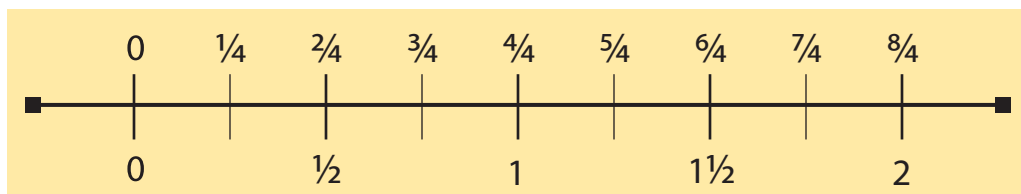
1. Using unit fractions and visual fraction models.
  - a. Unit fractions are fractions with a numerator of one. For example,  $\frac{1}{4}$ ,  $\frac{1}{2}$ , and  $\frac{1}{3}$  are unit fractions.
  - b. The fraction  $\frac{3}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$  where  $\frac{1}{4}$  represents one unit of a whole shape divided into 4 equal parts.
  - c. Visual models for the fraction  $\frac{2}{3}$ .



- d. Fraction amounts differ according to the size of the whole. As shown below, the fractional halves do not cover the same area, but each is still  $\frac{1}{2}$  of the whole shape.



2. This example uses a number line model to represent fractions equivalent to numbers less than one, more than one and equal to one.



3. My friend and I each had the same-sized chocolate candy bar. I ate  $\frac{1}{2}$  of mine and my friend ate  $\frac{1}{3}$  of his. Who ate more? How do you know?

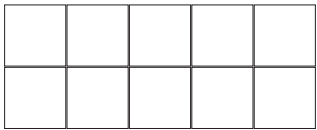
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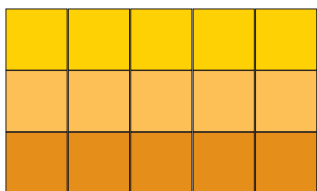
1. Recognize area as an attribute of two-dimensional shapes.
2. Measure the area of a shape:
  - a. Find the total number of same-sized square units e.g., inches, centimeters, needed to cover the shape with no gaps or overlaps.
  - b. One square unit is the standard unit of measure.
3. Understand that rectangular arrays (organized patterns like rows and columns) can be decomposed (taken apart) into identical rows or columns.
  - a. Use decomposition of arrays into rectangular arrays of squares to connect area to multiplication.

### Examples:

1. Area is the measure, in square units, of the inside of a two-dimensional figure.  
*The area of the figure below is 10 square units.*



2. How many one-inch squares would it take to cover a sheet of paper?
3. An array of squares with 3 rows and 5 columns can be decomposed (taken apart) into 3 rows of 5 square units as shown below. Each row represents a group of 5 and can be used to model skip counting by 5, as row 1 = 5, row 2 = 10 and row 3 = 15 in the counting process.



The same could be done vertically to reveal columns of 3 and skip counting by 3.

# 4

## CRITICAL AREA FOUR: By the end of third grade, students should:

1. Describe, analyze and compare properties of two-dimensional shapes.
2. Compare and classify shapes by their sides and angle.
3. Relate the fractions they are learning to geometry by expressing the area of part of a shape as a unit fraction of the whole shape.

### Examples:

1. Describe a rhombus, a square, a rectangle, a trapezoid, a triangle, a hexagon, etc. Compare the number of sides of given shapes.
2. Show examples of several 4-sided figures. What do these shapes have in common?
3. Compare a triangle to a square. How are they similar? How are they different?
4. Draw examples of different quadrilaterals. Given different shapes, have students group them by similar angles.
5. Cut a rectangle diagonally. Ask students to show that they are each the same size. These new triangles now represent  $\frac{1}{2}$  of the rectangle.
6. What are all the ways you can divide a rectangular birthday cake into 8 equal parts (eighths).
7. Shapes can be partitioned (divided) into fractions in many different ways. The following squares are all divided into four equal parts.



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# MATH

## In the Utah Core State Standards for fourth grade there are three critical areas.

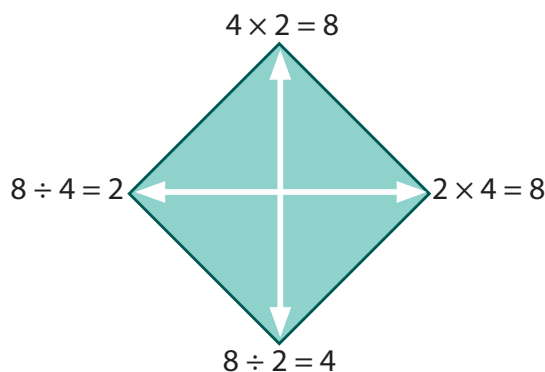
The critical areas define what students should know and understand (conceptual understanding), and be able to do (procedural understanding and fluency).

### CRITICAL AREA ONE: By the end of fourth grade, students should:

1. Understand place value up to 1,000,000 and know the value of each number in each place.
2. Be able to compute products (answers to multiplication problems) and quotients (answers to division problems) of whole numbers with multiple digits by applying what they learned in previous grades.
3. Understand that multiplication and division are opposite operations; that is, multiplication and division reverse each other.
4. Estimate and mentally calculate products ( $\times$ ) and quotients ( $\div$ ).
5. Become fluent with procedures for multiplying and dividing whole numbers efficiently.
6. Understand and explain why multiplication and division procedures work.
7. Solve problems using multiplication and division procedures.
8. Know how to describe what a division remainder means depending on the context of the problem.

#### Examples:

1.  $56 \times 20 = \underline{\quad}$ . Using the distributive property,  $(50 \times 20) + (6 \times 20) = \underline{\quad}$ .
2. Fact families show the relationship between operations:



3. Estimate the product of  $56 \times 20$ .
4. A 17-inch-long piece of rope is cut into 2-inch pieces. How many 2-inch pieces are there? How much of the rope is left?

# 2

## CRITICAL AREA TWO: By the end of fourth grade, students should:

1. Understand how different fractions can be equivalent. They will develop ways of recognizing and generating equivalent fractions.
2. Understand that fractions can be compared, added, subtracted, and multiplied, and perform those operations.
3. Be able to use understanding of unit fractions, e.g.,  $\frac{1}{4}$ ,  $\frac{1}{6}$ ,  $\frac{1}{3}$ , to compose (build) fractions from unit fractions, and to decompose (break into parts) fractions into unit fractions.
4. Be able to multiply a fraction by a whole number.

### Examples:

1.  $\frac{15}{9} = \underline{\hspace{2cm}}$ .                      What is an equivalent fraction for  $\frac{4}{10}$  ?
2.  $\frac{5}{6} - \frac{3}{6} = \underline{\hspace{2cm}}$ .                       $2\frac{4}{5} - 1\frac{2}{5} = \underline{\hspace{2cm}}$ .
3. A cake recipe calls for  $\frac{3}{4}$  cup of milk,  $\frac{1}{4}$  cup of oil, and  $\frac{2}{4}$  cup of water. How much liquid was needed to make the cake? Justify your answer.
4. Composing:  $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \underline{\hspace{2cm}}$ .      Decomposing:  $\frac{3}{6} = \frac{?}{6} + \frac{?}{6} + \frac{?}{6}$
5. Kathy is having a party. She wants  $\frac{2}{3}$  cup of trail mix per guest. She expects 6 guests. How much trail mix should Kathy prepare? Write an equation and justify your solution with a visual model.

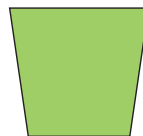
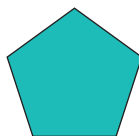
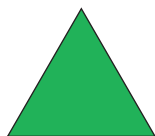
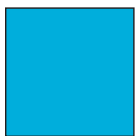
# 3

## CRITICAL AREA THREE: By the end of fourth grade, students should:

1. Describe, analyze, compare, and classify two-dimensional shapes.
2. Deepen their understanding of two-dimensional shapes and their characteristics (properties).
3. Use two-dimensional shapes to solve problems involving line symmetry (the shape is the same on both sides of the line).

### Examples:

1. Identify which of these shapes have perpendicular or parallel sides, and justify your selection.



2. Use lines, angles (right, acute, obtuse, straight), parallel and perpendicular lines to build two-dimensional shapes. Describe their properties.
3. Use pattern blocks, tangrams, or pentaminoes to create a figure that has at least one line of symmetry. Draw a two-dimensional replica of that figure showing the lines of symmetry.

## AT HOME

Parents should act as resources and supports for homework help. They should never do the homework themselves. The tips below come from the National Council of Teachers of Mathematics Homework Tips webpage (<http://www.nctm.org/resources/content.aspx?id=2876>).

### TIPS FOR FAMILIES – HOMEWORK HELP

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# MATH

# Grade



## In the Utah Core State Standards for fifth grade there are three critical areas.

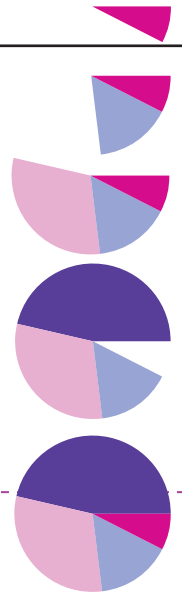
The critical areas define what students should know and understand (conceptual understanding), and be able to do (procedural understanding and fluency).

### CRITICAL AREA ONE: By the end of fifth grade, students should:

1. Represent addition and subtraction of fractions with unlike denominators as equivalent problems with like denominators.
2. Be able to fluently add and subtract fractions with unlike denominators.
3. Be able to estimate sums and differences of fractions.
4. Be able to represent multiplication and division of fractions in model form. (Note: This is limited to division of unit fractions, e.g.,  $1/8$ ,  $1/5$ , or  $1/3$ , by whole numbers and whole numbers by unit fractions.)
5. Be able to explain why the procedures for multiplying and dividing fractions make sense.

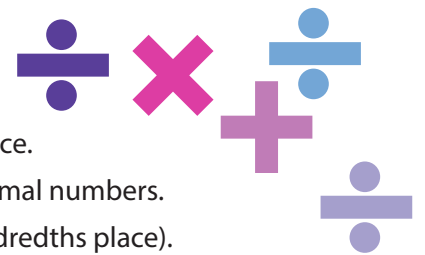
#### Examples:

- |  |    |  |
|--|----|--|
| 1. $1/3 + 1/5 = 5/15 + 3/15$                         | or | $3/4 - 2/3 = 9/12 - 8/12 =$                        |
| 2. $5/8 + 1/6 = 19/24$                               | or | $4/5 - 3/4 = 1/20$                                 |
| 3. Estimate the sum of $3/4$ and $1/3$ .             | or | Estimate the difference of $5/6$ and $1/4$ .       |
| 4. Draw a picture of $1/2$ divided by 4.             | or | Draw a picture of 3 times $1/5$ .                  |
| 5. Use words to explain why 3 divided by $1/2 = 6$ . | or | Use words to explain why 5 times $1/3 = 1^{2/3}$ . |



### CRITICAL AREA TWO: By the end of fifth grade, students should:

1. Use the meaning of base-ten numerals and properties of operations to explain why division procedures work.
2. Fluently compute multi-digit numbers in all operations.
3. Fluently add and subtract decimals to the hundredths place.
4. Estimate sums and differences of decimal numbers to the hundredths place.
5. Understand and explain the procedures for multiplying and dividing decimal numbers.
6. Accurately and fluently multiply and divide decimal numbers (to the hundredths place).



#### Examples:

1. Use words to explain why 2000 divided by 50 = 40.
2. Find  $678 + 928$ . Find  $9002 - 391$ . Find  $207 \times 48$ . Find 6478 divided by 79.
3. Find  $.52 + .38$  or Find  $.67 - .25$ .
4. Estimate  $.365 + .113$  to the nearest hundredth.
5. Use words to explain how to multiply  $.02$  and  $.56$ . Use words to explain why  $.50$  divided by  $.25$  equals 2.
6. Multiply 0.71 and 0.36. What is 0.75 divided by 5?

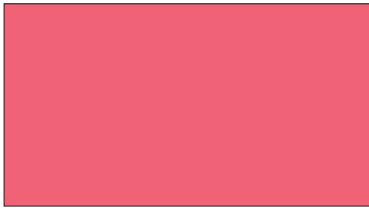
# 3

## CRITICAL AREA THREE: By the end of fifth grade, students should:

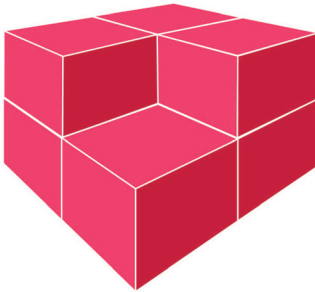
1. Recognize that three-dimensional shapes have volume.
2. Understand that volume can be measured by finding the total number of same-size units (cubes).
3. Select appropriate units of measure.
4. Select appropriate tools and strategies for measuring and/or estimating volume.
5. Be able to decompose (break apart) three-dimensional shapes into layers of arrays of cubes and use the volumes of the smaller shapes to calculate the total volume.
6. Determine and measure the parts of three-dimensional shapes in order to find the volumes and solve real-world and mathematical problems.

### Examples:

1. Which of the following has volume?

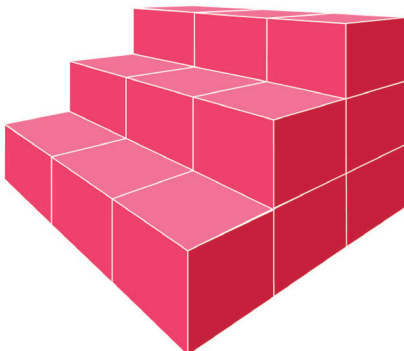


2. How many cubic units is this shape?



3. Which would be a better unit of measure to find the volume of your bedroom?
  - a. a cubic centimeter
  - b. a cubic meter
4. Which is a better tool to use to find the volume of a shoebox?
  - a. a ruler
  - b. a yardstick

5. Find the total number of cubic units in this shape.



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# MATH

Grade

# 6

In the Utah Core State Standards for sixth grade there are four critical areas.

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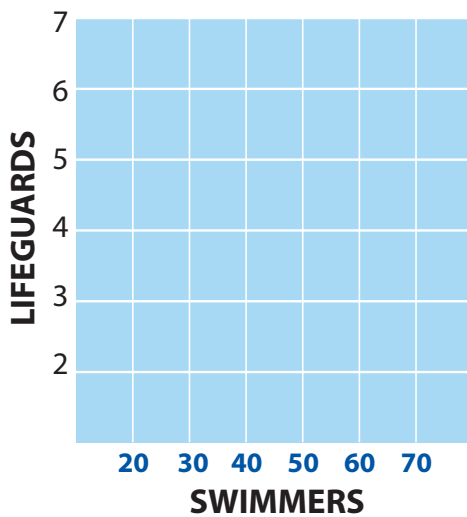
**CRITICAL AREA ONE: By the end of sixth grade, students should:**

1

1. Use multiplication and division to solve ratio and rate problems.
2. Use visual tools to connect their understanding of multiplication and division with rates and ratios.
3. Connect ratios and fractions.
4. Solve a wide variety of problems involving ratios and rates.

**Examples:**

1. The newspaper reported, "For every vote candidate A received, candidate B received three votes." Describe possible election results using at least three different ratios. Explain your answer.
2. Analyze the table below to determine the missing values. Graph the information from the table on the coordinate plane and explain the relationship of swimmers to lifeguards.



<b>SWIMMERS</b>	<b>20</b>	<b>30</b>	<b>40</b>	<b>50</b>	<b>60</b>	<b>70</b>
<b>LIFEGUARDS</b>	<b>2</b>	<b>3</b>	<b>4</b>			

3. Lewis found yo-yo replacement strings listed at \$3.00 per dozen. He only wants two strings. He can buy the strings individually at the same rate as a single string from the rate per dozen. Find the ratio for the cost of an individual string and the rate for the cost of two strings. Ratio relationship between the quantities (proportion):  $300/12 = ?/1$

What is the rate for one string?  $300 \div 12 = ?/1 = ?$

What is the rate for 2 strings?  $? \times 2 =$

**CRITICAL AREA TWO: By the end of sixth grade, students should:**

1. Use the meaning of fractions, multiplication, division, and the multiplication/division relationship to understand and explain why the procedure for dividing fractions makes sense.
2. Use multiplication and division to solve problems involving fractions.
3. Extend their previous understanding of numbers and number ordering to the full system of rational numbers, which includes negative integers.
4. Reason about the order and absolute value of rational numbers.
5. Reason about the location of points in all four quadrants of the coordinate plane.

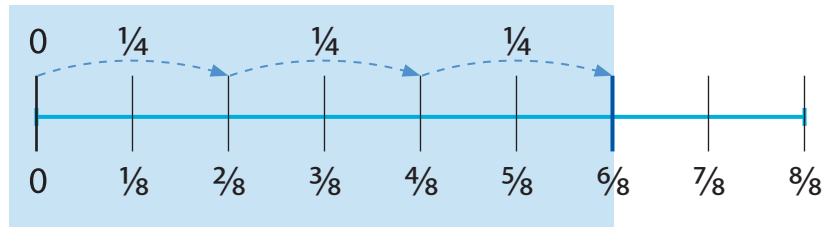
**Examples:**

1. **You have  $\frac{6}{8}$  pound of Skittles. You want to give your friends  $\frac{1}{4}$  lb. each. How many friends can you give Skittles to? Explain your answer.**

The standard procedure for solving this problem would be:  $\frac{6}{8} \div \frac{1}{4} = \frac{6}{8} \times \frac{4}{1} = \frac{24}{8} = 3$ . Why does that procedure make sense?

**Solve using the meaning of fractions:** The meaning of fractions is that a fraction is a part of a whole. In this problem, the one-pound bag of Skittles is partitioned into 8 parts, each  $\frac{1}{8}$  pound. One of those parts is  $\frac{1}{8}$  of the bag. Here we are dealing with  $\frac{6}{8}$  pounds of the bag, or 6 equal parts of the 8 parts making up the whole bag. We are to find how many  $\frac{1}{4}$  pound parts there are in  $\frac{6}{8}$  pounds of the bag.

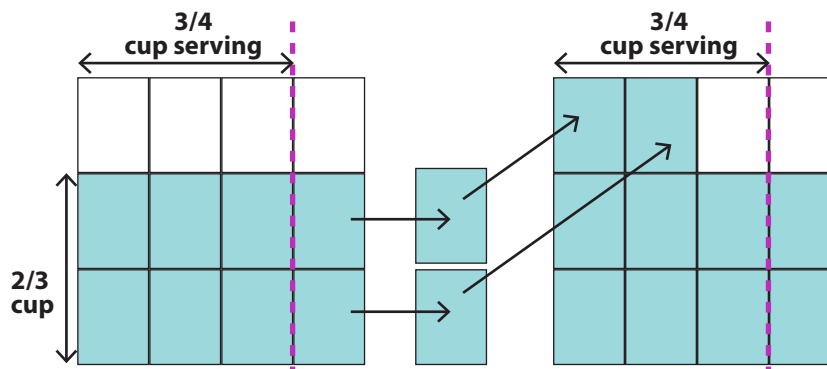
Using a number line can help with this problem.



There are three “jumps” of  $\frac{1}{4}$  each in  $\frac{6}{8}$ , so you can share the Skittles with three friends. In other words,  $\frac{6}{8}$  parts  $\div$   $\frac{1}{4}$  parts = 3 equal shares.

2. **How many  $\frac{3}{4}$  cup servings are there in  $\frac{2}{3}$  cup of ice cream?**

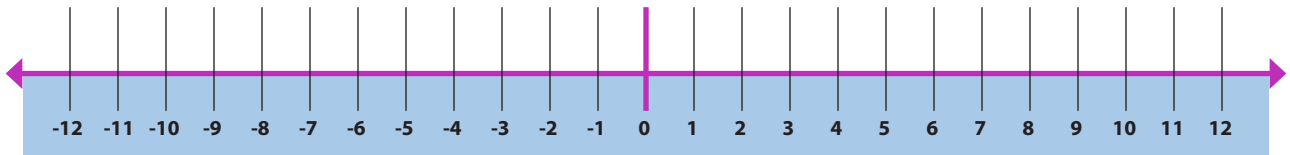
We know that the one cup container has  $\frac{2}{3}$  cups of ice cream left. The size of a regular serving is  $\frac{3}{4}$  cups. We are asked to figure out how many  $\frac{3}{4}$  cup servings we can get from what is left in the container. A visual fraction model called an area model can help us solve this problem using the meaning of fractions.



In this model the whole is one  $\frac{3}{4}$  cup serving, not the whole container.  $\frac{2}{3}$  cup of ice cream fills  $\frac{8}{9}$  of the  $\frac{3}{4}$  cup serving. So, a  $\frac{2}{3}$  cup of ice cream  $\div$  a  $\frac{3}{4}$  cup serving = an  $\frac{8}{9}$  serving of ice cream.

### Solve using the relationship between multiplication and division:

- Multiplication and division are inverse, or opposite, operations. In other words, since  $56 \div 8 = 7$ , it is also true that  $56 \times 1/7 = 8$ . Seven and  $1/7$  are multiplicative inverses because  $7 \times 1/7 = 1$ . Fractions follow the same rules as do any other number. So,  $6/8 \div 1/4 = 6/8 \times 4/1$ , since  $1/4$  and  $4/1$  are inverses ( $1/4 \times 4/1 = 1$ ).
- Place the following rational numbers on a number line (approximations are okay).  $-5$ ,  $3\frac{1}{2}$ ,  $-6.5$ ,  $49/50$ ,  $-12.4$ ,  $3.\overline{666}$ ,  $2/3$ ,  $-2/3$  (make up your own).



- Absolute value: If Sam has deposited \$3 in his bank account for the past 9 weeks, and makes a debit card purchase for \$45, how could he represent the balance changes in his account? Use words to describe the changes made to his balance and the new balance.
- On the coordinate plane, Bill's house is at  $(-4, 6)$ , the library is at  $(-4, -2)$  and the bakery is at  $(3, -2)$ . What is the distance between Bill's house and the library? The library and the bakery? Show two different methods to find the difference.

# 3

## CRITICAL AREA THREE: By the end of sixth grade, students should:

- Understand the use of variables in mathematical expressions.
- Write expressions and equations that correspond to a given situation. They will evaluate the expression and use the expression and formulas to solve problems.
- Write and evaluate equations.
- Understand that expressions in different forms can be equivalent and, by using properties of operations, be able to rewrite expressions in equivalent forms.
- Know the values of the variables that make the equations true.
- Solve simple one-step equations by using the properties of operations and equality of both sides.
- Construct and analyze tables.

### Examples:

- Complete the table by evaluating the expression:

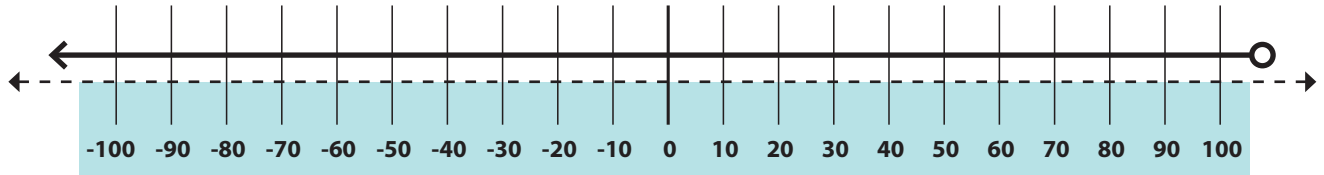
x	0	3	7	12
$5x + 8$				

- Jonathan works at a pet store walking puppies. This week he will walk each of four puppies a mile each day. He walks the puppies one at a time. How many miles will he walk in 6 days? Create a table and an expression to represent this problem.

Day	Miles
1	4
2	
3	
4	
5	
6	?

3. You know that you can find the area of a triangle using the formula  $A = 1/2 bh$ . If a triangle has an area of  $48 \text{ cm}^2$ , what can its base and height be? Draw diagrams to justify your thinking.
4. Are the following expressions equivalent? Why or why not?
  - a.  $x + x + 1 + 1 = 2x + 2$
  - b.  $5(x + 3) = 5x + 5$
5. Ronnie earned \$.50, giving her a total of \$3.17. Write an equation that allows you to find her beginning amount.
6. Water boils at  $100^\circ\text{C}$ . Write an inequality that represents all the temperatures at which water does not boil. Represent the solution on a number line.

Represent the solution on the number line:



# 4

## CRITICAL AREA FOUR: By the end of sixth grade, students should:

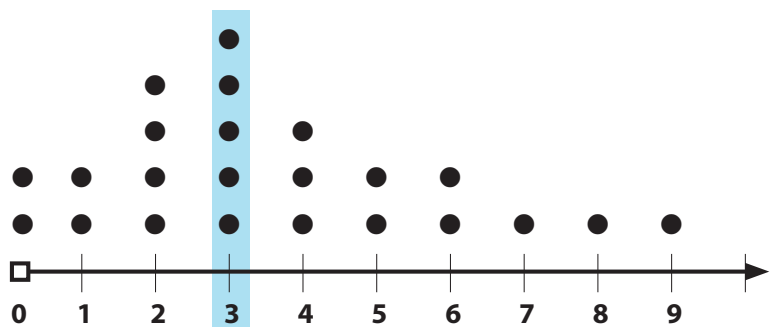
1. Begin to develop their ability to think statistically.
2. Recognize and use mean and median to find the center of a set of data and know that each yields different values.
3. Recognize that a measure of variability can also be useful for summarizing data.
4. Learn to describe and summarize numerical data sets while considering the context in which the data was collected.

### Examples:

1. "How old am I?" is not a statistical question, because it has one simple answer and no variability. "How old are the students in my school?" is a statistical question, because the answers will vary.

2. Mark took a survey of his classmates to find out how many siblings each has. He plotted the data on a line plot.

Next he determined the center (the median) to be 3. The spread of the data is 10, since it goes from 0 to 9. The shape of the data is skewed to the left of the plot, so the data show that it is more common to have less than 5 siblings than it is to have more than 5.



3. Provided a box score from a college or professional basketball game, have the students pick out the points scored by each player. The students will find the center (median) of the data and the spread of the data. Have the students graph the data using a line plot and describe the overall shape. Then have the students answer the following questions:
  - a. All players who don't score at or above the median points scored have to ride a stationary bicycle for 20 minutes. List the players who have to ride the bicycle.
  - b. The coach is trying to get the team to play better as a team. He is using the spread of the data as a way to determine if they are playing as a team. How might the coach use the spread to accomplish his goal?

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## TIPS FOR FAMILIES – HOMEWORK HELP

### Math Homework Is Due Tomorrow—How Can I Help?

Homework causes trouble in many households. Relax—remember whose homework it is! Think of yourself as more of a guide than a teacher. Don't take over for your child. Doing that only encourages him or her to give up easily or to ask for help when a problem becomes difficult.

The best thing you can do is ask questions. Then listen to what your child says. Often, simply explaining something out loud can help your child figure out the problem. Encourage your child to show all work, complete with written descriptions of all thinking processes. This record will give your child something to look back on, either to review or to fix a mistake, and can also help the teacher understand how the problem was solved.

### Asking the following kinds of questions can help you and your child tackle the challenges of math homework:

- What is the problem that you're working on?
- Are there instructions or directions? What do they say?
- Are there words in the directions or the problem that you do not understand?
- Where do you think you should begin?
- Is there anything that you already know that can help you work through the problem?
- What have you done so far?
- Can you find help in your textbook or notes?
- Do you have other problems like this one? Can we look at one of those together?
- Can you draw a picture or make a diagram to show how you solved a problem like this one?
- What is your teacher asking you to do? Can you explain it to me?
- Can you tell me where you are stuck?
- Is there someone you can call to get help? Can you discuss the problem with a classmate?
- Would using a calculator help you solve the problem?
- Would it help to go on to another problem and come back to this one later?
- Is there a homework hotline at your school? What is the phone number for it?
- Why don't we look for some help on the Internet?
- If you do only part of a problem, will the teacher give you some credit?
- Can you go in before or after school for help from the teacher?

### Remember, *support homework—don't do it!*

- ▶ Besides supporting your child on homework, show the importance of learning math by helping your child **connect math with daily life**.
- ▶ Point out **your own activities that involve mathematics**, such as deciding whether you have enough money to buy items on a shopping list, estimating how long it will take to make a trip, determining how much carpet or wallpaper to buy for a room, or developing a schedule to complete a series of tasks.
- ▶ Talking about these everyday situations will give you a chance to increase your child's **appreciation for the usefulness of mathematics**.

Other tips for parents can be found at: <http://www.nctm.org/resources/content.aspx?id=7928>