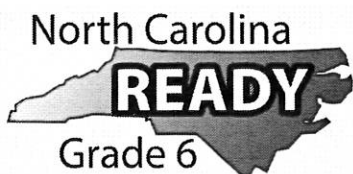


# Chapter 6

## Ratios, Unit Rates, and Percents

This chapter covers the following READY standards:



Ratios and Proportional Relationships
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6.RP.1, 6.RP.2, 6.RP.3
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### 6.1 Ratios (DOK 2)

**Ratios** are used to compare parts to a whole.

**Example 1:** The recipe for jam requires 8 cups of sugar for every 6 cups of strawberries. What is the ratio of strawberries to sugar in this recipe?

First number requested	$\frac{6}{8}$	$\frac{\text{cups strawberries}}{\text{cups sugar}}$
Second number requested	8	

**Answers may be simplified to lowest terms.**  $\frac{6}{8} = \frac{3}{4}$

**Ratios** are used to compare amounts. They can also be written using a colon (:)

**Example 2:** 5:7. This ratio would be read "five to seven". Ratios do not always explain the actual amount but rather a relationship or comparison. Ratios are written based on the order of the amounts that are requested in the question. Like fractions, ratios may need to be reduced to lowest terms or simplest form.

#### Simple Cake Recipe

- 1 cup milk
- 2 cups sugar
- 3 cups flour
- 4 eggs, beaten

Mix thoroughly; bake at 350°F until done.

Use the recipe above to write the ratios for each comparison. Express your answer in fraction form and simplify to lowest terms. (DOK 2)

- |                   |                  |                  |                  |
|-------------------|------------------|------------------|------------------|
| 1. milk to sugar  | 3. flour to eggs | 5. eggs to sugar | 7. milk to flour |
| 2. sugar to flour | 4. milk to eggs  | 6. eggs to milk  | 8. sugar to milk |

## 6.2 Ratio Problems (DOK 2)

In some word problems, you may be asked to express answers as a **ratio**. Ratios can look like fractions. Numbers must be written in the order they are requested. In the following problem, 8 cups of sugar is mentioned before 6 cups of strawberries. But in the question part of the problem, you are asked for the ratio of STRAWBERRIES to SUGAR. The amount of strawberries IS THE FIRST WORD MENTIONED, so it must be the **top** number of the fraction. The amount of sugar, THE SECOND WORD MENTIONED, must be the **bottom** number of the fraction.

**Example 3:** The recipe for jam requires 3 cups of sugar for every 6 cups of strawberries. What is the ratio of strawberries to sugar in this recipe?

First number requested	$\frac{6}{3}$	$\frac{\text{cups strawberries}}{\text{cups sugar}}$
Second number requested		

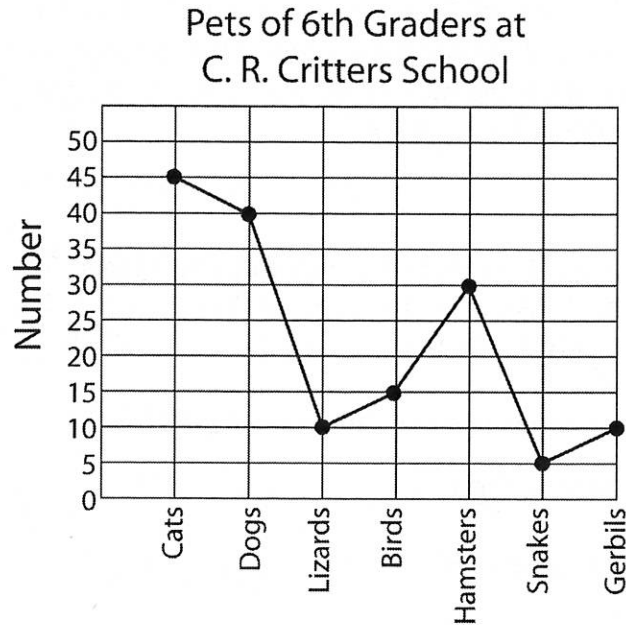
Answers may be reduced to lowest terms.  $\frac{6}{3} = \frac{2}{1}$

**Practice writing ratios for the following word problems and simplify to lowest terms. DO NOT CHANGE ANSWERS TO MIXED NUMBERS. Ratios should be left in fraction form. (DOK 2)**

1. Out of the 301 seniors, 117 are boys. What is the ratio of boys to the total number of seniors?
2. It takes 11 cups of flour to make 3 loaves of bread. What is the ratio of cups of flour to loaves of bread?
3. A skyscraper that stands 530 feet tall casts a shadow that is 84 feet long. What is the ratio of the shadow to the height of the skyscraper?
4. The newborn weighs 7 pounds and is 21 inches long. What is the ratio of weight to length?
5. Jack paid \$4.00 for 6 pounds of apples. What is the ratio of the price of apples to the pounds of apples?

## 6.3 Using Graphs to Solve Ratio Problems (DOK 2)

Carefully look at the following graphs and solve the ratio problems that follow. (DOK 2)



1. What is the ratio of lizards to dogs?
2. What is the ratio of gerbils to birds?
3. What is the ratio of cats to hamsters?
4. What is the ratio of birds to dogs?

	Type of Sport		
	Football	Basketball	Soccer
Boys	14	22	16
Girls	1	15	12

5. What is the ratio of boy soccer players to girl soccer players?
6. What is the ratio of girl basketball players to girl soccer players?
7. What is the ratio of boy football players to girl basketball players?
8. What is the ratio of girl soccer players to girl football players?

## 6.4 Equivalent Ratios (DOK 1, 2)

Ratios show how two amounts are related. If the ratio of boys to girls in a school is 1:3, this can be written as  $\frac{10}{30}$ , 2:6, or  $\frac{20}{60}$ . Each one of these represents an equivalent ratio to 1:3.

To find equivalent ratios, write the ratio as a fraction. Then, multiply or divide the top and bottom by the same number. To express the ratio in simplest form, you must divide each number in the ratio by their Greatest Common Factor (GCF).

**Example 4:**  $\frac{2}{5} = \frac{4}{\square}$

Multiply the 2 numbers diagonal from each other.  $5 \times 4 = 20$ .

Divide that answer by the other number.  $20 \div 2 = 10$ .

10 is the missing number.

Use what you know about ratios to solve the following. (DOK 2)

- Write the ratio  $\frac{15}{25}$  in simplest form.
- Write the ratio 4:8 in simplest form.
- Write the ratio  $\frac{8}{64}$  in simplest form.
- Write the ratio 14 : 21 in simplest form.

Replace the  $x$ ,  $y$ , and  $z$  in the tables of equivalent ratios with the correct number. Do not simplify the answers. (DOK 2)

5.

2 : 3
40 : $x$
$\frac{y}{6}$
$\frac{12}{z}$

6.

1 : 5
30 : $x$
$\frac{y}{25}$
$\frac{6}{z}$

7.

3 : 4
21 : $x$
$\frac{y}{40}$
$\frac{18}{z}$

8.

2 : 7
22 : $x$
$\frac{y}{28}$
$\frac{4}{z}$

9.

3 : 8
9 : $x$
$\frac{y}{88}$
$\frac{18}{z}$

- Mrs. Iachetta's recipe for salad dressing uses a ratio of 1 part olive oil to 2 parts vinegar. If she uses 3 cups olive oil, how much vinegar will she need?
- Marc's grades are as follows: Reading, 88; Math, 92; Science, 96; Social Studies, 90; and Language Arts, 94. Which classes are compared by the ratio 94:90? (Write them as a ratio.)
- A map shows a scale of 1 inch = 50 miles. How many miles are represented by 4.5 inches on the map?

### 6.5 Solving Ratio Problems (DOK 1)

To test if two ratios are equal, we can cross multiply. If the cross products are equal then the two ratios are equal.

**Example 5:** Determine if the following are equivalent ratios.

$$\frac{2}{3} = \frac{10}{15} \text{ and } \frac{4}{5} = \frac{8}{15}$$

**Step 1:** Cross multiply the first set of ratios.

$$\frac{2}{3} = \frac{10}{15} \Rightarrow 2 \times 15 = 3 \times 10 \Rightarrow 30 = 30$$

$\frac{2}{3}$  and  $\frac{10}{15}$  are equivalent ratios.

**Step 2:** Cross multiply the first set of ratios.

$$\frac{4}{5} = \frac{8}{15} \Rightarrow 4 \times 15 = 5 \times 8 \Rightarrow 60 \neq 40$$

$40 \neq 60$  so  $\frac{4}{5}$  and  $\frac{8}{15}$  are not equivalent ratios.

Cross products can also be used to find a missing part of equivalent ratios.

**Example 6:** Find  $n$ :  $\frac{1}{2} = \frac{n}{8}$

**Step 1:** Cross multiply.

$$1 \times 8 = 2n$$

**Step 2:** Solve for  $n$ .

$$8 = 2n$$

$$4 = n$$

**Circle the equivalent ratios. Use cross multiplying to determine which are equivalent ratios and which are not. (DOK 1)**

1.  $\frac{2}{5} = \frac{6}{10}$

2.  $\frac{6}{4} = \frac{3}{2}$

3.  $\frac{8}{10} = \frac{4}{5}$

4.  $\frac{8}{3} = \frac{1000}{375}$

**Find the missing term from each equivalent ratio. (DOK 1)**

5.  $\frac{2}{3} = \frac{4}{n}$

8.  $\frac{4}{5} = \frac{200}{y}$

11.  $\frac{9}{10} = \frac{99}{n}$

14.  $\frac{15}{n} = \frac{3}{4}$

6.  $\frac{8}{5} = \frac{x}{25}$

9.  $\frac{3}{4} = \frac{75}{y}$

12.  $\frac{2}{1} = \frac{14}{w}$

15.  $\frac{12}{60} = \frac{x}{5}$

7.  $\frac{n}{3} = \frac{9}{27}$

10.  $\frac{6}{x} = \frac{42}{49}$

13.  $\frac{4}{x} = \frac{6}{7.5}$

16.  $\frac{15}{20} = \frac{x}{8}$

## 6.6 Ratio Word Problems (DOK 2)

Ratios can be used to solve problems in real life situations.

**Example 7:** Gail ran 100 m in 16 seconds. How long did it take her to run 1 m?

**Step 1:** Set up the equivalent ratios.  

$$\frac{16}{100} = \frac{n}{1} \leftarrow \begin{array}{l} \text{Time} \\ \text{Distance} \end{array}$$

**Step 2:** Cross multiply and solve.  
 $100n = 16$   
 $n = 0.16$  seconds

**Example 8:** Use the situation in Example 7 for the following question. At that rate, how long would it take her to run 250 m?

**Step 1:** Set up the equivalent ratios.  

$$\frac{16}{100} = \frac{n}{250}$$

**Step 2:** Cross multiply and solve.  
 $16 \times 250 = 100n$   
 $4,000 = 100n$   
 $40 = n$   
 Gail could run 250 m in 40 seconds.

**Use what you have learned about equivalent ratios to solve the following word problems. (DOK 2)**

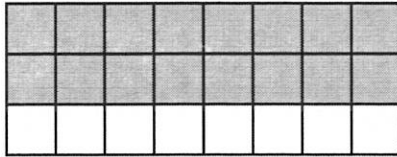
- James planted 12 seeds. Six of them never sprouted. At that rate how many seeds would James expect to sprout if he planted 60 seeds?
- Coffee is on sale 3 pounds for \$6.99. How much would 5 pounds cost?
- CD's are on sale 4 for \$16. How much would 7 cost?
- If 6 pounds of apples cost \$9, how much would 15 pounds of apples cost?
- If \$36 of grass seed will cover 6,000 square feet, how much would it cost to plant grass in a yard that is 54,000 square feet?
- There is a \$3 shipping fee for every \$50 purchased from a catalog. What would be the shipping cost for an \$800 order?
- The bakery makes a profit of \$150 for every 50 loaves of bread they sell. How many loaves were sold if they only made \$120 profit?
- A scavenger hunt map shows 1 inch = 50 feet. How far in real life are two points that are 4.5 inches away on the map?



### 6.7 Modeling Ratios (DOK 2, 3)

Models can also be used to express ratios.

**Example 9:** For every two female cheerleaders, there must be one male cheerleader to assist with jumps. The model below shows the ratio of female to male cheerleaders,  $\frac{2}{1}$  or 2:1, when there is a full squad of 24.



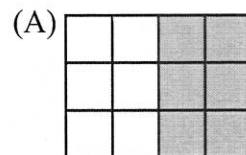
This model shows there are 16 female cheerleaders for every 8 male cheerleaders. The shaded portion is the number of female cheerleaders. The unshaded portion is the number of male cheerleaders.

**Draw a model to represent each situation. (DOK 3)**

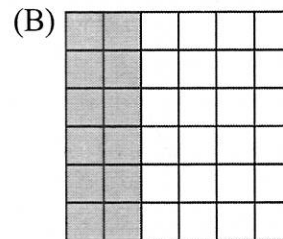
- The ratio of computers to students is 1:2. The total number of students is 12.
- The ratio of boys to girls is  $\frac{2}{3}$  in a class of 20.
- The ratio of dogs to cats at the pound is 3:5 with a total of 24 animals.
- The ratio of passing grades to failing grades is  $\frac{4}{1}$  in a class of 25.

**Match each situation to its model. (DOK 2)**

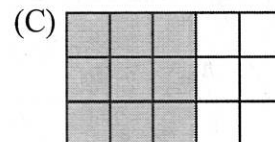
5. There are 3 new cars for every 2 used cars at a car lot.



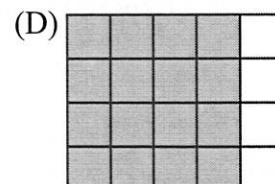
6. There is a boy for every girl at the dance.



7. There are 4 bats for every ball in the gear bag.



8. There are 2 roses for every 4 carnations in a vase.



**Other ways to model ratios...**

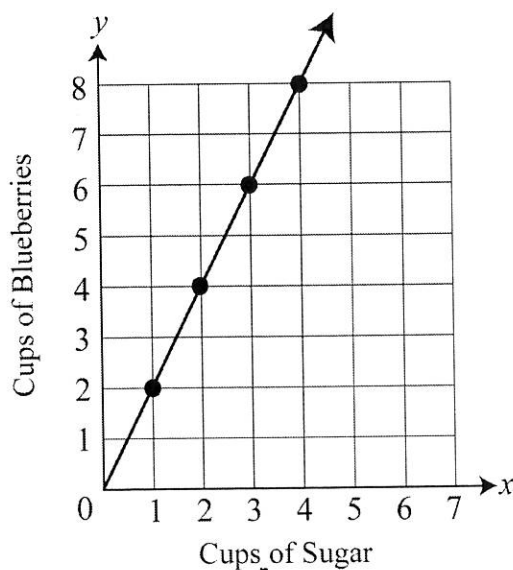
In chapter 5, you learned to plot points on a coordinate plane. Those points also demonstrate ratios. The coordinates  $(x, y)$  may be plotted as the ratio:  $\frac{y}{x}$ .

**Example 10:** Mrs. Nelson is making blueberry jam. The ratio of berries to sugar is 2 cups of berries : 1 cup sugar.

An equation for this recipe is  $y = \frac{2}{1}x = 2x$ .

**Step 1:** Plot the points on a coordinate grid from the recipe table below.

Cups of Sugar	Cups of Blueberries
Equation: $y = 2x$	
( $x$ -coordinate)	( $y$ -coordinate)
1	2
2	4
3	6
4	8

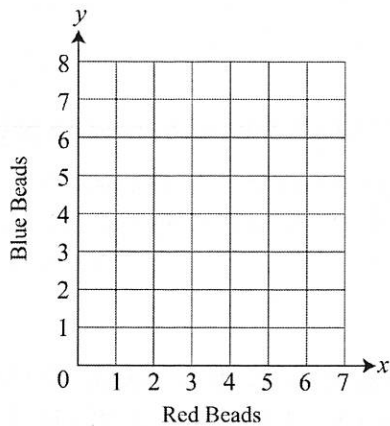




Plot the points from the ratio tables below. (DOK 2)

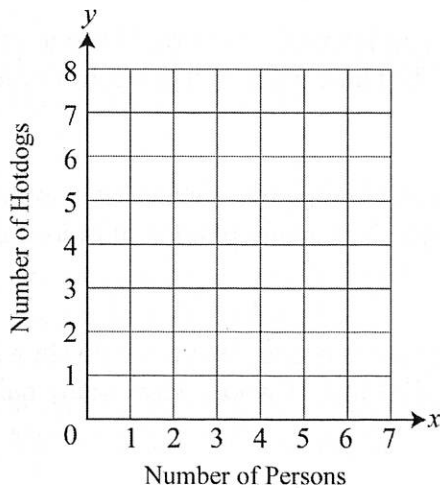
1. Emma is making red and blue hair decorations for herself and her friends. The ratio of blue beads to red beads is given in the table below.

Red Beads ( $x$ )	Blue Beads ( $y$ )
Equation: $y = \frac{3}{2}x$	
2	3
4	6



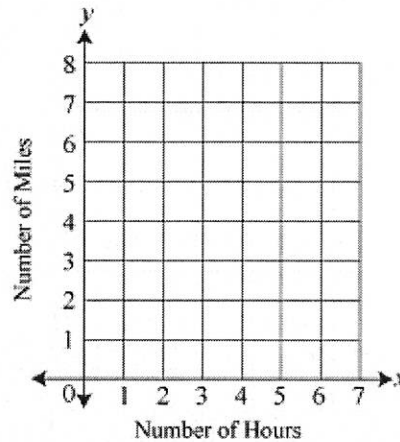
2. John cooks 2 hotdogs for everybody at the barbecue. The ratio of hotdogs to people is in the table below.

# of Persons ( $x$ )	# of Hotdogs ( $y$ )
Equation: $y = 2x$	
1	2
2	4
3	6



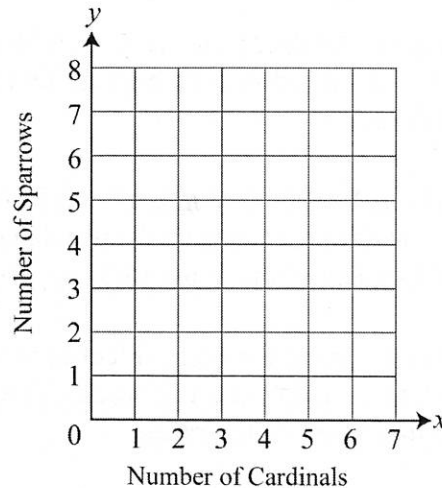
3. Enrique can walk an average of 3 miles per hour. The ratio of Enrique's miles per hour are in the table below.

# of Hours ( $x$ )	# of Miles ( $y$ )
Equation: $y = 3x$	
1	3
2	6



4. Marie went on a nature walk. For every cardinal she spotted, she saw 3 sparrows. Finish filling out the table of the ratio of sparrows to cardinals is shown in the table below.

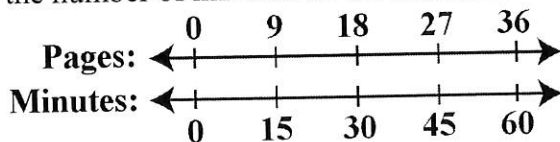
# of Cardinals ( $x$ )	# of Sparrows ( $y$ )
Equation: $y = 3x$	
1	
2	



**More ways to model ratios...**

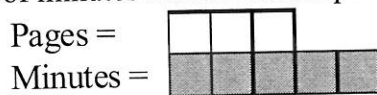
**Example 11:** Paul is reading a novel and wants to know how long it will take to read one chapter, which is 36 pages. It took Paul 15 minutes to read the first 9 pages. The ratio of pages read to minutes is 9 : 15. Model this ratio using a double number line and a tape diagram. Find the total number of minutes to read one chapter.

**Step 1:** The double number line shows the pages read on the top number line and the number of minutes on the bottom number line.



As you can see from the number lines, it takes Paul 60 minutes to read 36 pages.

**Step 2:** A tape diagram shows the pages read on the top portion and the number of minutes on the bottom portion. The ratio in simplest form is shown below.



**1) Write a ratio for each problem. 2) Draw a double number line for each problem. 3) Draw a tape diagram for each problem using the simplified ratio. 4) Answer the ratio question. (DOK 3)**

1. Sherrie makes lemonade using 1 lemon for every 2 pints of water. Write a ratio showing the number of lemons to pints of water. In a new batch of lemonade, Sherrie uses 4 lemons. Using the same ratio, how many pints of water will she use in the new batch?
2. Marta has 3 red beads for every 5 yellow beads on her necklace. Write a ratio showing the number of red beads to yellow beads. Her necklace has 20 yellow beads. Using the same ratio, how many red beads does her necklace have?
3. Martin drove 50 miles for every 60 minutes of driving on an interstate car trip. Write a ratio showing the miles driven to minutes driven. How long will it take Martin to drive 200 miles using this ratio?
4. Mrs. Wilcox bought 2 pounds of onions for every 10 pounds of potatoes. Write a ratio showing the pounds of onions to pounds of potatoes. Using this ratio, how many pounds of onions did Mrs. Wilcox buy if she bought 40 pounds of potatoes?
5. Trevor uses 4 nails for every 6 feet of wood while making a tree house. Write a ratio showing the number of nails to feet of wood. Trevor uses a total of 24 feet of wood. How many nails does he use based on the ratio?

## 6.8 Unit Rate (DOK 2)

**Unit rate** is the ratio of two measurements where the second term is 1. Examples of unit rate are miles per hour, expressed as  $\frac{\text{number of miles}}{\text{number of hours}}$ , the price per package as  $\frac{\text{price per case}}{\text{number of packages}}$ , or the pay rate per hour, expressed as  $\frac{\text{total pay}}{\text{total hours worked}}$ . Solving the division (ratio) problem will give you the answer.

**Example 12:** Mr. Callahan drove 420 miles in 7 hours. How many miles per hour did Mr. Callahan average?

**Step 1:** Set up the ratio:  $\frac{\text{number of miles}}{\text{number of hours}} = \frac{420}{7}$ .

**Step 2:** Divide:  $\frac{420}{7} = 60$ .

**Answer:** Mr. Callahan averaged 60 miles per hour.

**Carefully read the rate problems below and solve. (DOK 2)**

1. Gloria drove 250 miles in 5 hours. What was her average rate of speed?
2. Alonzo has to do 20 math test problems in 40 minutes. How many minutes per math problem does this give Alonzo?
3. Malena walked 2 miles in 26 minutes. How many minutes per mile does Malena walk?
4. Mr. Paxon can pack 960 toy pachyderms in an 8 hour shift. How many toy pachyderms can Mr. Paxon pack per hour?
5. Nikki can bounce a basketball 900 times in 20 minutes. How many times can Nikki bounce a basketball in 1 minute?
6. Mr. Vanderson drove 110 miles in 2 hours. How fast did Mr. Vanderson drive?
7. Dakota walked 12 blocks to his uncle's house in 30 minutes. How many minutes did it take Dakota to walk 1 block?
8. Mrs. Ulrich rolled 32 meatballs for her family in 8 minutes. How many minutes does it take Mrs. Ulrich to roll 1 meatball?

### 6.9 More Unit Rates (DOK 2)

The word "per" shows the rate. If you are given the rate, like tons *per* hour or inches *per* year, that would indicate a multiplication problem. Other problems ask you to calculate the rate, and those problems would use division. Make sure the answer you generate makes sense to the problem. If it doesn't make sense, you may have used the wrong operation.

**Example 13:** A factory produces  $6\frac{1}{2}$  tons of concrete mix per hour, how many tons can be produced in  $12\frac{1}{4}$  hours?

The rate is given in the problem,  $6\frac{1}{2}$  tons per hour. The question asks how much mix would be produced in a certain number of hours,  $12\frac{1}{4}$ , so you would need to multiply:

$$6\frac{1}{2} \times 12\frac{1}{4} = \frac{13}{2} \times \frac{49}{4} = \frac{637}{8} = 79\frac{5}{8}$$

Since the factory can produce  $6\frac{1}{2}$  tons of concrete mix in one hour, the factory would be able to produce  $79\frac{5}{8}$  tons of concrete mix in  $12\frac{1}{4}$  hours.

**Example 14:** The Mountain View Junior High gymnastics team boarded a bus to go to a gymnastics meet in another city. They were on the bus for 4.5 hours. They traveled 225 miles. What was the average rate of speed they traveled.

Take the number of miles and divide by the number of hours:  $225 \div 4.5 = 50$ .

They traveled at an average of 50 miles per hour.

#### Solve the following rate problems. (DOK 2)

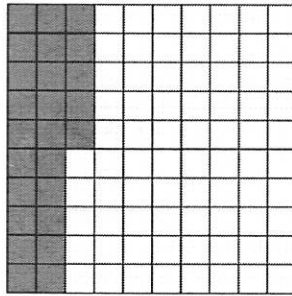
1. The Washington family went on a car trip during school break. The first day, they drove 12 hours at an average rate of speed of 52 miles per hour. How many miles did they travel on the first day of their trip?
2. Mrs. Ingram earns \$12.50 per hour. How much money will Mrs. Ingram earn in a 40 hour work week?
3. Nikki works at a restaurant. Part of her job includes pouring water into the pint size glasses. Nikki estimates that she pours 125 gallons of water each day. Knowing there are 8 pints per gallon, calculate how many pint size glasses Nikki pours in a five day work week.
4. Mr. Yarling works 60 hours per week. He earns \$15.00 per hour for the first 40 hours and "time and a half", or \$22.50 per hour, for his overtime hours of 20 hours per week. How much money does Mr. Yarling earn in one 60 hour work week?
5. Mia spends about 1.25 hours per night, five nights a week, on home work. How many hours will Mia spend doing home work on 22 nights of homework? Give your answer in decimal form.
6. Ismael receives \$5.00 per week for his allowance. Every week he deposits \$2.00 into his savings account at the bank and asks for the remainder of the \$5.00 in quarters. How many quarters does Ismael have at the end of 4 weeks?

## 6.10 Percents (DOK 2)

**Percent** means "out of 100." In real life, percents are used to figure out taxes, tips, sales prices, and even grades. It is written as a number followed by the percent sign (%).

**Example 15:** 25%

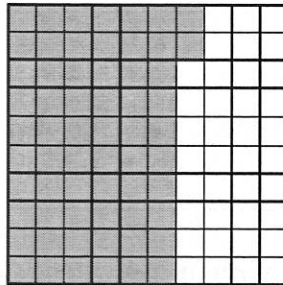
This is read "twenty-five percent". It means 25 out of 100. This can easily be written as the fraction  $\frac{25}{100}$  ( $\frac{1}{4}$  in simplest form) and as the decimal 0.25. The model below also shows 25% because 25 of 100 blocks are shaded.



### Changing Percents to Decimals and Decimals to Percents:

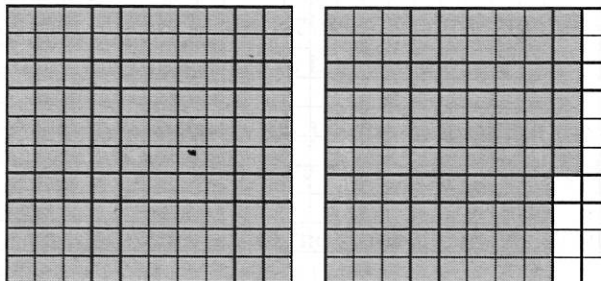
**Example 16:** 62% written as a decimal would be 0.62.

To write a percent as a decimal, simply move the decimal place two spaces to the left and leave off the percent sign (%).



**Example 17:** 1.86 written as a percent would be 186%.

To write a decimal as a percent, simply move the decimal place two spaces to the right and add a percent sign (%).





**Changing Percents to Fractions and Fractions to Percents:**

**Example 18:** 44% written as a fraction is  $\frac{44}{100}$ , which simplifies to  $\frac{11}{25}$ .  
 To write a percent as a fraction, the percent number becomes the numerator (top number) of the fraction and 100 becomes the denominator. Sometimes the fraction needs to be simplified.

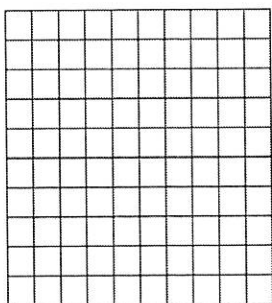
**Example 19:**  $\frac{3}{8}$  written as a decimal is  $0.375 = 37.5\%$   
 To change a fraction to a percent, write the fraction as a decimal first, like you did in chapter 2. Then move the decimal two spaces to the right and add a percent (%).

**Complete the chart. (DOK 2)**

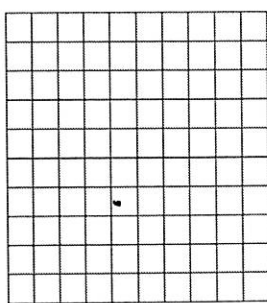
	Percent	Fraction	Decimal
1.	15%		
2.			0.39
3.		$\frac{1}{4}$	
4.	35%		
5.			0.99
6.		$\frac{33}{100}$	
7.			0.58
8.	18%		
9.		$\frac{29}{100}$	
10.	67%		

**Shade each model to represent the percent indicated. (DOK 2)**

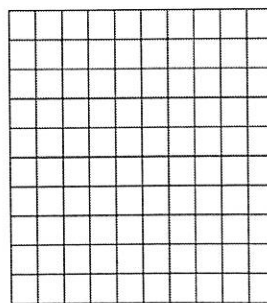
11. 58%



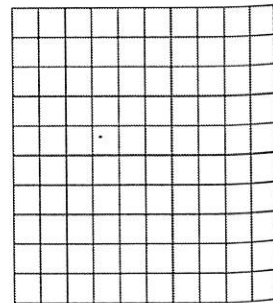
12. 18%



13. 79%



14. 99%



## 6.11 Finding the Whole in a Percent Problem (DOK 2)

There are times when you may be given the part of a whole and the percent of the part, but the whole number is unknown.

**Example 20:** Three bottles of water represent 12.5% of a case of bottles water.  
How many bottles are there in one whole case?

**Step 1:** Set up the following proportion,

$$\frac{\text{part}}{\text{whole}} = \frac{\%}{100}$$

**Step 2:** Find the whole. Use the proportion in step 1.

$$\frac{3}{?} = \frac{12.5}{100}$$

**Step 3:** Cross multiply to solve for ?:

$$3 \times 100 = 12.5 \times ?$$

$$300 = 12.5 \times ?$$

$$300 \div 12.5 = 12.5 \div 12.5 \times ? \quad \text{Divide both sides by 12.5.}$$

$$24 = ?$$

**Answer:** There are 24 bottles in the case.

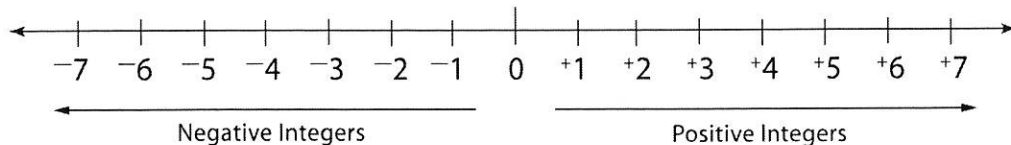
### Find the whole number in each problem. (DOK 2)

1. Carlos works in a clothing store. Ten hours represent 25% of Carlos' work week. How many hours does Carlos work in one week?
2. Mr. O'Grady harvested his garden. He put the tomatoes into boxes, each box representing 20% of his tomato harvest. Each box holds 24 tomatoes. How many tomatoes did Mr. O'Grady harvest?
3. Fabiola found that she has already used 60 pieces, which is 40% of her notebook paper. How many pieces of paper were in the notebook at the start?
4. In Irene's neighborhood, she found that 12, which is 16% of the houses were painted brown. How many houses are in Irene's neighborhood?
5. Dakota has \$90 saved up. Each week he puts 50% of his allowance in his savings account. How much money did Dakota receive in all that he could save \$90?
6. Alejandro found that his bag of jelly beans includes 30 red jelly beans, which represents 15% of the entire bag. How many jelly beans are in the whole bag?
7. Warren poured out a cylinder of potato chips. He found that 6 of the chips, which represents 8%, were broken. How many potato chips were there in the whole cylinder?
8. Two of the students, which represents 8% of the students, in Ms. Clark's class wore red shirts today. How many students are in Ms. Clark's class?



### 6.12 Graphing a Percent on a Number Line (DOK 2)

Graphing a percent on a number line is similar to graphing any rational number. Find the amount the percent represents, and graph as you would any rational number.



**Example 21:** Find 25% of 10 then graph the answer on a number line .

**Step 1:** Change the percent into a decimal.  $25\% = 0.25$

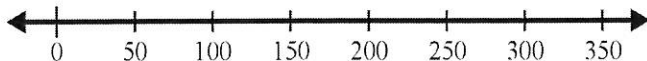
**Step 2:** Multiply the number 10 by the decimal (0.25).  $10 \times 0.25 = 2.5$

**Step 3:** Plot 2.5 on the number line.

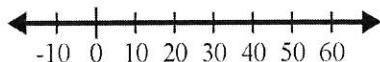


**Solve the percentage problems below, and graph the answer on the number line. Round your answer to the nearest whole number. (DOK 2)**

1. 30% of 500

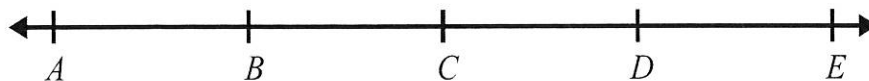


2. 23% of 200



**Using the situation below to answer the following questions. (DOK 2)**

Tangee drew a number line on her paper that looked like the one below.



- Tangee drew a new point on the number line that is 40% on the distance from point *A* to point *E*. Between which two letters does the new point lie?
- Tangee drew a new point on the number line that is 72% on the distance from point *A* to point *E*. Between which two letters does the new point lie?
- Tangee drew a new point on the number line that is 11% on the distance from point *A* to point *E*. Between which two letters does the new point lie?
- Tangee drew a new point on the number line that is 85% on the distance from point *A* to point *E*. Between which two letters does the new point lie?

### 6.13 Going Deeper into Ratios, Unit Rates, and Percents (DOK 3)

Solve each problem. Show your work. (DOK 3)

1. An office supply store made a table of the supplies sold for the month of March. Part of the table is shown below. The "Dollars Sold" is rounded to the nearest ten dollars.

Item:	Paperclips	Pens - Multi-packs	Printer Paper	3-Ring Binders
Units Sold:	2,122	1,417	934	278
Dollars Sold:	\$2,100	\$4,220	\$3,260	\$1,390

Part 1: What is the ratio of the dollars sold of paperclips to the dollars sold of multi-packs of pens?

Part 2: What is the unit rate of printer paper?

Part 3: Which item sold about 13% of the total sales of the four items shown in the table?

2. A review of the population of sixth graders at Addmont Elementary is shown in the table below.

6th Grade:				
Class:	Mr. Clark	Mrs. Stein	Ms. Warrick	Mrs. Taylor
Number of Boys:	13	12	12	11
Number of Girls:	11	14	12	14

Part 1: Which class has a ratio of 1:1 of boys and girls?

Part 2: Which class is made up of 44% boys?

Part 3: What is the ratio of girls to boys for all four classes combined?

3. The Stanley family went on a car trip visiting science and art museums in four cities. The number of miles they drove between cities is shown in the table below.

From Home to City A	From City A to City B	From City B to City C	From City C to City D	From City D to Home
330 miles	115 miles	270 miles	110 miles	255 miles

Part 1: What is the ratio of the number of miles from Home - City A to the number of miles from City C - City D?

Part 2: What is the percentage of total miles that were driven from City B to City C?

Part 3: If Mr. Stanley gets an average of 24 miles per gallon, how many gallons did he use for the whole trip?

### Chapter 6 Review

Write the ratios requested in the following word problems. Write the ratios as fractions in simplest form. (DOK 2)

1. Jerry's shirt is made of 60% cotton and 40% polyester. What is the ratio of polyester to cotton?
2. A basket of fruit containing 30 pieces of fruit has 20 apples and 10 bananas. What is the ratio of bananas to apples?
3. A recipe for chicken noodle casserole takes 2 pounds of chicken and 1 pound of noodles. What is the ratio of noodles to chicken?
4. A pet store has 30 hamsters and 50 birds. What is the ratio of hamsters to birds?

Use the chart below to solve the ratio problems that follow. (DOK 2)

Favorite Ice Cream

	Chocolate	Vanilla	Strawberry	Mint Chip	Choc Swirl
Boys	27	6	7	13	10
Girls	14	8	11	27	18

5. What is the ratio of the number of girls that favor chocolate ice cream to the number of boys that favor chocolate ice cream?
6. What is the ratio of the number of boys that prefer mint chip ice cream to boys that prefer strawberry ice cream?
7. What is the ratio of the number of boys that prefer choc swirl ice cream to girls that prefer vanilla ice cream?

Answer the following questions. (DOK 2)

8. Manuel drove 180 miles in 3 hours. What was his rate of speed?
9. Melissa can walk 1 mile in 22 minutes. If she keeps the same rate of speed, how far can she walk in 66 minutes?
10. Gloria can knit one afghan square in 50 minutes. If she knits continuously at the same rate of speed, how many squares can she make in 4 hours and 10 minutes?

Replace the  $x$ ,  $y$ , and  $z$  in the tables of equivalent ratios with the correct number. Do not simplify the answers. (DOK 2)

11.

$1 : 7$
$10 : x$
$\frac{y}{21}$
$\frac{5}{z}$

12.

$2 : 11$
$6 : x$
$\frac{y}{66}$
$\frac{4}{z}$

13.

$3 : 5$
$60 : x$
$\frac{y}{10}$
$\frac{15}{z}$

1) Write a ratio in each problem in simplest form. 2) Draw a double number line for each problem. 3) Draw a tape diagram for each problem. (DOK 3)

14. Laura makes muffins using 1 cup of sugar for every 2 cups of flour. Write a ratio showing the amount of sugar to flour.
15. Johan has 4 black cars in his model car collection of 12 cars. Write a ratio showing the number of black cars to total cars in Johan's collection.

Complete the chart. (DOK 2)

	Percent	Fraction	Decimal
16.	10%		
17.			0.4
18.		$\frac{1}{5}$	
19.	75%		

Find the whole number in each problem. (DOK 2)

20. Bill works in a hardware store. Sixteen hours represent 40% of Bill's work week. How many hours does Bill work in one week?
21. Elena has a doll collection. Three of her dolls, representing 15% of her collection, have red hair. How many dolls are in Elena's total collection?

Use what you know about ratios to solve.

22. A print of a famous painting is  $\frac{1}{3}$  the size of the original. If the original is 9 feet long, how long is the print?
23. A drawing of a whale's skeleton shows a scale of 1 inch : 8 feet. How long is the whale if the skeleton is drawn 8.5 inches long?
24. A map's scale shows 2.5 cm = 1 km. How far are two points on the map that are 2.3 km in real life?