Name _____ Period _____ Date _____

UNIT 5
STUDENT PACKET

Math Links
GRADE 6

PERCENT

Parent (or Guardian) signature _____

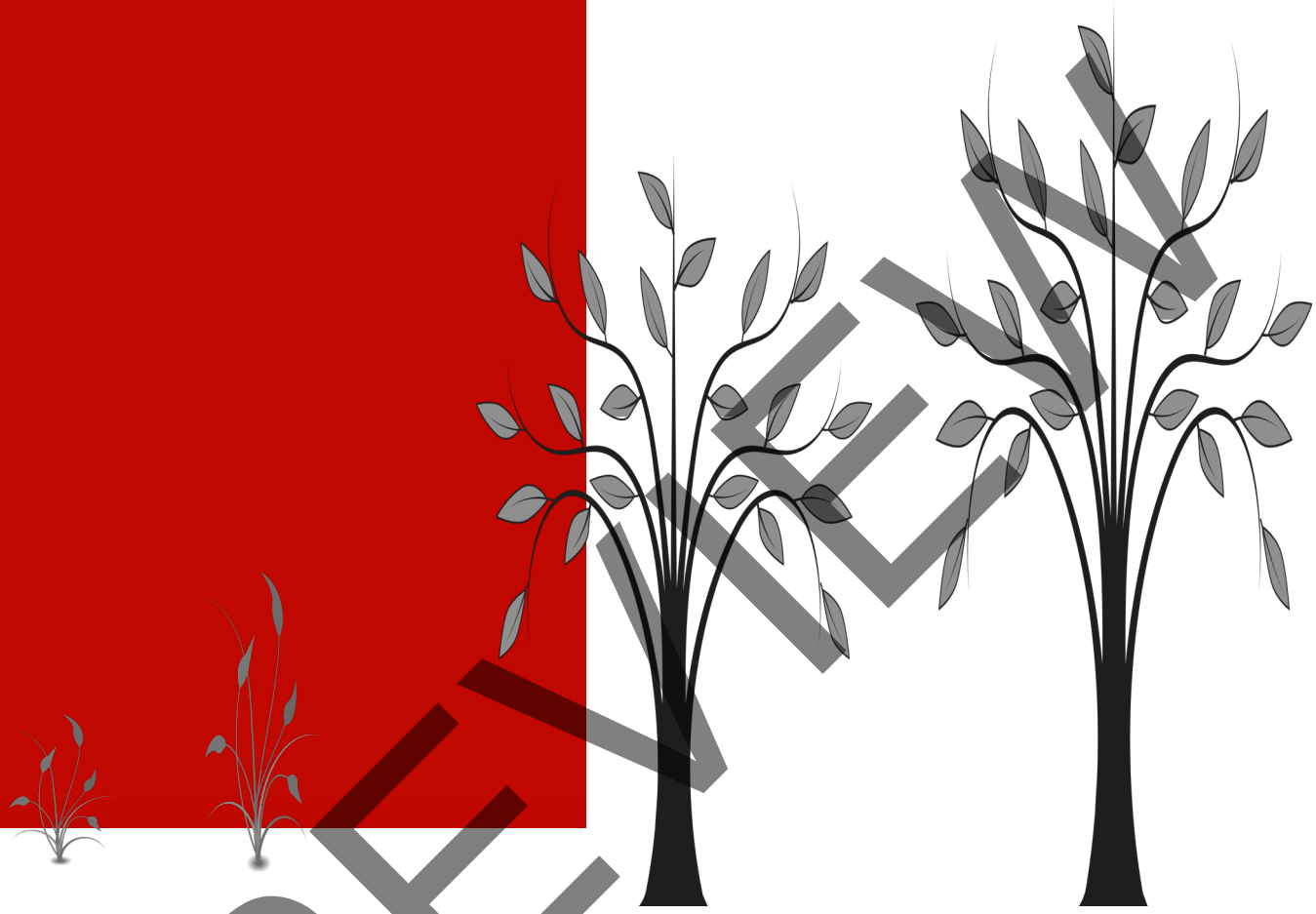
MY WORD BANK

Explain the mathematical meaning of each word or phrase, using pictures and examples when possible. See **Student Resources** for mathematical vocabulary.

equivalent fractions	multiplication property of 1
percent	percent of a number
ratio	

GROWTH SPURTS

Follow your teacher's directions.



(1)

PERCENT AS A NUMBER

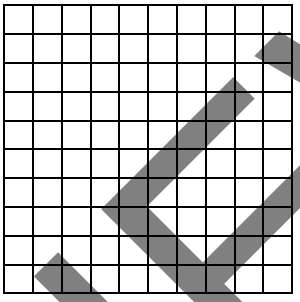
We will use an area model, the multiplicative identity (referred to as the Big 1), and division to explore relationships between fractions, decimals, and percents.

[6.RP.3c, 6.NS.3; SMP1, 3, 6]

GETTING STARTED

The 10 x 10 grids shown at the right each represent one whole.

1. Shade $\frac{1}{2}$ of this 10 × 10 grid.



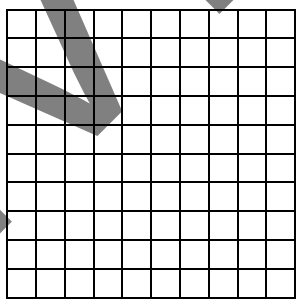
   a. The shading illustrates that $\frac{1}{2} = \frac{\_\_\_\_}{100}$.

   b. Write $\frac{1}{2}$ of a dollar in cents. _____¢

   c. Write $\frac{1}{2}$ of a dollar in dollars. $_____

   d. Write $\frac{1}{2}$ as a decimal. _____

2. Shade $\frac{1}{4}$ of this 10 × 10 grid.



   a. The shading illustrates that $\frac{1}{4} = \frac{\_\_\_\_}{100}$.

   b. Write $\frac{1}{4}$ of a dollar in cents. _____¢

   c. Write $\frac{1}{4}$ of a dollar in dollars. $_____

   d. Write $\frac{1}{4}$ as a decimal. _____

3. What does it mean to eat…

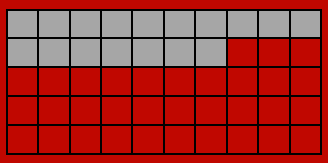
a. 100% of a sandwich?	b. 50% of a sandwich?	c. 25% of a sandwich?

FRACTION GARDENS

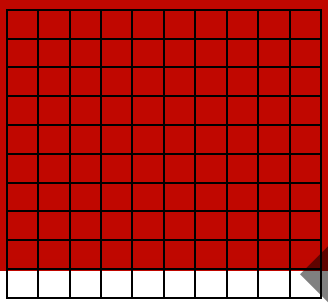
We will use an area model and the multiplicative identity (the Big 1) to explore percent. Each drawing represents a garden. Each square represents one square foot. The shaded portion is planted. Complete the problem in each column.

1. 50 square feet

a. What fractional part is planted?



b. Shade the garden below so that the same fractional part is planted.



c. The shading illustrates:

$$\frac{17}{} = \frac{}{100}$$

d. Complete this equation. Show the Big 1.

$$\frac{17}{50} \bullet \frac{}{} = \frac{}{100}$$

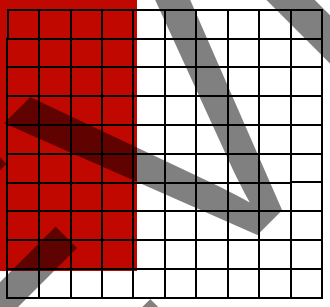
e. Write this fraction as a decimal.

f. Write this fraction as a percent.

2. 4 square feet

a. What fractional part is planted?

b. Shade the garden below so that the same fractional part is planted.



c. The shading illustrates:

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

d. Complete this equation. Show the Big 1.

$$\left(\frac{}{4}\right) \bullet \frac{}{} = \frac{}{100}$$

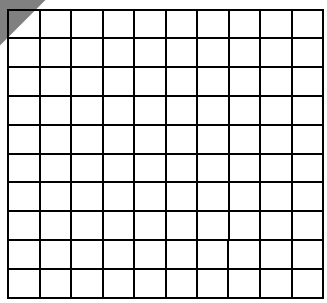
e. Write this fraction as a decimal.

f. Write this fraction as a percent.

3. 5 square feet

a. What fractional part is planted?

b. Shade the garden below so that the same fractional part is planted.



c. The shading illustrates:

$$\frac{}{} = \frac{}{100}$$

d. Complete this equation. Show the Big 1.

$$\left(\frac{3}{}\right) \bullet \frac{}{} = \frac{}{100}$$

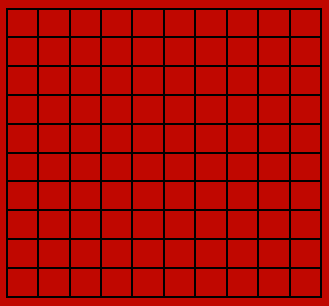
e. Write this fraction as a decimal.

f. Write this fraction as a percent.

FRACTION GARDENS
Continued

4. 10 square feet
   a. What fractional part is planted?

   b. Shade the garden below so that the same fractional part is planted.



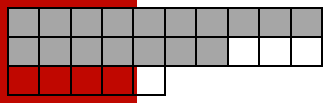
   c. The shading illustrates: $\frac{\quad}{100}$

   d. Complete this equation. $\left(\frac{3}{\quad}\right) \bullet \frac{\quad}{\quad} = \frac{\quad}{100}$

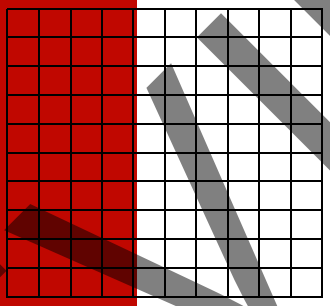
   e. Write this fraction as a decimal.

   f. Write this fraction as a percent.

5. 25 square feet
   a. What fractional part is planted?



   b. Shade the garden below so that the same fractional part is planted.



   c. The shading illustrates: $\frac{\quad}{100}$

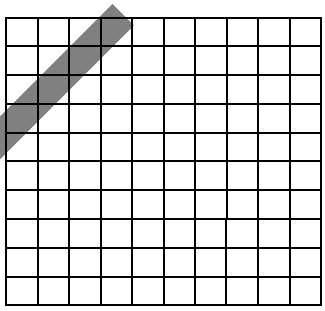
   d. Complete this equation. $\left(\frac{\quad}{25}\right) \bullet \frac{\quad}{\quad} = \frac{\quad}{100}$

   e. Write this fraction as a decimal.

   f. Write this fraction as a percent.

6. 20 square feet
   a. What fractional part is planted?

   b. Shade the garden below so that the same fractional part is planted.



   c. The shading illustrates: $\frac{\quad}{100}$

   d. Complete this equation. $\left(\frac{\quad}{20}\right) \bullet \frac{\quad}{\quad} = \frac{\quad}{100}$

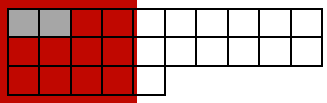
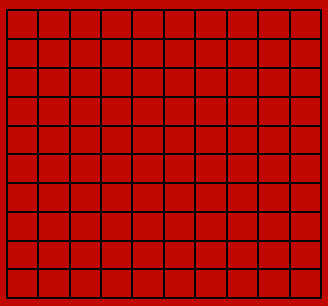
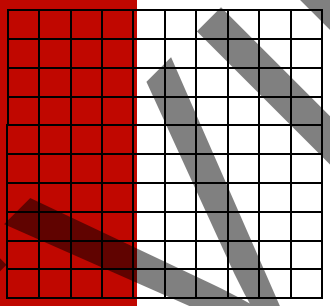
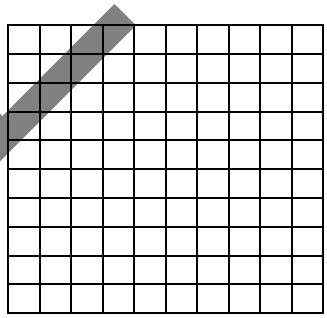
   e. Write this fraction as a decimal.

   f. Write this fraction as a percent.

7. Record the meanings of the multiplication property of 1 and percent in **My Word Bank**.

PRACTICE 1

Each drawing represents a garden. Each square represents one square foot. The shaded portion is planted. Complete each problem by column.

1. 10 square feet	2. 25 square feet	3. 4 square feet
a. What fractional part is planted? 	a. What fractional part is planted? 	a. What fractional part is planted? 
b. Shade the garden below so that the same fractional part is planted. 	b. Shade the garden below so that the same fractional part is planted. 	b. Shade the garden below so that the same fractional part is planted. 
c. The shading illustrates: $\frac{\quad}{100}$	c. The shading illustrates: $\frac{\quad}{100}$	c. The shading illustrates: $\frac{\quad}{100}$
d. Complete this equation. $\frac{2}{\quad} \cdot \frac{\quad}{\quad} = \frac{\quad}{100}$	d. Complete this equation. $\frac{2}{\quad} \cdot \frac{\quad}{\quad} = \frac{\quad}{100}$	d. Complete this equation. $\frac{4}{\quad} \cdot \frac{\quad}{\quad} = \frac{\quad}{100}$
e. Write this fraction as a decimal.	e. Write this fraction as a decimal.	e. Write this fraction as a decimal.
f. Write this fraction as a percent.	f. Write this fraction as a percent.	f. Write this fraction as a percent.

4. Draw a garden with 10 total parts with no parts planted. Then write this shaded amount as a fraction and as a percent.

PRACTICE 2

Complete the table below to rename each number in different forms.

	Fraction	Decimal (number)	Decimal (words)	Percent
1	$\frac{1}{4}$		twenty-five hundredths	
2		0.29		
3				70%
4	$\frac{4}{25}$			
5		0.07		
6				65%
7			four tenths or forty hundredths	
8				50%

Solve using any strategy.

9. Enrique got 17 problems correct out of 20 on his math test. What percent of the test did he get correct?

10. A 25-person dance crew includes 9 boys. What percent of the crew are girls?

11. Li noticed that 8 out of 40 classmates were left-handed. What percent of the class was left-handed?

Do you think you would expect to see left-handedness in the general population at this same rate? _____ Support your claim with evidence.

USING DIVISION TO CHANGE FRACTIONS TO DECIMALS AND PERCENTS

Change each fraction to a decimal and a percent. Recall in **Unit 4**, division was used to find decimal numbers.

1. Ronni wanted to rename $\frac{3}{8}$ as a decimal and a percent. She divided as shown to the right. Use Ronni's work to complete each equation below.

$$\begin{array}{r} .375 \\ 8\overline{)3.000} \\ -24\downarrow \\ \quad 60 \\ \quad -56\downarrow \\ \quad\quad 40 \\ \quad\quad -40 \\ \quad\quad\quad 0 \end{array}$$

$\frac{3}{8} = 0.\_\_\_\_$	$\frac{3}{8} = \frac{\_\_\_\_}{1000}$	$\frac{3}{8} = \frac{\_\_\_\_}{100}$	$\frac{3}{8} = \_\_\_\_\%$

2. Jay input 3 divided by 8 on his calculator and got 0.38. Why do you think Jay's result is different than Ronni's?

Use long division to change each fraction to a decimal and a percent.

3. $\frac{5}{8}$	4. $\frac{9}{40}$	5. $\frac{9}{10}$

6. Lindsay and Adanna are doing homework and they don't have a calculator. Lindsay says, "I'm using long division for problem 3 above, but I can do problem 5 in my head." Adanna agrees. Explain why you think that they agree about this.

PRACTICE 3: EXTEND YOUR THINKING

1. Michael wanted to rename $\frac{1}{3}$ as a decimal and as a percent. He divided as shown to the right. Use Michael's work to complete each statement.

$$3\overline{)1.000} = .333$$
$$-9 \quad 10$$
$$-9 \quad 10$$
$$-9 \quad 1$$

$\frac{1}{3} \approx 0.\_\_\_\_$	$\frac{1}{3} \approx \frac{\_\_\_\_}{1000}$	$\frac{1}{3} \approx \frac{\_\_\_\_}{100}$	$\frac{1}{3} \approx \_\_\_\_\%$

2. Susie divided 1 by 3 on her calculator and got 0.3333333. Why do you think Susie's result is different than Michael's?

Change each fraction to a decimal and a percent. Complete problems using mental math, equivalent fractions, or division.

3. $\frac{2}{3}$	4. $\frac{17}{20}$	5. $\frac{5}{6}$

6. Lindsay and Adanna (continuing their homework from the previous page) both agreed that they did not need to do long division for problem 4 above, but it helped for problem 3. Explain why you think that they agree about this too.

PERCENT OF A NUMBER

We will continue to build concepts about percent. We will use chunking and multiplication procedures to find a percent of a number. We will convert between fractions, decimals, and percents.

[6.RP.3c; SMP2, 5, 6, 7, 8]

GETTING STARTED

Rename each number below in different forms.

Fraction	Decimal (number)	Decimal (words)	Percent
1. $\frac{3}{5}$			
2.	0.3		
3. $\frac{1}{4}$			
4.		one hundred twenty-five thousandths	

5. Compare the numbers in problems 1 and 2 above.

   a. What is the relationship between the fractions?

   b. What is the relationship between the decimals?

6. Compare the numbers in problems 3 and 4 above.

   a. What is the relationship between the fractions?

   b. What is the relationship between the percent?

7. Matt's cell phone has a percent in the upper right corner. Explain what the following means when seen on Matt's phone.

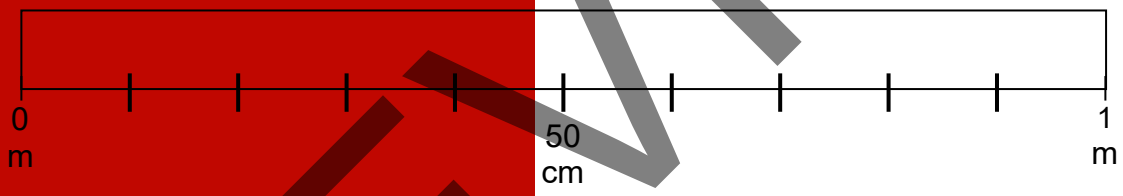
   a. 100% b. 78% c. 5%

MONEY AND METERS

1. One dollar is equal to _____ cents.

Find each percent of a dollar.

2. 100% of a dollar is _____ cents.
3. 50% of a dollar is _____ cents.
4. 25% of a dollar is _____ cents.
5. 75% of a dollar is _____ cents.
6. 0% of a dollar is _____ cents.
7. 10% of a dollar is _____ cents.
8. 20% of a dollar is _____ cents.
9. 5% of a dollar is _____ cents.
10. 34% of a dollar is _____ cents.
11. 76% of a dollar is _____ cents.
12. One meter is equal to _____ centimeters (cm).
13. The rectangle below represents a meter stick, marked off in centimeters (100 cm = 1 m). Label each tick mark.



14. Write the letter on the meter stick above that represents the percent of the whole meter stick (measuring from 0 meter to 1 meter) for each of the following:

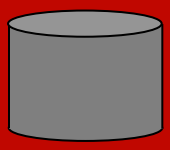
A.	100%	B.	50%	C.	10%
D.	20%	E.	80%	F.	5%
G.	25%	H.	75%	I.	55%

15. How are finding cents in a dollar and finding centimeters on a meter stick related?

MAKING SENSE OF PERCENT

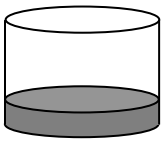
Complete the problems below.

1. Estimate how full each container is using a percent value.

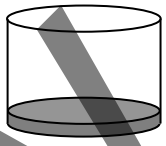


Container A

Container B



Container C



Container D

A. _____ B. _____ C. _____ D. _____

2. Suppose that, when full, each container holds 800 ounces of liquid. Estimate the number of ounces in each container.

A. _____ B. _____ C. _____ D. _____

3. Now suppose these containers hold 900 ounces of liquid. Estimate the number of ounces in each container.

A. _____ B. _____ C. _____ D. _____

Fill in the blanks below with appropriate words or numbers to complete each percent statement.

4. Finding 100% of the volume of a container is the same as finding _____ of it.

   100% of $40 is _____. 100% of 300 meters is _____.

5. Finding 50% of the volume of a container is the same as finding _____ of it.

   This is the same as multiplying by _____ or dividing by _____.

   50% of $40 is _____. 50% of 300 meters is _____.

6. Finding 25% of the volume of a container is the same as finding _____ of it.

   This is the same as multiplying by _____ or dividing by _____.

   25% of $40 is _____. 25% of 300 meters is _____.

7. Finding 10% of something is the same as finding _____ of it.

   This is the same as multiplying by _____ or dividing by _____.

   10% of $40 is _____. 10% of 300 meters is _____.

PRACTICE 4

For problems 1 and 2, first answer each question, and then use the answers to complete parts a and b for each. Show your work or explain your reasoning.

1. What is 10% of $50?

   a. Use this result to find 20% of $50.

   b. Use this result to find 5% of $50.

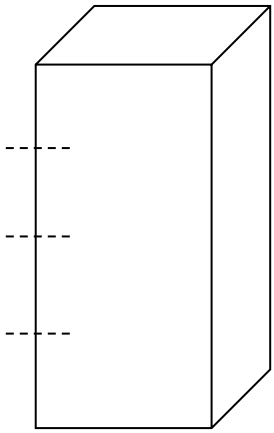
2. What is 10% of 200 meters?

   a. Use this result to find 30% of 200 m.

   b. Use this result to find 1% of 200 m.

A rectangular container holds 600 ounces of liquid when full. Use the picture if it is helpful, and determine how much liquid makes the container:

3. 50% full
4. 25% full
5. 75% full
6. 10% full
7. 20% full
8. 30% full
9. 5% full
10. 15% full
11. 1% full
12. 2% full
13. 0.5% full
14. 1.5% full



15. What would it mean for the container to be 150% full?

    How much liquid would it contain if it was 150% full?

    Is this possible? Explain.

PRACTICE 5

On the previous pages, you used properties of arithmetic and a mental math process of composing and decomposing numbers to make calculations easier. We call this "chunking."

Complete the tables below using chunking.

	Amount of Money	Find 10%	Find 5%	Find 15%	Find 20%
1.	$30	$3			
2.	$150				
3.	$500				
4.	$16				
5.	$42				

	Item	Find 10%	Find 5%	Find 50%	Find 25%
6.	80 games				
7.	60 apples				
8.	120 students				
9.	20 cars				

	More Money	Find 1%	Find 2%	Find 200%	Find 150%
10.	$200				
11.	$7,000				
12.	$150				

13. Why might it be difficult to use chunking to find 73% of $93?

USING MULTIPLICATION TO FIND PERCENT OF A NUMBER

In part (a) of each problem, use a chunking strategy to find the percent of a number. In parts (b) and (c), perform the related multiplication calculations using fractions and decimals.

1a. Find 20% of 50 by chunking.	1b. Multiply 50 by $\frac{20}{100}$.	1c. Multiply 50 by 0.2.
2a. Find 5% of 320 by chunking.	2b. Multiply 320 by $\frac{5}{100}$.	2c. Multiply 320 by 0.05.
3a. Find 25% of 180 by chunking.	3b. Multiply 180 by $\frac{25}{100}$.	3c. Multiply 180 by 0.25.
4a. Find 150% of 60 by chunking.	4b. Multiply 60 by $\frac{150}{100}$.	4c. Multiply 60 by 1.50.

5. How is each "a" part above related to its corresponding "b" and "c" parts?

6. Circle all expressions below that are equivalent to 20% of 45.

$45 \bullet \frac{20}{100}$ $45 \bullet \frac{2}{10}$ $45(0.20)$ $45(0.2)$

7. Record the meaning of <u>percent of a number</u> in **My Word Bank**.

PRACTICE 6

Rewrite each percent expression as two multiplication expressions. Then compute. Round if necessary. Check using a calculator.

	Percent Expression	Multiplication by a Fraction	Multiplication by a Decimal	Work space (if needed)
1.	15% of 60	$60 \bullet \frac{15}{100} =$	60(0.15) = ____	
2.	9% of 90			
3.	37% of 52			
4.	125% of 12			
5.	7% of 25			
6.	110% of 18			

Solve by chunking. Then check using a multiplication strategy. Show your work clearly.

7. The local sales tax in Los Angeles in the beginning of 2017 was 9%. How much was tax on a $60 jacket?

8. Suppose a pair of jeans cost $40. If there is a 35% off sale, how much is the savings?

PRACTICE 7

Find the percent of each quantity using any strategy.

1. 9% of $60	2. 28% of $60
3. 87% of $110	4. 120% of $110

5. In 2018, sales tax in some California counties was 8%. What was the California sales tax on a phone that costs $325.00?

6. CC Middle School has 240 6th graders, and 156 of them play afterschool sports. What percent of 6th grade student play afterschool sports?

7. A box contains 36 apples. Julia has 3 of the apples. Kaelen has $\frac{1}{6}$ of the apples. Rosalie has 25% of the apples. Steve has the rest.

a. How many apples does Steve have?	b. What percent of the apples does Steve have?

8. Mr. Gold's 6th grade class earned $1,290 from the fund raiser. They are setting aside $\frac{1}{4}$ of the money for an end of the school year dance, 30% for the buddy program, and the remaining money is for new technology. How much money do they have for:

a. the dance?	b. the buddy program?	c. new technology?

PERCENT APPLICATIONS

We will solve percent problems using double number lines and other strategies.
[6.RP.3c, 6.SP.2, 6.SP.3, 6.SP.4, 6.SP.5cd; SMP1, 2, 3, 4]

GETTING STARTED

Complete the table by chunking.

	Item	Find 10%	Find 5%	Find 15%	Find 25%
1.	$45				
2.	125 miles				
3.	300 pencils				
4.	$12				

Use multiplication to compute.

5. 17% of 60 kilometers	6. 7% of 60 kilometers	7. 170% of 60 kilometers

8. Scirpio Africanus said, "I am convinced that life is 10% what happens to me and 90% how I react to it." What do you think about this statement?

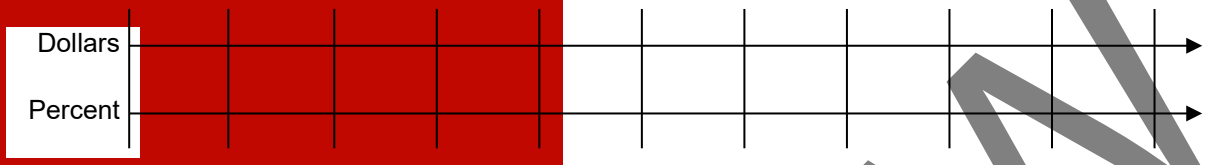
9. Describe a situation for which finding a percent greater than 100% makes sense.

PERCENT AND DOUBLE NUMBER LINES

Follow your teacher's directions.

(1)

(2)



(3)

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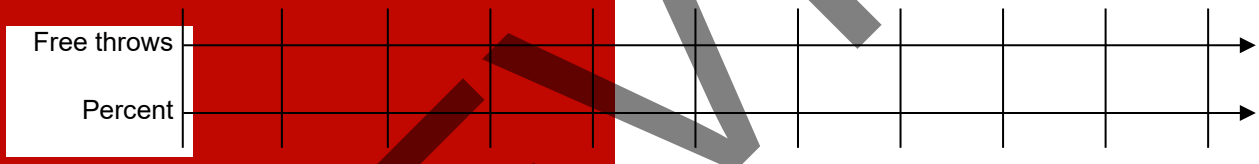

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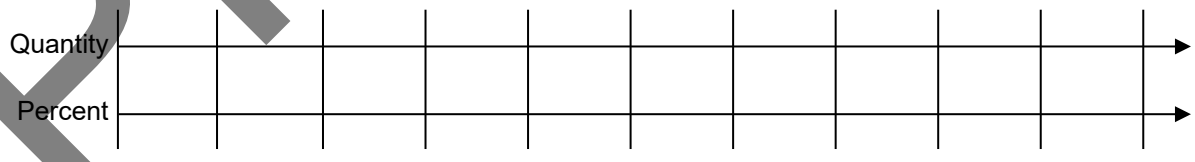
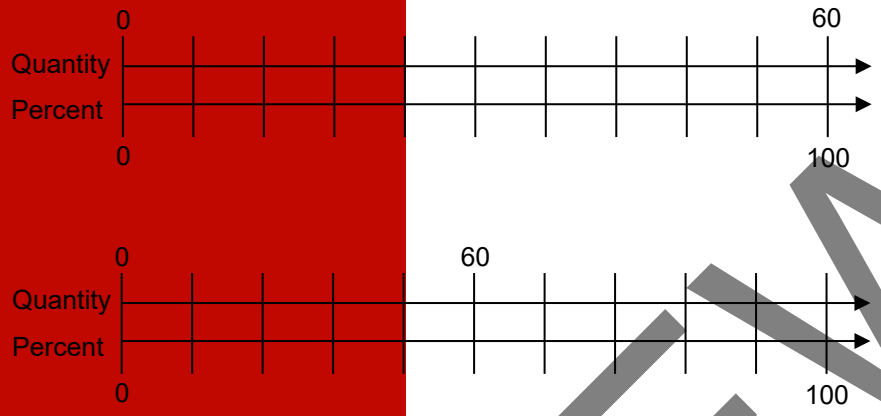


(9)

PRACTICE 8

1. Complete the double number lines below with the information given.



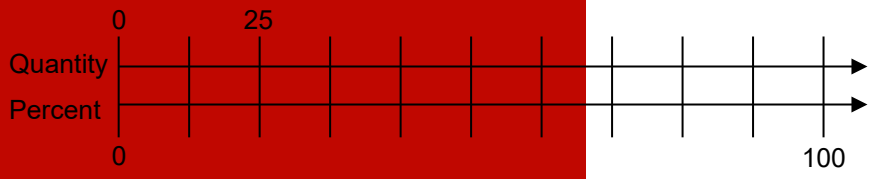
For problems 2 – 7, use the double number lines above to help you answer questions and write equivalent fractions.

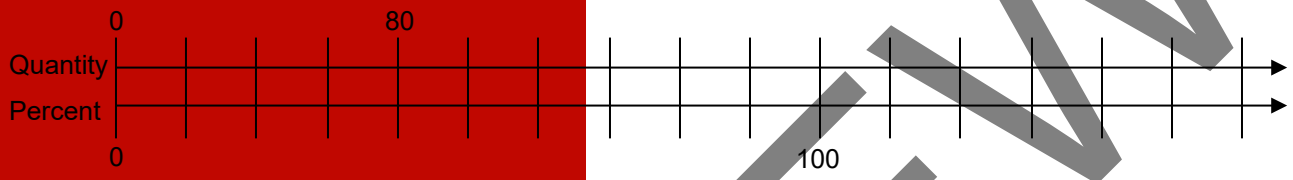
	Question	Answer	Equivalent Fractions
2.	What is 20% of $60?	____ is 20% of $60.	$\frac{\quad}{60} = \frac{20}{100}$
3.	A dress that cost $120 was discounted 40%. What was the discount?		
4.	What is 25% of 60 ribbons?		
5.	48 is 40% of what quantity?		
6.	Jabari answered 54 out of 60 questions correctly. What percent did he answer?		
7.	Angela decorated 9 cupcakes and was 15% done. How many total cupcakes are there?		

8. Record the meanings of ratio and equivalent fraction in **My Word Bank**.

PRACTICE 9

1. Complete the double number lines below with the information given.





For problems 2-7, use the double number lines above to help you answer questions and write equivalent fractions.

	Question	Answer	Equivalent Fractions
2.	What is 120% of 200?		
3.	62.5 is 50% of what quantity?		
4.	A game was marked up 30% to $260. What was its original price?		
5.	A coat was on sale for 30% off. It is now $87.50. What was its original price?		
6.	200 students were in the 6th grade at ABC Middle School in 2011. In 2021 there were 320. What percent of the original are there in 2021?		
7.	45% of what quantity is 90?		

PRACTICE 10 – EXTEND YOUR THINKING

Solve using any method.

1. Last month, Miss Snell's dance class had 20 students. This month, her class size is 140% of the number of students she had last month. How many students does she have this month?

2. Sunny Middle School has 560 students and 84 of them are vegetarian. What percent of the students are vegetarian?

3. Andrew sells hoverboards and is paid a 10% commission. In other words, if he sells $100 worth of hoverboards, he keeps $10 of it. About three-fourths of the way through the month, Andrew sees that he has earned about $1,800.

   a. What dollar amount of hoverboards did he sell at this point?

   b. At this rate, what should he expect his earnings to be at the end of the month?

4. Marco was on an exercise machine at the gym. The time display began at 60 minutes, and then counted down toward 0. When the display flashed "20% done," how much time was left on the time display?

TEXT MESSAGING

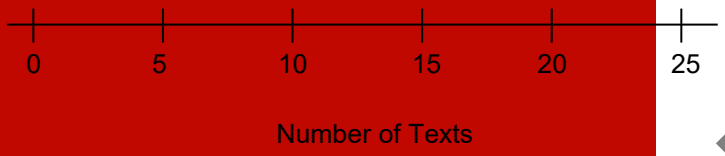
Twenty-one 6th graders were surveyed about the number of text messages they sent last night. Here is what they reported:

Number of text messages sent last night

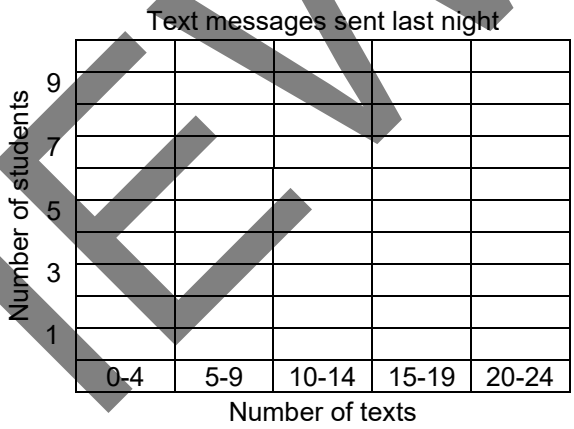
0	0	0	0	1	1	2
3	4	4	6	7	8	8
10	11	13	13	16	18	23

1. Find the 5-number summary: (_____ , _____ , _____ , _____ , _____)
   Min Q1 Q2 Q3 Max

2. Create a box plot.



3. Create a histogram.



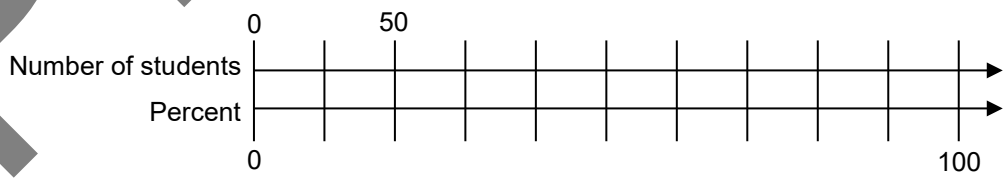
4. What is the average (mean) number of texts made by this group of 6th graders last evening?

5. What percent of the total number of students surveyed is represented by the interquartile range?

6. What percent of the total number of students surveyed is represented in each range on the histogram? Round to the nearest whole percent.

   0-4: _____ 5-9: _____ 10-14: _____ 15-19: _____ 20-24: _____

7. Finish the double number line to determine the total number of students in the 6th grade. How many students are in the 6th grade?



8. Assume that, for the purpose of making predictions, the percent values from problem 6 are relatively accurate for the entire 6th grade. Predict the number of students who texted 15-19 times. _____ who texted 20-24 times. _____

GROWTH SPURTS REVISITED

Follow your teacher's directions.

(1)

(2)

(3)

REVIEW

RUMMY GAME: FRACTION, DECIMAL, AND PERCENT

This game is for 2-4 players. Each group will need 40-48 blank cards (at least 2.5" by 3"). Before the game begins, each group creates its own set of Rummy Cards.

1. Groups create 10-12 sets of 4 equivalent fraction, decimal, and percent cards. Two examples are:

$\frac{1}{2}$	0.5	50%	$\frac{4}{8}$

$\frac{3}{4}$	0.75	75%	$\frac{75}{100}$

2. Record two of the sets of equivalent fraction, decimal, and percent cards that you made.

3. Establish the game rules and play. One variation is:

   - The dealer shuffles the deck and deals seven cards to each player. The next card is turned face-up in the center of the table and the rest of the deck is stacked face-down next to it. Each player builds sets of three or four matching cards from his/her hand. Matching sets are cards with equal numerical values.
   - The play moves in a clockwise direction starting with the player on the dealer's left. Each player's turn starts by drawing a card, either the top card of the deck or the top card of the discard pile. Then, if the player has any sets, the player may (but is not required to) lay them down for everyone to see. If there is one card that matches a set that someone else has played, the player may also lay it down. Finally, the player must discard one card face-up on the top of the discard pile.
   - If all the cards in the deck are used before a player goes out, the discard pile—except for the top card—can be shuffled and used as the deck.
   - Play ends when a player discards his/her last card. At this time, each player scores one point for each card they have laid down and loses one point for each card they still hold in their hand. The player who goes out earns seven extra points.
   - Play continues until one player earns 50 points.

4. Challenge: Create another game that can be played with your cards. Write the rules and play with your classmates.

BIG SQUARE PUZZLE: PERCENT

1. Assemble the puzzle given to you by your teacher.

2. These percent statements are similar to some on the big square. Fill in the blanks.

   a. 75% of 60 is _____.

   b. 30% of _____ is 18.

   c. $\frac{3}{4}$ as a percent is _____ %

   d. 125% as a decimal is _____.

3. Choose one percent statement from above and rewrite as a multiplication statement in two different ways, using fractions and decimals.

WHY DOESN'T IT BELONG?: PERCENT

A $\frac{2}{5}$	**C** 0.4
B 40%	**D** $\frac{8}{20}$

1. Pick one number that doesn't belong and explain your reasoning.

2. Pick another number that doesn't belong and explain your reasoning.

3. Explain a reason why ALL of the numbers DO belong together.

POSTER PROBLEMS: PERCENT

Part 1: Your teacher will divide you into groups.

- Identify members of your group as A, B, C, or D.
- Each group will start at a numbered poster. Our group start poster is _____.
- Each group will have a different colored marker. Our group marker is _____.

Part 2: Do the problems on the posters by following your teacher's directions.

Poster 1 (or 5)	Poster 2 (or 6)	Poster 3 (or 7)	Poster 4 (or 8)
Rose Middle School raised $1,280 during the annual fundraiser.	Sunflower Middle School raised $2,068 during the annual fundraiser.	Poppy Middle School raised $892 during the annual fundraiser.	Lily Middle School raised $1,676 during the annual fundraiser.

Each school listed above is in the same district and funds will be distributed as follows. Show all work.

A. 20% will be used for a field trip. How much is this?

B. 15% will be used for sports equipment. How much is this?

C. $\frac{1}{4}$ will be used for "Buddy Benches™". How much is this?

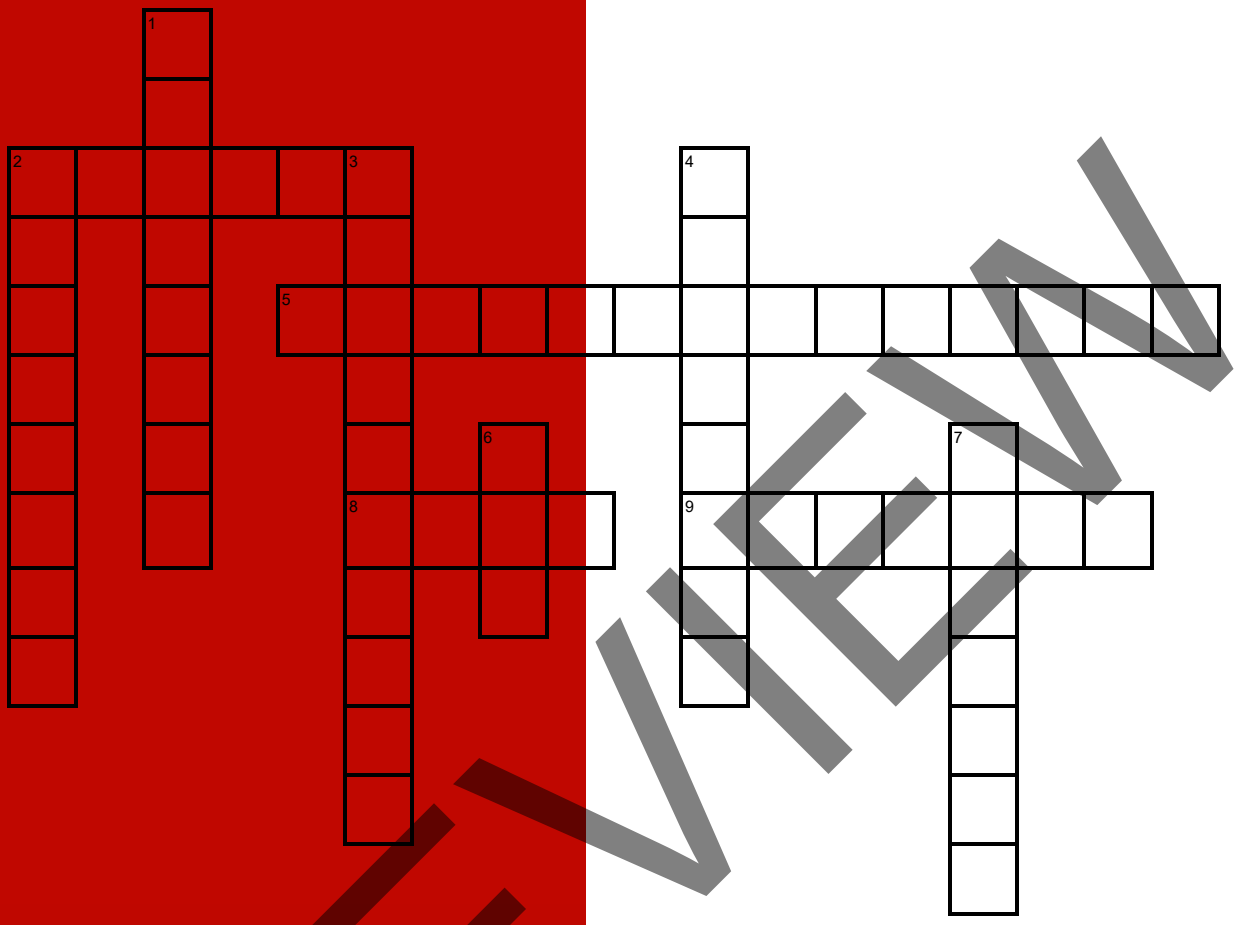
D. The remaining amount will be used to purchase library books. What percent of the total is this? How much money is this?

Part 3: Return to your seats. Work with your group. Refer to your starting poster. Show work.

1. Check all calculations using a calculator.

2. If library books cost an average of $15 per book, about how many books could your "start poster" school purchase?

VOCABULARY REVIEW



Across

2 Equivalent ratios can be found using a _____ number line.

5 The Big 1 is a visual way to remember the ___ identity.

8 Shaded grids (as in fraction gardens) are an example of a(n) ____ model.

9 parts per hundred

Down

1 a mental math technique for finding a percent of a number

2 Multiplying a number by $\frac{1}{2}$ is the same as _____ the number by 2.

3 $\frac{3}{20}$ and $\frac{15}{100}$ are _____ fractions.

4 To find 13% of 42, _____ 0.13 by 42.

6 10% of a dollar is ___ cents.

7 $\frac{7}{10}$ is equal to ___ %.

SPIRAL REVIEW

1. **Computational Fluency Challenge**: This paper and pencil exercise will help you gain fluency with multiplication and division. Try to complete this challenge without any errors. No calculators!

   a. Start with 4.5. Multiply by 4. Multiply the result by 0.7. Multiply the result by 8. Multiply the result by 10. Now you have a "big number". My big number is _____.

   b. Start with your big number. Divide it by 56. Divide the result by 1.8. What is the final result? _____

2. Brian rode 3 kilometers on his bike. His friend Kathy rode 2,500 meters on her bike. Who rode the farther, and by how much?

3. Gianna wants to surround her garden on all four sides with fencing. Her rectangular garden is 24 inches by 60 inches.

   a. Write a numerical expression for the number of feet of fencing she will need.

   b. How many feet of fencing will she need?

SPIRAL REVIEW
Continued

4. Circle all expressions that are equivalent to 375.

   3(100 + 25) 4(100 – 25) 3(125) 3(100) + 25 (25 + 100)3

5. Oliver has *d* dollars in his wallet. His mom gives him $15 for allowance.
   a. Write an algebraic expression to represent the number of dollars Oliver has.

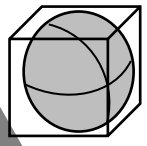
   b. If he initially had $27, how much does he have now?

6. First estimate. Then compute the exact value.

a. 25.08 ÷ 12	b. 6.51 ÷ 3.1

SPIRAL REVIEW
Continued

7. A basketball is put in a gift box that is 1 foot on each edge.



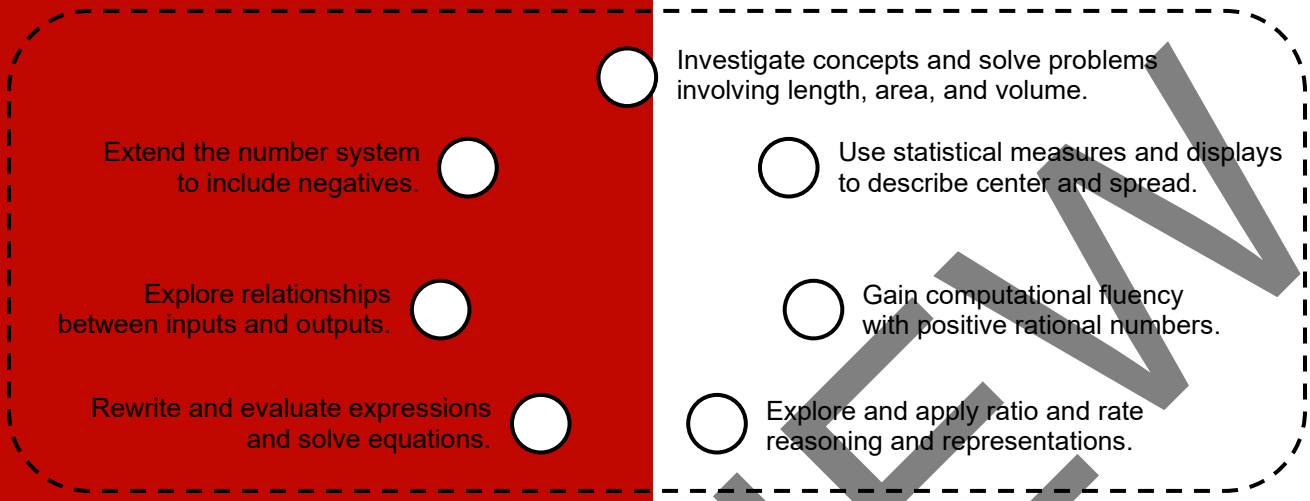
   a. What is the volume of the gift box?

   b. How many gift boxes with basketballs in them will fit in a shipping box that is 24 inches by 36 inches by 48 inches?

8. Lucy has two birds, Molly and Shasta, and a turtle, Daisy. She feeds Molly $\frac{3}{4}$ of a cup of bird food a day and Shasta $\frac{1}{2}$ of a cup of bird food a day. She feeds Daisy $\frac{2}{3}$ of a cup of turtle food a day. She bought an 18-cup bag of bird food and a 9-cup bag of turtle food. Which bag will be empty first?

REFLECTION

1. **Big Ideas**. Shade all circles that describe big ideas in this unit. Draw lines to show connections that you noticed.



   Give an example from this unit of one of the connections above.

2. **Unit Progress.** Go back to **Monitor Your Progress** on the cover and complete or update your responses. Explain something you understand better now than before or something you would still like to work on.

3. **Mathematical Practice.** You learned a chunking procedure for estimating percent. Give some examples of when an estimation of percent might be useful [SMP 6]. Then circle one more SMP on the back of this packet that you think was addressed in this unit and be prepared to share an example.

4. **More Connections.** Describe a situation from the unit or from real life where data and percent are used to make a prediction. Comment on whether the data is a good predictor.

STUDENT RESOURCES

Word or Phrase	Definition
equivalent fractions	The fractions $\frac{a}{b}$ and $\frac{c}{d}$ are equivalent if they represent the same point on the number line. This occurs if the results of the division problems $a \div b$ and $c \div d$ are equal. Since $\frac{1}{2} = 1 \div 2 = 0.5$ and $\frac{2}{4} = 2 \div 4 = 0.5$, the fractions $\frac{1}{2}$ and $\frac{2}{4}$ are equivalent.
multiplication property of 1	The multiplication property of 1 states that $a \bullet 1 = 1 \bullet a = a$ for all numbers a. In other words, 1 is a multiplicative identity. The multiplication property of 1 is sometimes called the multiplicative identity property. $4 \bullet 1 = 4, \quad 1 \bullet 25 = 25, \quad \frac{1}{2} \bullet \boxed{\frac{4}{4}} = \frac{4}{8}$ In the third equation above, since we are multiplying by 1 in the form of $\frac{4}{4}$, we refer to it as the Big 1.
percent	A percent is a number expressed in terms of the unit $1\% = \frac{1}{100} = 0.01$. Similarly, $p\% = \frac{p}{100} = p(0.01)$. One way to convert a number to a percent is to multiply the number by 1 in the form of 100%. $4 = 4 \times 100\% = 400\%; \quad 0.6 = 0.6 \times 100\% = 60\%$ One way to convert a percent to a number is to express $p\%$ as p hundredths. The fraction may be converted to a decimal by dividing. $15\% = \frac{15}{100} = 0.15; \quad 40\% = \frac{40}{100} = 0.40 = 0.4.$
percent of a number	A percent of a number is the product of the percent and the number. It represents the number of parts per 100 parts. 15% of 300 is $\frac{15}{100} \bullet 300 = 45$, or $(0.15)(300) = 45$. If 45 out of 300 students are boys, then 15 out of every 100 students are boys, and 15% of the students are boys.
ratio	A ratio is a pair of positive numbers in a specific order. The ratio of a to b is denoted by $a : b$ (read "a to b," or "a for every b").

Equivalent Fractions: The Big 1

The number 1 is called the multiplicative identity. Multiplying a fraction by any form of 1 does not change its value.

The Big 1 is a notation for 1 in the form of a fraction $\frac{n}{n}$ ($n \neq 0$). For example,

$$1 = \frac{1}{1} = \frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \frac{5}{5} = \ldots$$

We can use the following picture to help remind us that these fractions are equivalent to 1:

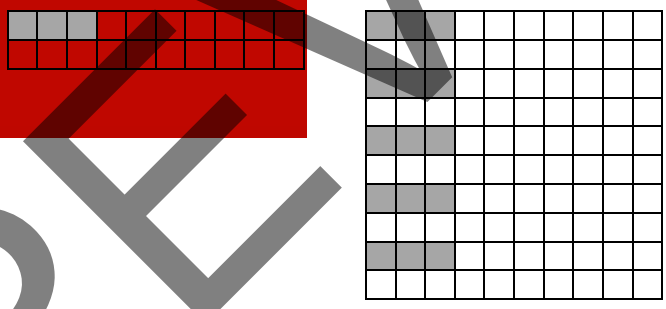
$$1 = \boxed{\frac{8}{8}}$$

The Big 1 can be used to show equivalence of fractions. For example,

$$\frac{2}{5} \times \boxed{\frac{10}{10}} = \frac{20}{50} \quad \text{or} \quad \frac{20}{50} \div \boxed{\frac{10}{10}} = \frac{2}{5}.$$

Equivalent Fractions

The diagrams below illustrate that $\frac{3}{20} = \frac{15}{100}$. In the second diagram, the pattern is repeated five times. The fractional part remains the same as the size of the whole changes.



$$\frac{3}{20} = \frac{15}{100}$$

Using the Big 1, this equivalence can be written:

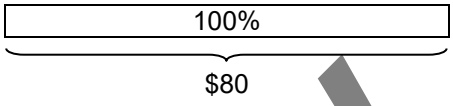
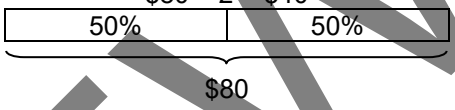
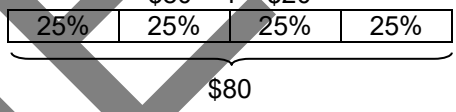
$$\frac{3}{20} \cdot \boxed{\frac{5}{5}} = \frac{15}{100}.$$

Visually, multiplying the numerator by 5 represents repeating the shaded parts five times, and multiplying the denominator by 5 represents repeating the total number of parts in the denominator five times.

With this process, the size of the part does not change.

Some Fraction-Decimal-Percent Equivalents

$\frac{1}{2} = \frac{50}{100} = 0.5 = 50\%$ $\frac{1}{4} = \frac{25}{100} = 0.25 = 25\%$ $\frac{3}{4} = \frac{75}{100} = 0.75 = 75\%$ $\frac{5}{4} = \frac{125}{100} = 1.25 = 125\%$ Conversion strategy: Think: $\frac{3}{4}\left(\frac{25}{25}\right) = \frac{75}{100} = 75\%$	$\frac{1}{10} = \frac{10}{100} = 0.1 = 10\%$ $\frac{3}{10} = \frac{30}{100} = 0.3 = 30\%$ $\frac{5}{10} = \frac{50}{100} = 0.5 = 50\%$ Conversion strategy: Think: $\frac{3}{10} = \frac{30}{100}$, so $0.3 = 0.30 = 30\%$	$\frac{1}{25} = \frac{4}{100} = 0.04 = 4\%$ $\frac{16}{25} = \frac{64}{100} = 0.64 = 64\%$ $\frac{9}{50} = \frac{18}{100} = 0.18 = 18\%$ Conversion strategy: Think: 25(4) = 100, so $\frac{16}{25}\left(\frac{4}{4}\right) = \frac{64}{100} = 64\%$
$\frac{3}{20} = \frac{15}{100} = 0.15 = 15\%$ $\frac{13}{20} = \frac{65}{100} = 0.65 = 65\%$ $\frac{19}{20} = \frac{95}{100} = 0.95 = 95\%$ Conversion strategy: Think: 20 nickels in a dollar $\frac{1}{20}$ of a dollar is \$0.05	$\frac{1}{5} = \frac{2}{10} = 0.2 = 20\%$ $\frac{2}{5} = \frac{4}{10} = 0.4 = 40\%$ $\frac{3}{5} = \frac{6}{10} = 0.6 = 60\%$ $\frac{4}{5} = \frac{8}{10} = 0.8 = 80\%$ Conversion strategy: Think: If I know tenths, I can easily convert to hundredths.	$\frac{1}{8} = \frac{12.5}{100} = 0.125 = 12.5\%$ $\frac{3}{8} = \frac{37.5}{100} = 0.375 = 37.5\%$ $\frac{5}{8} = \frac{62.5}{100} = 0.625 = 62.5\%$ $\frac{7}{8} = \frac{87.5}{100} = 0.875 = 87.5\%$ Conversion strategy: Think: $\frac{1}{4} = \frac{25}{100}$, so half of $\frac{1}{4}$ is $\frac{1}{8} = \frac{12.5}{100}$ $= 12.5\%$

Connecting Multiplication and Division to Percent of a Number	
Think	**Example**
Finding 100% of something is the same as finding all of it.	100% of \$80 = \$80 
Finding 50% of something is the same as finding one-half of it. This is the same as multiplying by $\frac{1}{2}$ or dividing by 2.	50% of \$80 = $\frac{1}{2}$(\$80) = \$40 \$80 ÷ 2 = \$40 
Finding 25% of something is the same as finding one-fourth of it. This is the same as multiplying by $\frac{1}{4}$ or dividing by 4.	25% of \$80 = $\frac{1}{4}$(\$80) = \$20 \$80 ÷ 4 = \$20 
Finding 10% of something is the same as finding one-tenth of it. This is the same as multiplying by $\frac{1}{10}$ or dividing by 10.	10% of \$80 = $\frac{1}{10}$(\$80) = \$8 \$80 ÷ 10 = \$8
Finding 1% of something is the same as finding one-hundredth of it. This is the same as multiplying by $\frac{1}{100}$ or dividing by 100.	1% of \$80 = $\frac{1}{100}$(\$80) = \$0.80 \$80 ÷ 100 = \$0.80
Finding 20% of something is the same as doubling 10% of it.	20% of \$80 = 2(\$8) = \$16
Finding 5% of something is the same halving 10% of it.	5% of \$80 = $\frac{1}{2}$(\$8) = \$4
Finding 15% of something is the same as adding 10% of it and 5% of it.	15% of \$80 = \$8 + \$4 = \$12

Using Chunking to Find a Percent of a Number

We use the word "chunking" to describe a process of decomposing and composing numbers to make calculations easier, especially when done mentally. Another way to describe this is "taking numbers apart and putting them back together." For example, if adding 17 and 26, we might decompose each number into tens and ones, adding 10 + 20 = 30, and 7 + 6 = 13, and finalizing the sum by adding 30 + 13 = 43.

Longer method (applying the distributive property)	**Shorter method** (mostly done mentally)
20% of 60 = (10% + 10%) of 60 = 10% of 60 + 10% of 60 = 6 + 6 = 12	20% of 60 10% → 6 10% → 6 20% → 12 Note that given a number representing the whole, we use an arrow to efficiently show the percent of the number using mental math and chunking.
15% of 60 = (10% + 5%) of 60 = 10% of 60 + 5% of 60 = 6 + 3 = 9	15% of 60 10% → 6 5% → 3 15% → 9

Using Multiplication to Find a Percent of a Number

Some percent values are hard to find mentally. For example, finding 17% of something is the same as finding $\frac{17}{100}$ = 0.17 of it. In this case, it may be easier to find the percent by using the definition of a percent of a number:

> A percent of a number is the product of the percent and the number.

Find 17% of $80.

Strategy 1: **Use fractions**

$$\frac{17}{100} \bullet 80 = \frac{17 \bullet 80}{100} = \frac{1360}{100} = 13.60$$

So 17% of $80 is $13.60.

Strategy 2: **Use decimals**

(0.17) • (80) = 13.6 or 13.60

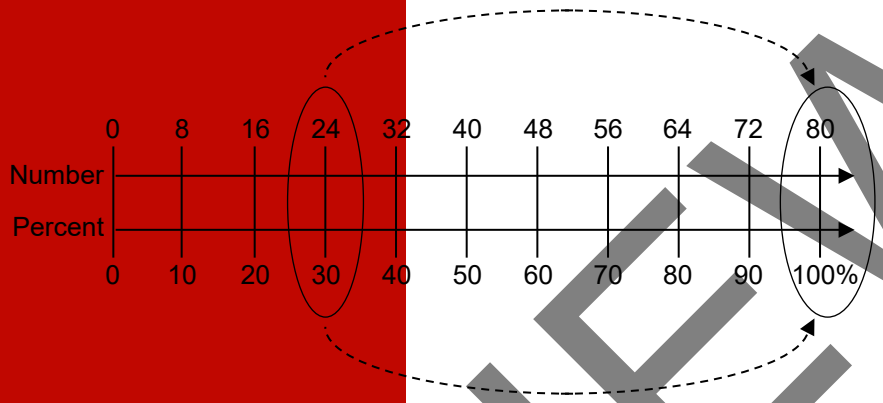
So 17% of $80 is $13.60.

Using Double Number Lines to Solve Percent Problems

Strategy 1: Solve on the double number line

30% of 80 is what amount?

Create a double number line with percents represented in increments of 10% on the bottom line, and the whole number represented in equal increments on the top. Since the whole is 80 (in this case), count by 8s for the equal increments (80 ÷ 10 = 8).



Since 30% corresponds to 24 on the double number line, 30% of 80 is 24.

Strategy 2: Identify equivalent ratios on the double number line and create equivalent fractions.

Create equivalent fractions based on the part-to-whole relationships.

$$\frac{\text{part}_{number}}{\text{whole}_{number}} = \frac{\text{part}_{percent}}{\text{whole}_{percent}}$$

$$\frac{\boxed{24}}{80} = \frac{30}{100}$$

This equivalence is based on the dotted arrows above.

Create equivalent fractions based on the part-to-part relationships.

$$\frac{\text{part}_{number}}{\text{part}_{percent}} = \frac{\text{whole}_{number}}{\text{whole}_{percent}}$$

$$\frac{\boxed{24}}{30} = \frac{80}{100}$$

This equivalence is based on the circles above.

COMMON CORE STATE STANDARDS

STANDARDS FOR MATHEMATICAL CONTENT	
6.RP.A	**Understand ratio concepts and use ratio reasoning to solve problems.**
6.RP.3	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations:
c.	Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
6.SP.A	**Develop understanding of statistical variability.**
6.SP.2	Understand that a set of data collected to answer a statistical question has a distribution that can be described by its center, spread, and overall shape.
6.SP.3	Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
6.SP.B	**Summarize and describe distributions.**
6.SP.4	Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
6.SP.5	Summarize numerical data sets in relation to their context, such as by:
c.	giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
d.	relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.
6.NS.B	**Compute fluently with multi-digit numbers and find common factors and multiples.**
6.NS.3	Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

STANDARDS FOR MATHEMATICAL PRACTICE	
SMP1	Make sense of problems and persevere in solving them.
SMP2	Reason abstractly and quantitatively.
SMP3	Construct viable arguments and critique the reasoning of others.
SMP4	Model with mathematics.
SMP5	Use appropriate tools strategically.
SMP6	Attend to precision.
SMP7	Look for and make use of structure.
SMP8	Look for and express regularity in repeated reasoning.

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