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MATH

Grade

6

In the Utah Core State Standards for sixth 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).

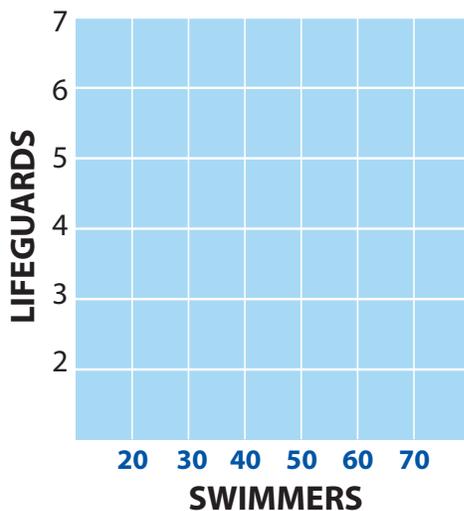
CRITICAL AREA ONE: By the end of sixth grade, students should:

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.



SWIMMERS	20	30	40	50	60	70
LIFEGUARDS	2	3	4			

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.

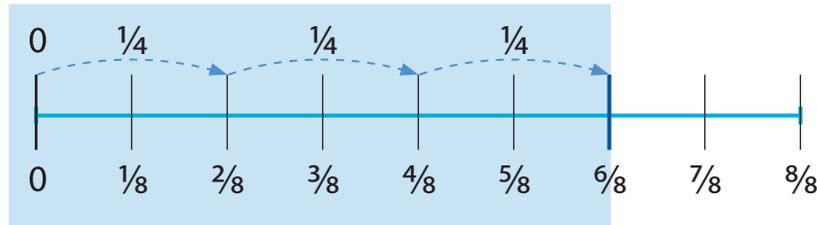
Examples:

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.

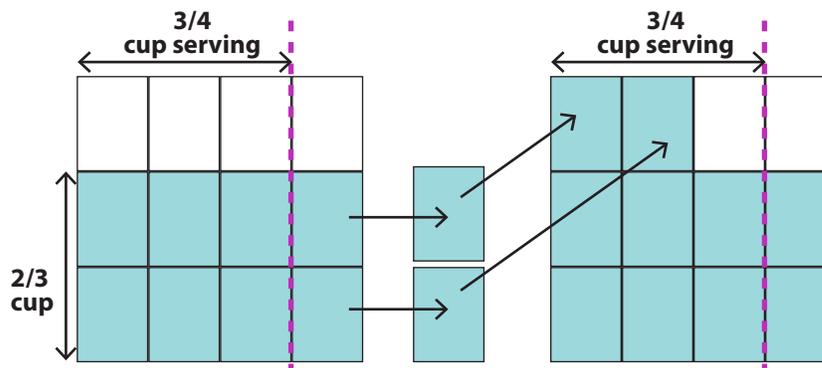
Using a number line can help with this problem.



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?**

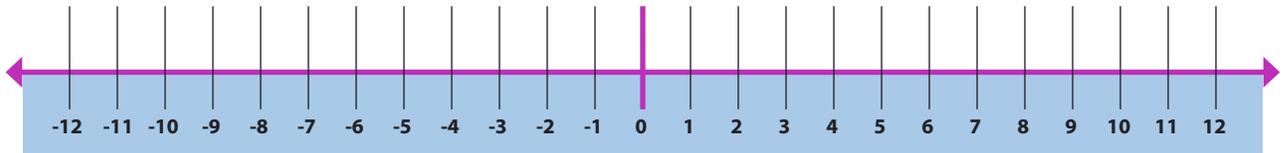
We know that the one cup container has $\frac{2}{3}$ cups of ice cream left. The size of a regular serving is $\frac{3}{4}$ cups. We are asked to figure out how many $\frac{3}{4}$ cup servings we can get from what is left in the container. A visual fraction model called an area model can help us solve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

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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:

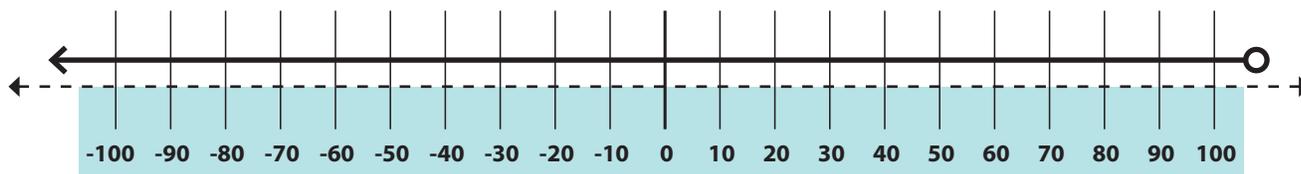
x	0	3	7	12
$5x + 8$				

- 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	?

- You know that you can find the area of a triangle using the formula $A = \frac{1}{2}bh$. If a triangle has an area of 48 cm^2 , what can its base and height be? Draw diagrams to justify your thinking.
- Are the following expressions equivalent? Why or why not?
 - $x + x + 1 + 1 = 2x + 2$
 - $5(x + 3) = 5x + 5$
- Ronnie earned \$.50, giving her a total of \$3.17. Write an equation that allows you to find her beginning amount.
- Water boils at 100°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:



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

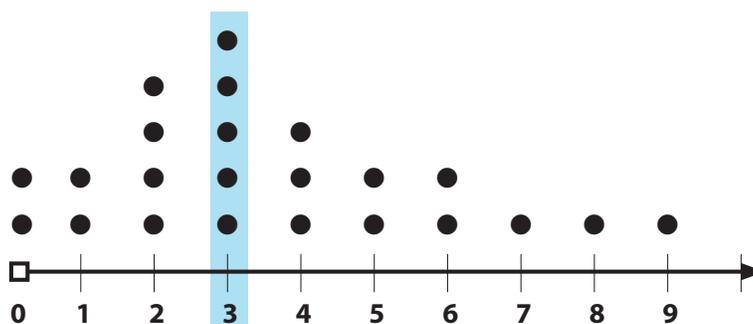
- Begin to develop their ability to think statistically.
- Recognize and use mean and median to find the center of a set of data and know that each yields different values.
- Recognize that a measure of variability can also be useful for summarizing data.
- Learn to describe and summarize numerical data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

Examples:

- "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.

- 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.



- 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:
 - 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.
 - 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?

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**.

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