Chapter 2

Fractions, Decimals, and Percents



Essential Question

WHEN is it better to use a fraction, a decimal, or a percent?

Mathematical Practices 1, 2, 3, 4, 5, 6, 7



Math in the Real World

Outer Space Due to the pull of gravity, an astronaut who weighs 180 pounds on Earth would weigh $\frac{1}{6}$ of that on the moon.

Write the astronaut's weight on the moon in the box below.









Cut out the Foldable in the back of this book.



Place your Foldable on page 166.



Use the Foldable throughout this chapter to help you learn about fractions, decimals, and percents.

What Tools Do You Need?



Vocabulary

least common denominator percent percent proportion

proportion rational number

Study Skill: Reading Math

Everyday Meaning The key to understanding word problems is to understand the meaning of the mathematical terms in the problem.

You will use the terms *factor* and *multiple* in this chapter. Here are two sentences that show their everyday meanings.

- Weather was a factor in their decision to postpone the picnic.
- The star quarterback won *multiple* post-season awards.

The table shows how the everyday meaning is connected to the mathematical meaning.

Term	Everyday Meaning	Mathematical Meaning	Connection
Factor	something that actively contributes to a decision or result	2 and 3 are factors of 6.	A factor helps to make a decision. In mathematics, factors "make up" a product.
Multiple	consisting of more than one or shared by many	The multiples of 2 are 0, 2, 4, 6,	Multiple means many. In mathematics, a number has infinitely many multiples.

Practice Make a list of other words that have the prefixes *fact-* or *multi-*. Determine what the words in each list have in common.

Word	Meaning	Connection
		Program
	official checarifing	rogram

What Do You Already Know?

List three things you already know about fractions, decimals, and percents in the first section. Then list three things you would like to learn about fractions, decimals, and percents in the second section.

What I know
What I want to find out

When Will You Use This?

Here is an example of how fractions, decimals, and percents are used in the real world.

Activity Suppose one-half of the students in your class are boys. How would you write one half as a fraction? a decimal? a percent? Which form would you use to represent one-half of the class? Explain your reasoning.

mart Lea	arning Pr	ogram	



Quick Review

Example 1

Find the GCF of 30 and 54.

First, make an organized list of the factors for each number. Then circle the common factors.

30:1,2,3,5,6,10,15,30 54:1,2,3,6,9,18,27,54

So, the greatest common factor, or GCF, is 6.

Example 2

Find the LCM of 15 and 40.

Write the prime factorization

$$15 = 3 \times 5$$

$$40 = 2 \times 2 \times 2 \times 5$$

Find the product of the prime factors. Use the common prime factor, 5, only once.

The least common multiple, or LCM, is $2 \times 2 \times 2 \times 3 \times 5$ or 120.

Quick Check

Greatest Common Factor Find the GCF of each set of numbers.

- **1.** 32 and 52
- **2.** 48 and 60

3. 18, 54, and 72

Show your

- **Least Common Multiple** Find the LCM for each set of numbers.
- **4.** 5 and 7

5. 12 and 30

- **6.** 6, 2, 22
- 7. The front gear of a bicycle has 54 teeth. The back gear has 18 teeth. How many complete rotations must the smaller gear make for both gears to be aligned in the original starting positions?



Which problems did you answer correctly in the Quick Check? Shade those exercise numbers below.

- (1
- 2
- 3
- 4
- 5





Decimals and Fractions



Real-World Link

Music The instruments below show the part of students in the school orchestra that play each type of instrument.





- 1. Write 0.25 in word form:
- 2. Write 0.25 as a fraction:





- 3. Write 0.15 in word form:
- 4. Write 0.15 as a fraction:





- **5.** Write 0.31 in word form:
- **6.** Write 0.31 as a fraction:





- **7.** Write 0.29 in word form:
- **8.** Write 0.29 as a fraction:



Which Mathematical Practices did you use? Shade the circle(s) that applies.

- 1 Persevere with Problems
- 2 Reason Abstractly
- 3 Construct an Argument
- 4 Model with Mathematics
- (5) Use Math Tools
- (6) Attend to Precision
- (7) Make Use of Structure
- 8 Use Repeated Reasoning



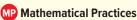
Essential Question

WHEN is it better to use a fraction, a decimal, or a percent?



Vocabulary

rational number



1, 3, 4, 5



Write Decimals as Fractions and Mixed Numbers

Decimals like 0.25, 0.15, 0.31, and 0.29 can be written as fractions with denominators of 10, 100, 1,000, and so on. Any number that can be written as a fraction is a **rational number**.

Decimals like 3.25, 26.82, and 125.54 can be written as mixed numbers in simplest form.

Examples

Write each decimal as a fraction in simplest form.

1. 0.6

The place-value chart shows that the place value of the last decimal place is tenths.

$$0.6 = \frac{6}{10}$$
 Say six tenths.
$$= \frac{\cancel{6}}{\cancel{10}}$$
 Simplify. Divide the numerator and denominator by the GCF, 2.

ı.							
	1,000	100	10	1	0.1	0.01	0.001
	thousands	hundreds	tens	ones	tenths	hundredths	thousandths
	0	0	0	0	, 6	0	0

 $=\frac{1}{10}$ $0.2=\frac{1}{5}$

$$0.25 = \frac{1}{4}$$
 $0.5 = \frac{1}{2}$

equivalencies:

Mental Math

Here are some commonly used decimal-fraction

$$0.75 = \frac{3}{4}$$

It is helpful to memorize these.

2. 0.45

$$0.45 = \frac{45}{100}$$
 Say forty-five hundredths.
$$= \frac{45}{100}$$
 Simplify.
$$= \frac{9}{20}$$

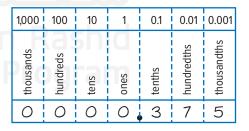
$$= \frac{9}{9}$$

1,000	100	10	1	0.1	0.01	0.001
thousands	hundreds	tens	ones	tenths	hundredths	thousandths
0	0	0	0	, 4	5	0

3. 0.375

$$0.375 = \frac{375}{1,000}$$
Say three hundred seventy-five thousandths.
$$= \frac{375}{1,000}$$
Simplify.
$$= \frac{3}{3}$$

Got it? Do these problems to find out.



Nonk

b. _____

C. _____

a. 0.8

b. 0.28

c. 0.125



Example

4. The average length of a conch shell is 9.85 inches. Express 9.85 as a mixed number in simplest form.

$$9.85 = 9\frac{85}{100}$$

$$= 9.85 \text{ or } 9.17$$

Say nine and eighty-five hundredths.

$$=9\frac{\frac{17}{85}}{\frac{100}{100}} \text{ or } 9\frac{17}{20} \text{ in.} \qquad \text{Simplif}$$



Got it? Do this problem to find out.

d. It takes approximately 4.65 quarts of milk to make a pound of cheese. Express this amount as a mixed number in simplest form.



d._____

Write Fractions and Mixed Numbers as Decimals

For fractions with denominators that are *factors* of 10, 100, or 1,000, you can write equivalent fractions with these denominators.

Example

5. Write $\frac{9}{12}$ as a decimal.

Method 1 Write an equivalent fraction.

$$\frac{9}{12} = \frac{3}{4} \quad \frac{3}{4} = \frac{75}{100}$$

$$\div 3 \quad \times 25$$

$$= 0.75$$

Simplify $\frac{9}{12}$. Then multiply the numerator and denominator of $\frac{3}{4}$ by 25.

Read 0.75 as seventy-five hundredths.

Method 2

Divide the numerator by the denominator.

To divide 9 by 12, place a decimal point after 9 and annex as many zeros as necessary to complete the division.

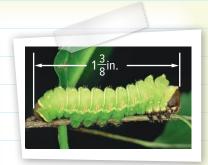
е. _____

Got it? Do these problems to find out.

e.
$$\frac{3}{5}$$

f.
$$\frac{14}{25}$$

g.
$$\frac{102}{250}$$





Example

6. A caterpillar can have as many as 4,000 muscles, compared to humans, who have about 600. Write the length of the caterpillar as a decimal.

$$1\frac{3}{8} = 1 + \frac{3}{8}$$

$$= 1 + \frac{375}{1,000}$$

$$= 1 + 0.375 \text{ or } 1.375$$

Definition of a mixed number

Multiply the numerator and the denominator by 125. Read 1.375 as one and three hundred seventy-five thousandths.

The length of the caterpillar is 1.375 inches.

Guided Practice



Write each decimal as a fraction or mixed number in simplest form. (Examples 1-4)



Write each fraction or mixed number as a decimal. (Examples 5 and 6)

4.
$$\frac{27}{75}$$
 =

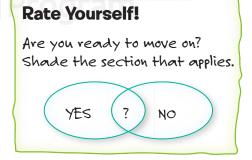
5.
$$\frac{7}{2}$$
 =

6.
$$3\frac{1}{5} =$$

- 7. Mr. Khalid's car averages 23.75 kilometers per gallon of petrol. Express this amount as a mixed number in simplest form. (Example 4)
- **8.** STEW The Siberian tiger can grow up to $10\frac{4}{5}$ feet long.

Express this length as a decimal. (Example 6)

9. Quilding on the Essential Question What is the relationship between fractions and decimals?



Independent Practice

Write each decimal as a fraction in simplest form. (Examples 1–3)



Write each fraction or mixed number as a decimal. (Examples 5 and 6)

5.
$$\frac{77}{200} =$$

6.
$$\frac{1}{20}$$
 =

7.
$$\frac{12}{75}$$
 =

8.
$$8\frac{21}{40}$$
 =

- 9. STEM Mercury orbits the Sun in $87\frac{24}{25}$ Earth days. Venus orbits the Sun in $224\frac{7}{10}$ Earth days, and Mars orbits the Sun in $686\frac{49}{50}$ days. Write each mixed number as a decimal. (Example 6)
- **10. STEW** Last week, a share of stock gained a total of 1.64 points. Express this gain as a mixed number in simplest form. (Example 4)

- 11. We Use Math Tools The table shows the ingredients in an Italian sandwich.
 - a. What fraction of a pound is each ingredient?

Ingredient	Amount (lb)
meat	0.35
vegetables	0.15
secret sauce	0.05
bread	0.05

- **b.** How much more meat is in the sandwich than vegetables? Write the amount as a fraction in simplest form.
- c. What is the total weight of the Italian sandwich? Write the amount as a fraction in simplest form.

12. Ziad can run the 100-meter dash in $16\frac{1}{5}$ seconds. Nawaf's best time is 19.8 seconds. How much faster is Ziad than Nawaf in the

100-meter dash?

13. The average length of a ladybug can range from 0.08 to 0.4 inch. Find two lengths that are within the given span.

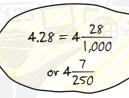
Write them as fractions in simplest form.





H.O.T. Problems Higher Order Thinking

14. Prind the Error Reem is writing 4.28 as a mixed number. Find her mistake and correct it.





15. Persevere with Problems Decide whether the following statement is *always*, *sometimes*, or *never* true. Explain your reasoning.

Any decimal that ends with a digit in the thousandths place can be written as a fraction with a denominator that is divisible by both 2 and 5.

ن<u>امج محمد بن راشــــد</u>

- **16. PReason Inductively** Write a fraction with a decimal value between $\frac{1}{2}$ and $\frac{3}{4}$. Write both the fraction and the equivalent decimal.
- 17. **We Wath Tools** Mayada is making a costume for her school play. She needs to buy 2 meters of cotton fabric at a cost of AED 3.49 per meter, and $\frac{1}{2}$ meter of satin fabric at AED 5.98 per meter. She has AED 15 to spend on the fabric. Use mental math to determine if she will have enough money. Explain.

Extra Practice

0.3 is three tenths.

Write each decimal as a fraction or mixed number in simplest form.

18.
$$0.3 = \frac{3}{10}$$

19. 0.65 =

Homework Help

Write each fraction or mixed number as a decimal.

22.
$$\frac{19}{25}$$
 =

23.
$$\frac{311}{500}$$
 =

24.
$$\frac{5}{8}$$
 =

25.
$$14\frac{3}{5} =$$

- **26.** Riad lives 0.85 kilometers from his school. Write this distance as a fraction in simplest form.
- 27. Al Salam Primary School has an average of $23\frac{3}{8}$ students per teacher. Write this mixed number as a decimal.

- 28. Hamad bought 20 meters of fencing. He used 5.9 meters to surround one flower garden and 10.3 meters to surround another garden. Write the amount remaining as a fraction in simplest form.
- **29.** In a survey, 9 out of 15 students named math as their favorite class. Express this rate as a decimal.

Mohammed Bin Rashid

30. We Use Math Tools The frequency table shows the favorite college football teams of middle school students. What fraction of the students chose Al Itihad? Write the fraction as a decimal.

Team	Tally	Frequency
Al Quwa	111	3
Al Ahli	JH11	6
Al Itihad	Ш	5
Al Azm	11	2
Al Ain	1111	4

Power Up! Test Practice

31. Layla ran the distances shown in the table. Write the total distance, in kilometers, as a fraction in simplest form.

32. Shade 0.25 of the design. Write a fraction in simplest form to represent the shaded part of the design.

Day	Distance (kill)
Monday	0.35
Wednesday	0.2
Friday	0.25



Spiral Review

Simplify each fraction.

33.
$$\frac{20}{100} = \frac{}{}$$

34.
$$\frac{35}{100} =$$

36.
$$\frac{48}{100} = \frac{}{}$$

- **37.** Jassir made 230 flyers for training. He handed two flyers out to each student. How many students received flyers?
- **38.** Look for a pattern and complete the table.

Multiplication Problem	Product
36 × 100	3,600
36 × 10	L
36 × 1	
36 × 0.1	
36 × 0.01	

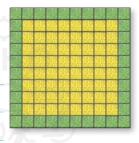
HOW can you model a percent?

MP Mathematical Practices
1, 3, 4

Jasim is using 1-inch tiles to make the mosaic shown at the right. Hse needs a total of 100 tiles. What percent of the tiles are green?

What do you know?

What do you need to find?

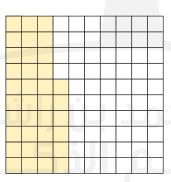


Hands-On Activity 1

A 10 \times 10 grid can be used to represent *hundredths*. It can also represent percents. The word *percent* (%) means *out of one hundred*. For example, 50% means 50 out of one hundred.

Step 1

Use a 10×10 grid to model the percent of tiles in the mosaic that are green.





Step 2

In the mosaic, tiles out of 100 are green.

As a fraction, this is $\frac{100}{100}$. When the denominator is 100, the numerator gives the numerical value of the percent.

So, % of the squares are green.

Hands-On Activity 2

Model 25% with a 10 \times 10 grid.

Step 1

25% means out

out of 100.

Step 2

Shade the squares, filling one column at a time.

Shade squares out of 100.



What fraction of the 10×10 grid is shaded?

What decimal represents the shaded part of the grid?

Hands-On Activity 3

Percents can also be modeled with bar diagrams. The entire bar represents 100%. The bar diagram below is divided into 10 equal sections, each representing 10%. The shaded region represents 40%.



Model 60% with a bar diagram.

Step 1

The bar diagram below is divided into equal sections. To find the value of each section, divide. $100\% \div 5 = 20\%$.

So, each section represents %.

	_
Sten	2
OCCP	

% + \(\)% + \(\)% = 60%

Shade sections of the diagram.

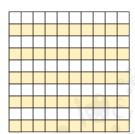
0	%		100)%

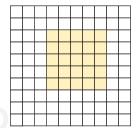


Work with a partner. Identify each percent modeled.

1.





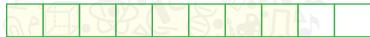


3. _____

0%

50%

100%

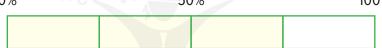


4. _____

0%

50%

100%

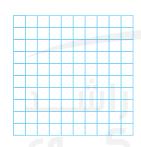


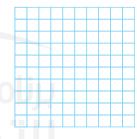
Work with a partner. Model each percent.

5. 37%

6. 8%







7. 45%

0%

509



8. 5%

0% 50% 100%



Analyze and Reflect

Work with a partner to determine the number of shaded sections for each model. The first one is done for you.

		Number of Shaded Sections using each Model		
	Percent	10 × 10 Grid	Bar Diagram with 10 Equal Sections	Bar Diagram with 20 Equal Sections
	45	45	4.5	9
9.	15			V ₀ O
10.	30		DOO	J HO
11.	55	43	√123	
12.	70			
13.	85			世へろう
14.	65	me!	1.22.0	Soil A

- 15. Write the percent shown by each model. Explain your reasoning.
 - a.
 - b.
 - c.
- 16. Reason Inductively How can you use a model to write a percent as a

fraction with a denominator of 100?



Create

- 17. Model with Mathematics Write a real-world problem that involves a percent. Then model the percent used in the problem.
- 18. Inquiry HOW can you model a percent?

Percents and Fractions

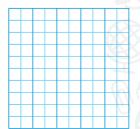


Real-World Link

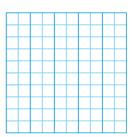
Sports Students were asked to choose their favorite sport to play.

1. For each sport, shade a 10×10 grid that represents the number of students out of 100 that chose the sport.

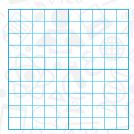
Basketball: 3 out of 20



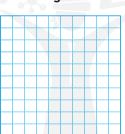
Gymnastics: 1 out of 20



Football: 3 out of 25



Swimming: 9 out of 100



2. What fraction with a denominator of 100 represents the number of students who chose each sport?

Basketball:



Football:



Swimming:



Which Mathematical Practices did you use?

Shade the circle(s) that applies.

- 1 Persevere with Problems
- 2 Reason Abstractly
- 3 Construct an Argument
- 4 Model with Mathematics
- (5) Use Math Tools
- 6 Attend to Precision
- 7 Make Use of Structure
- 8 Use Repeated Reasoning



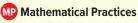
Essential Question

WHEN is it better to use a fraction, a decimal, or a percent?

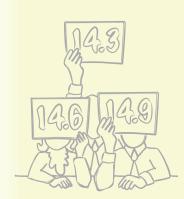


Vocabulary

percent









Key Concept

Percents as Fractions

Work Zone

Check for

50%, and $\frac{11}{20}$ is

Reasonableness

veasonable answer because 55% is a little more than

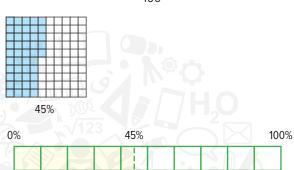
a little more than $\frac{10}{20}$ or $\frac{1}{2}$.

In Example 2, you can conclude that $\frac{11}{20}$ is a

Words A percent is a ratio that compares a number to 100.

Example $45\% \Rightarrow 45$ out of 100 or $\frac{45}{100}$

Models



To write a percent as a fraction, first write the percent as a rate per 100. Then simplify.

Examples

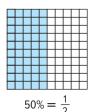
1. Write 50% as a fraction in simplest form.

50% means 50 out of 100.

$$50\% = \frac{50}{100}$$
$$= \frac{50}{100} \text{ or } \frac{1}{2}$$

Definition of percent

$$= \frac{50}{100} \text{ or } \frac{1}{2}$$
 Simplify. Divide the numerator and the denominator by the GCF, 50.



2. In a recent survey, 55% of cell phone owners said they text message. What fraction of cell phone owners is this?

$$55\% = \frac{55}{100}$$
 Definition of percent $= \frac{11}{20}$ Simplify.

So, $\frac{11}{20}$ of cell phone owners text message.

(work)

Got it? Do these problems to find out.

Write each percent as a fraction in simplest form.

C. _____

- **a.** 75%
- **b.** 90%
- **c.** 38%



Example

3. The table shows the percent of each movie type rented during a month. What fraction of the rentals were action movies?

$$35\% = \frac{35}{100}$$

Definition of percent

$$=\frac{\frac{7}{35}}{\frac{100}{20}}$$

Divide the numerator and denominator by the GCF, 5.

Action movies were rented $\frac{7}{20}$ of the time.

Types of Movies		
Action	35%	
Children's	5%	
Comedy	45%	
Drama	5%	
Horror	5%	
Documentary	5%	



Got it? Do this problem to find out.

d. Write the fraction of rentals that were horror movies.

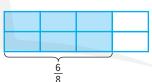


Fractions as Percents

To write a fraction as a percent, find an equivalent ratio with 100 as a denominator.

Example

4. Write the fraction $\frac{6}{8}$ as a percent.



$$\frac{6}{8} = \frac{3}{4}$$

Simplify by dividing by the GCF, 2.

$$\frac{3}{4} = \frac{\blacksquare}{100}$$

Write equivalent ratios. One ratio is the fraction. The other ratio is the unknown value compared to 100.



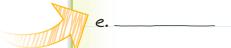
Since $4 \times 25 = 100$, multiply 3 by 25 to find the unknown value

So, $\frac{75}{100}$ or 75% of the rectangle is shaded.

Got it? Do this problem to find out.

e. Write the fraction $\frac{9}{12}$ as a percent.







eal Work

Example

5. Salah made 12 out of 40 shots during the championship game. What percent of his shots did Salah make?

$$\frac{12}{40} = \frac{3}{10}$$

Simplify $\frac{12}{40}$ by dividing the numerator and denominator by the GCF, 4.

$$\frac{\cancel{3}}{\cancel{10}} = \frac{\cancel{100}}{\cancel{100}}$$

Write equivalent ratios

Since $10 \times 10 = 100$, multiply 3 by 10 to find the unknown value.

So,
$$\frac{12}{40} = \frac{30}{100}$$
 or 30%.

Got it? Do this problem to find out.

f. Mariam spelled 19 out of 25 words correctly. What percent of the words did Mariam spell correctly?



Guided Practice



Write each percent as a fraction in simplest form. (Examples 1–3)

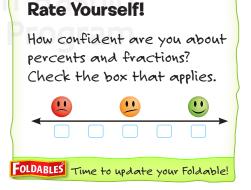
Write each fraction as a percent. Use a model if needed. (Example 4)

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

5.
$$\frac{3}{20}$$
 =

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

- 7. Maysa ran 7 out of 10 days. What percent of the days did she run? (Example 5)
- 8. **Quilding on the Essential Question** Why is it helpful to write a fraction as a percent?



Independent Practice

Write each percent as a fraction in simplest form. (Examples 1–3)

1. 2% =



2. 20% =

3. 85% =

4. 4% =

Write each fraction as a percent. Use a model if needed. (Example 4)

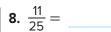
5. $\frac{2}{10}$ =



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



7. $\frac{7}{20}$ =



- 9. During his workout, Hussein spent 28% of the time on the treadmill. What fraction of his workout was on the treadmill? (Examples 1–3)
- **10.** A cat spends about 7 out of 10 hours sleeping. About what percent of a cat's day is spent sleeping? (Example 5)
- **11.** A survey showed that 82% of youth most often use the Internet at home. What fraction of youth surveyed most often use the Internet somewhere else?



- **12.** Jalal collects state quarters. He has 42 out of 50 available quarters. What is 42 out of 50 as a percent?
- **13.** Use the table to determine what percent of students prefer school uniforms and what percent do not prefer school uniforms. What is the relationship between these two percents?

Prefer School Uniforms		
No	Yes	
 	1111	

- **14. Multiple Representations** The table shows the percent of Earth's atmosphere that is each element.
 - a. Bar Diagram Model 21% using a bar diagram.

0%	100%

Element	Percent
Nitrogen	78
Oxygen	21
Other	1

b. Number Write the percent of Earth's atmosphere that is nitrogen as a fraction in simplest form.



H.O.T. Problems Higher Order Thinking

- **15. Reason Inductively** Write three fractions that can be written as percents between 50% and 75%. Justify your solution.
- **16. Persevere with Problems** For each model below, write the portion of the grid that is shaded as a percent and as a fraction.
 - a.
- b.
- c.
- 17. Which One Doesn't Belong? Identify the number that does not belong with the other three. Explain your reasoning.

9/20

~~	_	\sim
	45	
	100	

18. Persevere with Problems Complete each blank to find an expression that is equal to 16%.

a. _____ for every 100

b. ______ for every 50

c. 1 for every _

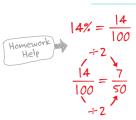
d. 0.5 for every

19. **Reason Inductively** Explain the difference between $33\frac{1}{3}\%$ and 33%.

Extra Practice

Write each percent as a fraction in simplest form.

20.
$$14\% = \frac{7}{50}$$



Write each fraction as a percent. Use a model if needed.

24.
$$\frac{7}{10}$$
 = _____



25.
$$\frac{21}{25}$$
 =



26.
$$\frac{3}{5}$$
 =

27.
$$\frac{18}{25}$$
 =

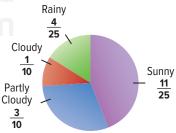
- **28.** In a recent year, 22% of email users said they spend less time using email because of spam. What fraction of email users is this?
- **29.** About $\frac{19}{20}$ of celery is water. What percent is this?

30. We Use Math Tools Mrs. Madiha took a survey of the types of pants her students were wearing. She collected the data at the right. What percent of her students were wearing cotton?

Type of Pants	Number of Students
Jeans	14
Cotton	9
Silk	2

- **31.** STEM The circle graph shows the fraction of each type of weather during September.
 - a. What percent of the days were sunny?
 - **b.** What percent of the days were rainy?
 - c. What percent of the days were sunny or rainy?
 - d. What percent of the days were cloudy or partly cloudy?

Weather During September



Power Up! Test Practice

- 32. On Sunday, 65% of the sudents at Al Khalil Middle School bought a hot lunch and the rest of the students packed their lunch. What fraction of students packed their lunch? Select all that apply.

- 33. The student council published the results of the survey about the new school mascot. Mohammed spilled water on the paper, but he knows that 72% of the students chose a mascot other than a tiger. How many students chose the Penguin as their new mascot?

Mascot	Number of Students
Eagle	11
Polar Bear	6
Tiger	14
Penguin	?

Spiral Review

Multiply.

34. $0.685 \times 100 =$

35.
$$0.09 \times 10 =$$

37. Refer to the table. Which lap has the slowest time?

Lap	Time (minutes)
1	1.59
2	1.85
3	1.64

38. Dunia has AED 10. She buys the items shown. How much will Dunia have left?



Percents and Decimals



Real-World Link

School A recent survey tells the favorite subjects of students at Al Islam Primary School.

Math: 28% Art: 16%

Science: 21% English: 13%

Social Studies: 15% Other: 7%



Essential Question

WHEN is it better to use a fraction, a decimal, or a percent?

MP Mathematical Practices

1, 3, 4, 5, 6

1. Write a fraction with a denominator of 100 to represent the percent for each subject.

Math:

100

Science:

100

Art: 100

Social Studies:

100

English:

Other:

2. Write each fraction from Exercise 1 as a decimal.

Math:

Science:

Art:

Social Studies:

English:

Other:

3. Make a Conjecture Look back at Exercise 2. Compare the decimals to the percents. Explain how to write a percent as a

decimal.



Which Mathematical Practices did you use? Shade the circle(s) that applies.

- 1 Persevere with Problems
- (5) Use Math Tools

2 Reason Abstractly

- 6 Attend to Precision
- 3 Construct an Argument
- (7) Make Use of Structure
- 4 Model with Mathematics
- 8 Use Repeated Reasoning

Key Concept

Write Percents as Decimals

Work Zone

WordsTo write a percent as a decimal, divide by 100 and remove

the % sign. This is the same as moving the decimal point two

places to the left.

Example
$$48\% = 48\%$$

$$= 0.48$$

Another way to write a fraction as a decimal is to write the percent as a fraction. Then write the fraction as a decimal.

Examples

Write each percent as a decimal.

1. 56%

Method 1 Write the percent as a fraction.

$$56\% = \frac{56}{100}$$

Rewrite the percent as a fraction with a denominator of 100.

= 0.56 Write 56 hundredths as a decimal.

Method 2 Move the decimal point.

56% = 56% Move the decimal point two places to the left.

= 0.56 Remove the percent sign.

2. 8%

$$8\% = \frac{8}{100}$$

Rewrite the percent as a fraction with a denominator of 100.

= 0.08 Write 8 hundredths as a decimal



3. 2%

Move the decimal point two places to the left.

Remove the percent sign.

Got it? Do these problems to find out.

- **a.** 32%
- **b.** 6%

c. 93%

Write Decimals as Percents

Key Concept

Words To write a decimal as a percent, multiply by 100 and add

a % sign. This is the same as moving the decimal point

two places to the right.

Example
$$0.36 = 0.36\%$$

= 36%

Another way to write a decimal as a percent is to write the decimal as a fraction with a denominator of 100. Then write the fraction as a percent.

Examples

4. Write 0.38 as a percent.

Method 1 Write the decimal as a percent.

$$0.38 = \frac{38}{100}$$
 Write 38 hundredths as a fraction.

Method 2 Move the decimal point.

$$0.38 = 0.38$$
 Move the decimal point two places to the right.

5. Write 0.2 as a percent.

$$0.2 = \frac{2}{10}$$
 Write 2 tenths as a fraction.

$$\frac{2}{10} = \frac{20}{100}$$

= 20% Write t

Write the fraction as a percent.

Got it? Do these problems to find out.

Write each decimal as a percent.

Rey Concept

STOP and Reflect

Why does it help to write a decimal as a fraction with a denominator of 100 when writing decimals as percents?



A.

e. _____

£.____





Example

The United Arab Emirates produces more dates than many other countries, producing 0.4 of the total date crops. Write 0.4 as a percent.

$$0.4 = 0.40$$

Annex a zero.

$$= 0.40\%$$

Multiply by 100 and add a % sign.

Simplify.

Check
$$0.4 = \frac{40}{100}$$

Write the decimal as a fraction with a denominator of 100.

Write the fraction as a percent.

Guided Practice

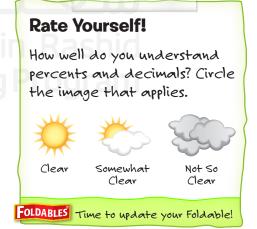


Write each percent as a decimal. (Examples 1-3)



Write each decimal as a percent. (Examples 4 and 5)

- 7. STEM About 0.7 of the human body is water. What percent is equivalent to 0.7? (Example 6)
- Building on the Essential Question What is the relationship between percents and decimals?



Independent Practice

Write each percent as a decimal. (Examples 1–3)

Write each decimal as a percent. (Examples 4 and 5)

- **9. Financial Literacy** A bank offers an interest rate of 4% on a savings account. Write 4% as a decimal. (Examples 1–3)
- **10.** When making a peanut butter and jelly sandwich, 96% of people put the peanut butter on first. Write 96% as a decimal. (Examples 1–3)
- **11.** In a recent year, 0.12 of school students downloaded a podcast from the Internet. What percent is equivalent to 0.12?
- **12.** In a recent year, the number of homes with digital cameras grew 0.44 from the previous year. Write 0.44 as a percent. (Example 6)

(Example 6)

13. Financial Literacy The formula I = prt gives the simple interest I earned on an account where an amount p is deposited at an interest rate r for a certain number of years t. Use the table to order the accounts from least to greatest interest earned after 5 years.

Accounts at First Savings Bank		
Account	p (AED)	r (%)
А	350	4
В	500	3.5
С	280	4.25

14. Persevere with Problems Zainab wants to buy a coat that costs AED 80. The store that sells the coat has multiple locations. The sales tax in each city is shown in the table. How much more would the coat cost in City A than City B?

City	Tax Rate (%)
А	7.25
В	6.5
С	6.75

15. Mahmoud took three tests on Thursday. He got a 92% on his English test, an 88% on his math test and a 90% on his science test. Write each percent as a decimal in order from least to greatest.



H.O.T. Problems Higher Order Thinking

- **16. Reason Inductively** Write a decimal between 0.5 and 0.75. Then write it as a fraction in simplest form and as a percent.
- 17. Persevere with Problems How would you write $43\frac{3}{4}\%$ as a decimal?
- **18. Model with Mathematics** Write a percent between 25% and 50%. Then write it as a decimal and as a fraction in simplest form.
- 20. MP Model with Mathematics Write a problem about a real-world situation in which you would either write a percent as a decimal or write a decimal as a percent.
- 21. Reason Abstractly Each square below is divided into sections of equal size. In which square is 25% of the square not shaded?

Square A



Square B



Square C



Square D



Extra Practice

Write each percent as a decimal.

$$17\% = \frac{17}{100} = 0.17$$

Write each decimal as a percent.

- **30.** In one day at a store, 7% of the sales were from shoes. Write 7% as a decimal.
- **31.** In one hour on a certain street, 65% of the cars that passed were black. Write 65% as a decimal.

- **32.** In a recent year, 0.57 of those registered to vote in the United States voted in an election. Write 0.57 as a percent.
- **33.** In a recent study, 0.82 of UAE residents own a cell phone. What percent is equivalent to 0.82?

34. Percise In some countries, sales tax is added to items that you purchase. The rate of sales tax varies by country. Use the table to order the countries from least to greatest sales tax.

Country Sales Tax		
Country	Sales Tax	
А	6.75%	
В	0.0625	
С	7 100	

Power Up! Test Practice

- 35. At baseball practice, Nael caught 16 out of 20 hits to the outfield. Select all the ways of expressing 16 out of 20.

0.8

- 80%
- 0.08

36. The Mumtaz family wants to purchase a television that costs AED 449. The store that sells the television has multiple locations in different cities. The sales tax for each city is shown. Complete the table below by arranging the cities from least to greatest sales tax rate. Write each sales tax as a percent.

-3 0/
$7\frac{3}{4}\%$
13 200
.0675

	City	Sales Tax Rate (%)
Least		
Greatest		P-J-OSA

Spiral Review

with <, >, or = to make a true statement. Fill in each (

37. 2.50 (



39. 0.015 (0.005

40. The table shows results for the 100 meter sprint. Who had the fastest time?

Athlete	Time (s)
Jalal	12.14
Yousef	11.84
Ali	11.94
Marwan	12.44

41. Rodina ate 0.75 sandwich. Her brother ate 1.5 sandwiches. Who ate more?

Percents Greater than 100% and Percents Less than 1%

Real-World Link

Plants There are over 220,000 species of plants on Earth. Of those, 590 are carnivorous. Plants such as a Venus Flytrap catch their prey as food.

1. Write the fraction of species of carnivorous plants in simplest form.

$$\frac{1}{220,000} \div \frac{1}{22,000}$$

2. Write your answer to Exercise 1 as a decimal rounded to the nearest thousandth. Use division to find your answer.





Essential Question

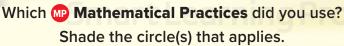
WHEN is it better to use a fraction, a decimal, or a percent?

MP Mathematical Practices 1, 3, 4, 5



- 3. Write your answer to Exercise 2 as a fraction.
- 4. Make a Conjecture Since 0.3 = 30% and 0.03 = 3%, what percent is equal to 0.003? Explain.





- 1 Persevere with Problems
- (5) Use Math Tools

2 Reason Abstractly

- 6 Attend to Precision
- 3 Construct an Argument
- (7) Make Use of Structure
- 4 Model with Mathematics
- 8 Use Repeated Reasoning

Work Zone

Percents

A percent less than 1%

equals a number less than 0.01 or $\frac{1}{100}$. A percent greater than 100% equals a number greater than 1.

Percents as Decimals and Fractions

Percents greater than 100% or less than 1% can also be written as decimals or as fractions.

Examples

1. Write 0.2% as a decimal and as a fraction in simplest form.

$$0.2\% = 00.2$$
 Divide by 100 and remove % symbol.
 $= 0.002$ Decimal form
 $= \frac{2}{1,000}$ or $\frac{1}{500}$ Fraction form

2. Write 170% as a mixed number in simplest form and as a decimal.

$$170\% = \frac{170}{100}$$
Definition of percent
$$= 1\frac{70}{100} \text{ or } 1\frac{7}{10}$$
Mixed number form
$$= 1.7$$
Decimal form

Got it? Do these problems to find out.

Write each percent as a decimal and as a mixed number or fraction in simplest form.

- **a.** 0.25%
- **b.** 300%
- **c.** 530%

c. _____



3. Hamza's savings increased by 250%. Write 250% as a mixed number in simplest form and as a decimal.

$$250\% = \frac{250}{100}$$
 Definition of a percent
$$= 2\frac{50}{100} \text{ or } 2\frac{1}{2}$$
 Mixed number form
$$= 2.5$$
 Decimal form

So, Hamza more than doubled his savings.

Got it? Do this problem to find out.

d. The stock price for a corporation increased by 0.11%. Write 0.11% as a decimal and as a fraction in simplest form.

a.

Mixed Numbers and Decimals as Percents

To write a decimal as a percent, multiply by 100 and add a percent sign. To write a mixed number as a percent, first write the mixed number as an improper fraction.

Example

4. Write $1\frac{1}{4}$ as a percent.

$$1\frac{1}{4} = \frac{5}{4}$$

Write $1\frac{1}{4}$ as an improper fraction.

$$\frac{5}{4} = \frac{\blacksquare}{100}$$

Find an equivalent fraction.

$$\frac{5}{4} = \frac{125}{100}$$

Since $4 \times 25 = 100$, multiply 5 by 25 to find an equivalent fraction.

So, $1\frac{1}{4}$ is $\frac{125}{100}$ or 125%.

Got it? Do these problems to find out.

Write each mixed number as a percent.

e.
$$2\frac{9}{10}$$

f.
$$3\frac{2}{5}$$

Alternative Method

$$\frac{1}{4} = 25\%$$

So,
$$1\frac{1}{4} = 125\%$$
.

Examples

5. Write 1.68 as a percent.

$$1.68 = 1.68$$

6. Write 0.0075 as a percent.

$$0.0075 = 0.0075$$

Multiply by 100

$$= 0.75\%$$

Add % symbol.

Got it? Do these problems to find out.

g. 2.5

h. 0.004

i. 0.0016



and Reflect

Is the decimal 6.7 equal to 67%? Explain below.





Example

STEM The cheetah is the fastest land mammal in the world. The peregrine falcon is the fastest bird in the world. Its speed is 2.1 times as fast as the cheetah. Write this number as a percent.

$$2.1 = 2.10$$
 Multiply by 100.
= 210% Add % symbol.

The peregrine falcon's speed is 210% of the cheetah's speed.

Got it? Do this problem to find out.

j. STEM The slowest land mammal is the sloth. Its speed is about 0.0016 that of a cheetah. Write this number as a percent.

Guided Practice



Write each percent as a decimal and as a mixed number or fraction in simplest form. (Examples 1–3)



Write each mixed number or decimal as a percent. (Examples 4-6)

4.
$$1\frac{4}{5} =$$

Rate Yourself!

Are you ready to move on?

ready to

move on.

Ihave a lot of questions.

7. A manufacturing company finds that 0.0019 of the light bulbs it makes are defective. Write this as a

percent. (Example 7)

Building on the Essential Question How are percents greater than 100% used in real-world contexts?

Shade the section that applies. 1 have a few questions.

Independent Practice

Write each percent as a decimal and as a mixed number or fraction in simplest form. (Examples 1-w3)



Write each mixed number as a percent. (Example 4)

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

6.
$$9\frac{3}{4} =$$

7.
$$4\frac{1}{5} =$$

8.
$$7\frac{3}{10} =$$

Write each decimal as a percent. (Examples 5 and 6)

- **13.** The size of a large milkshake is 1.4 times the size of a medium milkshake. Write 1.4 as a percent. (Example 7)
- **14.** STEM Fresh water from lakes accounts for only 0.001 of the world's water supply. Write this decimal as a percent. (Example 7)
- **15.** In a recent year, the United States Census Bureau reported that 0.3% of the population in the United States was Japanese. Write this percent as a decimal and as a fraction. Then interpret its meaning as a ratio of the United States population.
- **16.** Mariam answered all 21 multiple-choice questions correctly on her science test. If her teacher decided to let one of the questions count as a bonus, worth the same number of points as the other problems on the test, what was Mariam's test score? Write your answer as a decimal and as a percent.

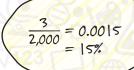
- 17. We Use Math Tools Refer to the table at the right.
 - **a.** Write the percent of magnesium found in the human body as a decimal.
 - **b.** Which element makes up $\frac{1}{400}$ of the human body?

Elements in the	Human Body
Element	Percent
Magnesium	0.05
Potassium	0.35
Sodium	0.15
Sulfur	0.25



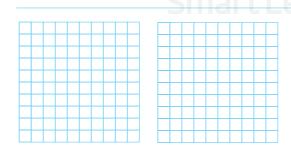
H.O.T. Problems Higher Order Thinking

18. (P) Find the Error Ali is writing $\frac{3}{2,000}$ as a percent. Find his mistake and correct it.





- **19. Persevere with Problems** The speed of a giraffe is 250% of the speed of a squirrel. If a squirrel's speed is 12 miles per hour, find the speed of a giraffe.
- 20. Model with Mathematics Write a real-world problem involving a percent greater than 100%. Then solve the problem.
- 21. Reason Inductively Explain how you would show 135% on a 10-by-10 grid. Then use the grids below to show 135%.



Extra Practice

Write each percent as a decimal and as a mixed number or fraction in simplest form.

$$475\% = \frac{475}{100}$$

$$= 4\frac{75}{100} \text{ or } 4\frac{3}{4}$$

Write each decimal as a percent.

- **30.** A collectible action figure sold for 193% of its original price. Write this percent as a decimal and as a mixed number or fraction in simplest form.
- **31.** A car's tire pressure decreased by 0.098 of its original pressure. Write 0.098 as a percent.

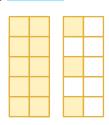
Write each percent as a decimal.

32.
$$\frac{3}{4}\% =$$

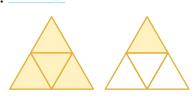
33.
$$\frac{3}{25}\% =$$

Use Math Tools One complete figure represents 100%. Write a percent to represent the shaded portion of each figure below.

34.



35.



Power Up! Test Practice

36. Shade the model to show 140%.



- **37.** About 0.036% of the water on Earth is found in lakes and rivers. Which of the following show 0.036% written as a fraction? Select all that apply.
 - $\frac{9}{25}$

 $\frac{36}{100}$

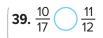
18 50,000 $\frac{27}{75,000}$

What is 0.036% written as a fraction in simplest form?

Spiral Review

Compare the fractions using <, >, or =.

38. $\frac{3}{6}$ $\frac{1}{8}$





41. Suad walked $\frac{3}{10}$ of a kilometer on Monday, $\frac{5}{10}$ of a kilometer on Tuesday, and $\frac{25}{100}$ of a kilometer on Wednesday. Plot each distance on the number line.



42. The flute players are $\frac{3}{10}$ of the band and the trumpet players are $\frac{1}{12}$ of the band. Is a greater fraction of the band flute players or trumpet players?

Problem-Solving Investigation Solve a Simpler Problem

Case #1 First Place Pizza

The daily lunch report indicated that 80% of the 300 students at Al Khulafaa Al Rashideen School chose pizza for lunch.

How many students bought pizza for lunch?

Mathematical Practices 1, 3, 4



Understand What are the facts?

- The lunch report says 80% chose pizza.
- There are 300 students at the school.



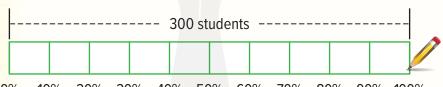
Plan What is your strategy to solve this problem?

Solve a simpler problem by finding 10% of the total students. Then use the result to find 80% of the total students.



Solve How can you apply the strategy?

Complete the bar diagram. Fill in the value of each section.



0% 20% 30% 40% 50% 60% 70% 80% 90% 100%

There are $300 \div 10$, or 10 groups with students in each group.

Multiply. \times 8 =

students chose pizza for lunch.



Check Does the answer make sense?

You know that 80% is close to 75%, which is $\frac{3}{4}$. Since $\frac{1}{4}$ of 300 is 75, $\frac{3}{4}$ of 300 is . So, my answer is reasonable.

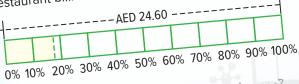
Analyze the Strategy

Reason Inductively Explain when you would use the solve a simpler problem strategy.

Case #2 Top Tip

Khalid's dad wants to leave an 18% tip for a AED 24.60

restaurant bill.



About how much money should he leave?



Understand

Read the problem. What are you being asked to find?

I need to estimate

Underline key words and values. What information do you know?

Khalid's dad wants to leave an

Is there any information that you do not need to know?

I do not need to know



Plan

Choose a problem-solving strategy.

I will use the _

strategy.



Solve

Use your problem-solving strategy to solve the problem.

Solve a simpler problem by finding 20% of AED 25.00. Use the result to estimate

18%. The whole is _____ . Make a bar diagram that is divided into

. The two shaded parts represent Each part represents

10% 10% 10% 10% 10% 10% 10% 10% 10% 10%

Because the whole is AED 25.00,

each part is _____.



So, 18% of AED 24.60 is about

Check

Use information from the problem to check your answer.

 $0.18 \times 24.60 =$ _____. So, AED 5 is a reasonable estimate.



Work with a small group to solve the following cases. Show your work on a separate piece of paper.

Case #3 Time

Three 24-hour clocks show the time to be 12 noon. One of the clocks is always correct, one loses a minute every 24 hours, and one gains a minute every 24 hours.

How many days will pass before all three clocks show the correct time again?



Case #4 Number Sense

The number 272 is a palindrome because it reads the same forward

How many numbers from 10 to 1,000 are palindromes?

Case #5 Sandwiches

In one day, a restaurant made the sandwiches shown in the table.

How many sandwiches are chicken?

Туре	Number	Percent		
Veggie	60	5		
Cheese	204	17		
Turkey	348	29		
Chicken	?	35		
Roast Beef	168	14		

Case #6 Border

Part of a strip of border for a bulletin board is shown. All of the sections of the border are the same width.





If the first shape on the strip is a triangle and the strip is 74 inches long, what is the last shape on the strip?

Mid-Chapter Check

Vocabulary Check



1. Define *percent*. Write $\frac{25}{100}$ as a percent then write $\frac{25}{100}$ as a decimal. (Lesson 2)

Skills Check and Problem Solving

Write each fraction as a decimal and each decimal as a fraction in simplest form. (Lesson 1)

2.
$$\frac{8}{20} =$$

4.
$$\frac{3}{100} =$$

Write each percent as a decimal and each decimal as a percent. (Lessons 3 and 4)

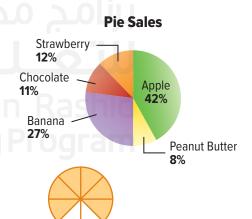
8. The number of chorus students increased by a factor of 1.2 from the previous year. Write 1.2 as a percent. (Lesson 4)

 Use Math Tools The graph shows the pie sales during one week. (Lessons 2 and 3)

a. What fraction of the pies sold was apple?

b. Write the percent of strawberry pies sold as a decimal.

10. Persevere with Problems The circle at the right is divided into sections of equal size. What percent of the circle is not shaded? (Lesson 2)



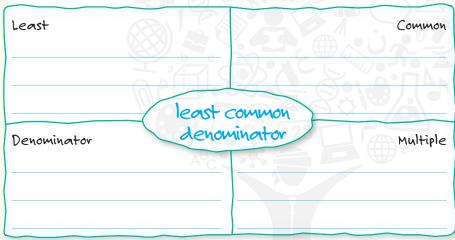
Compare and Order Fractions, Decimals, and Percents

Vocabulary Start-Up



The least common denominator, or LCD, is the least common multiple of the denominators of two or more fractions.

Complete the graphic organizer. Write the meaning of each word in the appropriate box. Provide examples.





Essential Question

WHEN is it better to use a fraction, a decimal, or a percent?



Vocabulary

least common denominator (LCD)

MP Mathematical Practices 1, 2, 3, 4, 5, 6



Real-World Link

- Ahmed is baking, but he wants to use only one measuring cup. He needs $\frac{1}{2}$ cup of sugar and $\frac{3}{4}$ cup of flour. What is the least common multiple of the denominators?
- What size measuring cup should he use: $\frac{1}{2}$ cup, $\frac{1}{3}$ cup, or $\frac{1}{4}$ cup? Explain.



Which Mathematical Practices did you use? Shade the circle(s) that applies.

- 1 Persevere with Problems
- (5) Use Math Tools

2 Reason Abstractly

- 6 Attend to Precision
- 3 Construct an Argument
- (7) Make Use of Structure
- 4 Model with Mathematics
- 8 Use Repeated Reasoning

Least Common

The LCM is $2 \times 2 \times 7$ or 28.

Multiple

Compare and Order Fractions

To compare fractions, you can follow these steps.

- 1. Find the least common denominator (LCD) of the fractions. That is, find the least common multiple of the denominators.
- Write an equivalent fraction for each fraction using the LCD.
- Compare the numerators.

Example

Fill in each () with <, >, or = to make a true statement.

1.
$$\frac{5}{8}$$
 $\frac{7}{12}$

The LCM of the denominators, 8 and 12, is 24. So, the LCD is 24. Write an equivalent fraction with a denominator of 24 for each fraction.

$$\frac{5}{8} = \frac{15}{24}$$
 $\frac{7}{12} = \frac{1}{2}$
 $\times 2$

$$\frac{15}{24} > \frac{14}{24}$$
, since 15 > 14. So, $\frac{5}{8} > \frac{7}{12}$.

Got it? Do these problems to find out.

a.
$$\frac{2}{3}$$
 $\frac{4}{9}$

a.
$$\frac{2}{3}$$
 $\frac{4}{9}$ **b.** $\frac{5}{12}$ $\frac{7}{8}$ **c.** $\frac{1}{6}$ $\frac{5}{18}$

c.
$$\frac{1}{6}$$
 $\frac{5}{18}$

Example

2. Order the fractions $\frac{1}{2}$, $\frac{9}{14}$, $\frac{3}{4}$, and $\frac{5}{7}$ from least to greatest.

Rewrite each fraction using the LCD of 28.

$$\frac{1}{2} = \frac{14}{28} \qquad \frac{9}{14} = \frac{18}{28} \qquad \frac{3}{4} = \frac{21}{28} \qquad \frac{5}{7} = \frac{20}{28}$$

$$\times 14^{7} \qquad \times 2^{7} \qquad \times 7^{7} \qquad \times 4^{7}$$

$$\frac{3}{4} = \frac{21}{28}$$

$$\frac{\cancel{5}}{7} = \frac{20}{28}$$

Since $\frac{14}{28} < \frac{18}{28} < \frac{20}{28} < \frac{21}{28}$, the order of the original fractions from least to greatest is $\frac{1}{2}$, $\frac{9}{14}$, $\frac{5}{7}$, $\frac{3}{4}$.



Got it? Do this problem to find out.

d. Order $\frac{1}{2}$, $\frac{5}{6}$, $\frac{2}{3}$, and $\frac{3}{5}$ from least to greatest.

Compare Fractions, Decimals, and Percents

It may be easier to compare fractions, decimals, and percents when they are all written as decimals.

$$\frac{1}{5} = 0.2 = 20\%$$

$$\frac{2}{5} = 0.4 = 40\%$$

$$\frac{3}{5} = 0.6 = 60\%$$

$$\frac{4}{5} = 0.8 = 80\%$$

$$\frac{1}{8} = 0.125 = 12.5\%$$

$$\frac{3}{8} = 0.375 = 37.5\%$$

$$\frac{1}{3} = 0.\overline{3} = 33.\overline{3}\%$$

$$\frac{2}{3} = 0.\overline{6} = 66.\overline{6}\%$$

Examples

with <, >, or = to make a true statement.

3. $\frac{3}{4}$ 0.7



Write the sentence.

Write $\frac{3}{4}$ as a decimal. Annex a zero to 0.7.

0.75 > 0.70Compare the hundredths place. 5 > 0

Since 0.75 is to the right of 0.7 on the number line, $\frac{3}{4} > 0.7$.

4. Salem made 85% of his free throws. Khalid made $\frac{7}{8}$ of his free throws. Who has the better average? Explain.



Write the sentence.

0.875 0.850

Write each number as a decimal. Annex a zero to 0.85

0.850 < 0.875

Compare the hundredths place. 5 < 7

Since 0.850 < 0.875, Khalid has the better average.



Since 0.85 is to the left of 0.875, the answer is correct. v

Got it? Do these problems to find out.

e.
$$\frac{2}{3}$$
 0.6

f. 0.7
$$\bigcirc \frac{8}{11}$$

g.
$$\frac{1}{5}$$
 0.2

i.
$$7\% \bigcirc \frac{7}{10}$$

h. 42% 0.44 **i.** 7%
$$\frac{7}{10}$$
 j. 6.5 650%





Example

The table shows the school carnival attendance. Which grade has the greatest part of the class attending the carnival?

Order the numbers from least to greatest. Express each number as a decimal with the same number of places.

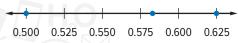
Grade	Attendance
6	<u>5</u> 8
7	0.5
8	58.3%

$$\frac{5}{8} = 0.625$$
 $0.5 = 0.500$

$$0.5 = 0.500$$

$$58.3\% = 0.583$$

Graph the numbers on a number line.



From least to greatest, the numbers are 0.5, 58.3%, and $\frac{5}{8}$.

Since $\frac{5}{8}$ represents Grade 6, Grade 6 has the greatest part of the class attending the school carnival.

Got it? Do this problem to find out.

k. Mahmoud found that $\frac{3}{5}$ of his class prefers vanilla ice cream, 26% prefers chocolate, and 0.14 prefers strawberry. Which kind of ice cream do students prefer the least?



Guided Practice

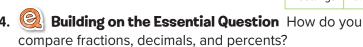


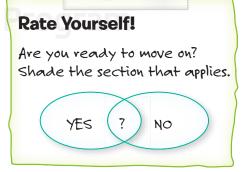
- **1.** Order the fractions $\frac{4}{5}$, $\frac{1}{2}$, $\frac{9}{10}$, and $\frac{3}{4}$ from least to greatest. (Examples 1 and 2)
- 2. Mayada spends $\frac{2}{3}$ of her free time blogging on the Internet. Marwa spends 60% of her free time blogging on the Internet. Who spends more of her free time blogging?

(Examples 3 and 4)

3. The table shows the wins for some
middle school football teams. Which team
has the greatest fraction of wins? (Example 5)

Team	Wins
Eagles	95%
Wolves	<u>9</u> 10
Mustangs	0.89





Independent Practice

Fill in each with <, >, or = to make a true statement. (Examples 1 and 3)

- **1.** $\frac{1}{3}$ $\frac{3}{5}$
- **2.** $\frac{7}{12}$ $\frac{1}{2}$
- 3. $\frac{1}{4}$ 0.4
- **4.** 0.7 $\frac{7}{9}$



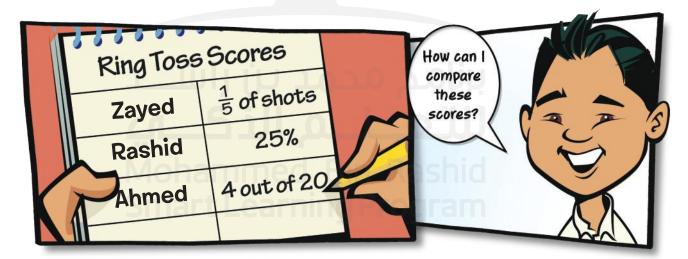
Order the fractions from least to greatest. (Example 2)

5.
$$\frac{1}{2}$$
, $\frac{2}{3}$, $\frac{1}{4}$, $\frac{5}{6}$

6.
$$\frac{2}{3}$$
, $\frac{2}{9}$, $\frac{5}{6}$, $\frac{11}{18}$

- 7. Samir spends 35% of his time doing math homework. Ali spends $\frac{2}{5}$ of his time doing math homework. Who spends more homework time on math? Explain. (Example 4)
- 8. Three snack bars contain $\frac{1}{5}$, 0.22, and 19% of their Calories from fat. Which snack bar contains the least amount of Calories from fat? (Example 5)

9. Model with Mathematics Use the graphic novel frame below for Exercises a—b.



- a. Write each score as a decimal.
- **b.** Compare the three scores.

10. Be Precise Complete the graphic organizer. Write the original numbers to complete the statement.

Number	Steps to Write the Number as a Decimal with Three Places		Decimal
3/8	Divide the by the		0.375
0.3	The number is a decimal. Annex zeros.		0.300
38.7%	Move the point places to the left.		0.387
20.1/•	Remove the symbol.	23	0.387

So.	<	<	\\

11. Order the portion of responses listed in the table from least to greatest.

Number of Times Eating Fast Food per Week	0	1–2	3–4	5+
Portion of Responses	17%	<u>11</u> 20	0.2	8%

H.O.T. Problems Higher Order Thinking

- 13. Persevere with Problems Order $\frac{3}{8}$, $\frac{3}{7}$, and $\frac{3}{9}$ from least to greatest without writing equivalent fractions with a common denominator. Explain your strategy.
- 14. Persevere with Problems Are the fractions $\frac{3}{9}$, $\frac{3}{10}$, $\frac{3}{11}$, and $\frac{3}{12}$ arranged in order from least to greatest or from greatest to least? Explain.
- **15. Construct an Argument** Is 0.4 less than, greater than, or equal to 44%? Explain your reasoning.

Extra Practice

 $\frac{21}{24} > \frac{20}{24}$ so $\frac{7}{8} > \frac{5}{6}$

Fill in each \bigcirc with <, >, or = to make a true statement.

16.
$$\frac{7}{8} > \frac{5}{6}$$

Homework $\frac{7}{8} = \frac{21}{24}, \frac{5}{6} = \frac{20}{74}$

17.
$$\frac{14}{18}$$
 $\frac{7}{9}$

18. 0.75
$$\bigcirc \frac{1}{2}$$

19.
$$\frac{1}{3}$$
 0.33

Order the fractions from least to greatest.

20.
$$\frac{1}{6}$$
, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{3}{7}$

21.
$$\frac{5}{8}$$
, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{9}{16}$

- 22. Shop Rite has jeans on sale for $\frac{3}{10}$ off. Save More has jeans on sale for 33% off. Which store has a better sale on jeans? Explain.
- **23.** A city's population rose 3% one year, 0.08 the next year, and by $\frac{2}{50}$ the next year. Order these increases from least to greatest.

Order each set of values from least to greatest.

24. 0.4,
$$\frac{5}{8}$$
, 38%

25.
$$\frac{1}{2}$$
, 0.55, $\frac{5}{7}$

- **26. W Use Math Tools** The table shows the favorite subjects of students in a recent survey.
 - a. Did more students choose art or math? Explain.
 - **b.** Which subject did most students choose? Explain.
- **Favorite Subject** Portion of **Subject Students** <u>4</u> 25 Art English 13% Math 0.28 Other 7% 21 Science 100 0.15 Social Studies

c. Order the subjects from least to greatest.

Power Up! Test Practice

- 27. A plumber needs to drill a hole that is just slightly larger than $\frac{3}{16}$ inch in diameter. Which measure is the smallest but still larger than $\frac{3}{16}$ inch?
 - $\frac{5}{32}$ inch
- $\frac{5}{16}$ inch
- $\square \frac{13}{64}$ inch $\square \frac{9}{32}$ inch

28. Al Farouq Elementary started a recyling program. The display shows the portion of the each item that is recycled at the school. Sort the items from least to greatest amount.

	Recycled Item
Least	
	\mathcal{O}
Greatest	





Spiral Review

Round each decimal to the nearest hundredth.

29. 0.623 ≈



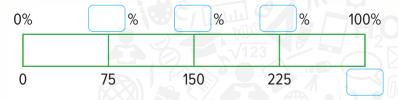
31. 5.105 ≈ _

- **32.** In a survey, $\frac{9}{25}$ of students ride the bus to school and $\frac{19}{50}$ walk to school. What fraction of students ride the bus or walk to school?
- 33. The student council bought 7 bags of apples for their fall celebration. How much did they pay for the apples?



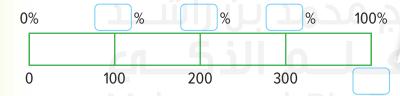
Real-World Link

Movies Seham surveyed 298 students and found that 52% like scary movies. Estimate the number of students that like scary movies.



- 1. Write the common percents from 0% to 100% at the top of the bar diagram.
- 2. What common percent is 52% close to? Shade the bar diagram above to show your answer.
- 3. Round 298 to the nearest hundred. 298 \approx Write your answer in the box below 100%.
- **4.** Use the bar diagram to estimate 52% of 298. Explain.

5. Use the bar diagram below to estimate 73% of 400.



Which Mathematical Practices did you use? Shade the circle(s) that applies.

- 1 Persevere with Problems
- (5) Use Math Tools

2 Reason Abstractly

- 6 Attend to Precision
- 3 Construct an Argument
- (7) Make Use of Structure
- 4 Model with Mathematics
- 8 Use Repeated Reasoning

Essential Question

WHEN is it better to use a fraction, a decimal, or a percent?

MP Mathematical Practices

1, 3, 4, 5

Estimate the Percent of a Number

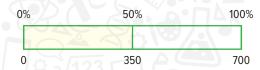
Estimating with percents will provide a reasonable solution to many real-world problems. Choose compatible numbers when estimating the percent of a number.

Examples

1. Estimate 47% of 692.

47% is close to 50% or $\frac{1}{2}$. Round 692 to 700.

 $\frac{1}{2}$ of 700 is 350. $\frac{1}{2}$ or half means to divide by 2.



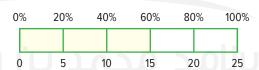
So, 47% of 692 is about 350.

2. Estimate 60% of 27.

60% is
$$\frac{3}{5}$$
.

Round 27 to 25 since it is divisible by 5.

 $\frac{1}{5}$ of 25 is 5. $\frac{1}{5}$, or *one fifth*, means divide by 5.



So, $\frac{3}{5}$ of 25 is 3 × 5 or 15.

So, 60% of 27 is about 15.

Got it? Do these problems to find out.

Estimate each percent.

- **a.** 48% of 76
- **b.** 18% of 42
- **c.** 73% of 41



Example

3. Polar bears can eat as much as 10% of their body weight in less than one hour. If an adult male polar bear weighs 715 pounds, about how much food can he eat in one hour?

To determine how much food a polar bear can eat in one hour, you need to estimate 10% of 715.

Method 1 Find equivalent ratios.

$$10\% = \frac{1}{10}$$
 and $715 \approx 700$

$$\frac{1}{10} = \frac{\blacksquare}{700}$$

Write the equivalent ratios.

$$\frac{1}{10} = \frac{1}{700}$$

$$\times 70$$

Since $10 \times 70 = 700$, multiply 1 by 70.

The unknown value is 70.

Method 2 Use mental math.

$$10\% = \frac{1}{10}$$
 and $715 \approx 700$

 $\frac{1}{10}$ of 700 is 70.

So, a polar bear can eat about 70 pounds of food in one hour.

Got it? Do this problem to find out.

d. Safiya decided to donate 30% of her savings. If she has AED 238 in her savings account, about how much will she donate?



d.____

When would you use mental math to estimate

Explain below.

the percent of a number?

and Reflect

Estimate Using the Rate per 100

You can also estimate with percents using a rate per 100.

Examples

4. Estimate 17% of 198.

17% = 17 out of 100

Write the percent as a rate per 100.

198 ≈ 200

Round to the nearest hundred.

Since 200 is 100 + 100, add 17 + 17 to estimate 17% of 198.

34 is about 17% of 198.



5. An airline records the snack orders of passengers. Last year 9% of all passengers ordered ginger ale to drink. There are 408 passengers on the flight to Abu Dhabi. About how many passengers does the airline expect to order ginger ale on this flight?

Estimate 9% of 408.

9% = 9 out of 100

Write the percent as a rate per 100.

408 ≈ 400

Round to the nearest hundred.

Since 400 is 100×4 , multiply 9×4 to estimate 9% of 408.

36 is about 9% of 408. So, about 36 passengers will order ginger ale.

Got it? Do these problems to find out.

Estimate using a rate per 100.

e. 27% of 307

- f. 76% of 192
- g. Last year 24% of the zoo visitors were under the age of 3. Last week, the zoo had 996 visitors. About how many of the zoo visitors were under the age of 3?

Guided Practice



Estimate each percent. (Examples 1 and 2)

- **1.** 19% of AED 53 \approx
- **2.** 21% of 96 ≈

3. 59% of 16 ≈



- **4.** A purse that originally cost AED 29.99 is on sale for 50% off. About how much is the sale price of the purse? (Example 3)
- 5. Mr. Tayseer received a bonus of AED 496 from his employer. He has to pay 33% of his bonus to taxes. How much will Mr. Tayseer pay in taxes? (Examples 4 and 5)
- **Building on the Essential Question** When is an estimate more useful than an exact answer?



How confident are you about estimating with percents? Shade the ring on the target.



Independent Practice

Estimate each percent. (Examples 1 and 2)

- **1.** 47% of AED 118 \approx
- **2.** 19% of 72 \approx
- **3.** 42% of 16 ≈
- **4.** 67% of 296 ≈



Estimate using a rate per 100. (Example 4)

5. 24% of 289 ≈

- **6.** 67% of 208 ≈
- 7. Penguins spend almost 75% of their lives in the sea. An Emperor Penguin in the wild has a life span of about 18 years.

 About how many years does this penguin spend in the sea? (Example 3)
- 8. In Mohsen's baseball card collection, 58% of the cards are players from the National League. He has 702 baseball cards. About how many baseball cards are players from the National League? Use a rate per 100 to estimate. (Example 5)
- 9. Model with Mathematics Refer to the graphic novel frame below for Exercises a-b.



- **a.** Suppose Jalal is shooting baskets and makes 40% of the 15 shots. Does he win a prize? Explain your reasoning.
- **b.** About what percent of the baskets need to be made in order to win a prize?

- 10. About 42% of Alaska's population lives in 11. During the basketball season, Fahd made the city of Anchorage. If Alaska has a total 37 baskets out of 71 attempts. About what population of 648,818, about how many percent of his shots did he miss? people live in Anchorage? Use Math Tools Estimate the percent that is shaded in each figure. 12. H.O.T. Problems Higher Order Thinking 15. Peason Inductively Noura wants to buy a shirt regularly priced at AED 32. It is on sale for 40% off. Noura estimates that she will save $\frac{2}{5}$ of AED 30 or AED 12. Will the actual amount be more or less than AED 12? Explain. 16. Persevere with Problems Order 10% of 20, 20% of 20, and $\frac{1}{5}$ % of 20 from least to greatest. 17. Construct an Argument A classmate is trying to estimate 42% of AED 122. Explain how your classmate should solve the problem. 18. Model with Mathematics Marwa's homeroom has raised 63% of its goal
 - for the school fundraiser. Marwan's homeroom has raised 48%. Create a situation in which Marwan's homeroom raised more money than Marwa's homeroom.

Extra Practice

Estimate each percent.

19. 53% of 59 ≈ of 60 is 30.

> 53% is close to 50% or $\frac{1}{2}$. Round 59 to 60.

20. 35% of 147 \approx

21. 26% of 125 \approx

22. 79% of 82 ≈

Estimate using a rate per 100.

24. 74% of 315
$$\approx$$

- 27. Hamdan spent 8 hours and 15 minutes at an amusement park yesterday. He spent 75% of the time at the park on rides. About how much time did he spend on rides?
- 28. A group of friends went on a hiking trip. They planned to hike a total of 38 kilometers. They want to complete 25% of the hike by the end of the first day. About how many kilometers should they hike the first day?
- 29. Sara has just finished her sixth grade scrapbook. In her scrapbook, 47% of the pages include her twin sister, Sana. The scrapbook has 896 photos. About how many photos include Sana? Use a rate per 100 to estimate.
- 30. The community garden has 596 vegetables. In the garden, 64% of the vegetables are green vegetables. About how many vegetables in the garden are green? Use a rate per 100 to estimate.
- **W** Use Math Tools Estimate the percent that is shaded in each figure.

31.



32.



Power Up! Test Practice

- **33.** In a survey of teens, 21% said their friends like to read and talk about books. About how many teens out of 1,095 would say their friends read and talk about books?
- **34.** Salman wants to buy the items shown in the table. He has a coupon that will take 20% off his total purchase and he has AED 50 to spend. What items can he purchase to spend the most of the AED 50, after applying the coupon? Explain.

ltem	Cost (AED)
jeans	25
khaki pants	20
package of socks	10
polo shirt	15
3 T-shirts	15

Spiral Review

Write each fraction as a decimal.

35.
$$\frac{22}{100} =$$

36.
$$\frac{7}{100}$$
 =

37.
$$\frac{67}{100} =$$

38.
$$\frac{15}{100} =$$

39.
$$\frac{12}{100} =$$

40.
$$\frac{6}{100} =$$

- **41.** At a clothing store, T-shirts are on sale for AED 9.97 each. What is the cost of 3 T-shirts?
- **42.** Ahmed's family planted a garden with the dimensions shown. What is the area of the garden?

7.5 m

m

HOW can you model the percent of a number?

MP Mathematical Practices
1, 3, 4

There were 180 people in a movie theater. Twenty percent of them received the student discount and 10% received the senior citizen discount. The rest did not receive a discount. How many people did not receive a discount?

What do you know?

What do you need to find?



Hands-On Activity

Model the situation using two bar diagrams.

Step 1

Use a bar diagram to represent 100%. Then use another bar diagram of equal length to represent 180 people.

	stude discou		seni disco								
percent	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	100%
people	18	18	18	18	18	18	18	18	18	18	180

Step 2

Divide each bar into 10 equal parts. Think: $180 \div 10 =$

So, each part of 180 represents people.

Step 3

Determine how many people did not receive a discount. Shade 2 sections of each bar diagram to represent the student discount. Shade 1 section of each bar diagram to represent the senior discount.

There are unshaded sections in each bar diagram.

So, people at the movie did not receive a discount.



Model with Mathematics Work with a partner. Find the part of each whole using two bar diagrams.

1 50% of 80 children $=$	

	100%
	children



Analyze and Reflect

3. Reason Inductively Explain how to use two bar diagrams to find 45% of AED 60.



Create

- 4. Model with Mathematics Write and solve a real-world problem about finding the percent of a number.
- 5. Inquiry HOW can you model the percent of a number?

Percent of a Number

Real-World Link

Snacks In a survey, 200 students chose their favorite snacks. Use the table to find the number of students who chose each snack.

Snack	Percent	Fraction	Equivalent Fraction	Number of Responses
Fruit	23%	23 100	46 200	46 out of 200
Cheese	15%	100	200	out of 200
Veggies	17%	100	200	out of 200
Cookies	15%	100	200	out of 200
Chips	18%	100	200	out of 200
No Snack	12%	100	200	out of 200

Essential Question

WHEN is it better to use a fraction, a decimal, or a percent?

MP Mathematical Practices

1, 3, 4, 5



Check Add the number of responses in the last column.

= 200 🗸

1. How does finding the percent as a rate per 100 help you find the number of responses out of 200?

Which Mathematical Practices did you use? Shade the circle(s) that applies.

- 1 Persevere with Problems
- (5) Use Math Tools

2 Reason Abstractly

- 6 Attend to Precision
- 3 Construct an Argument
- (7) Make Use of Structure
- 4 Model with Mathematics
- 8 Use Repeated Reasoning

and Reflect

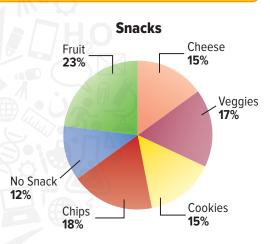
If 50 students were surveyed, how many students chose no snack?

Find the Percent of a Number

You can use fractions and decimals to find the percent of a number. To find the percent of a number, write the percent as a fraction with a denominator of 100. Then multiply the fraction by the number.

Example

1. Refer to the circle graph. Suppose there are 300 students at Ajvad Middle School. Find the number of students that have cheese as a snack.



Method 1 Write the percent as a fraction.

$$15\% = \frac{15}{100} \text{ or } \frac{3}{20}$$
Write the percent as a rate per 100.
$$\frac{3}{20} \text{ of } 300 = \frac{3}{20} \times 300$$
Multiply.

= 45

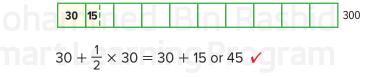
Method 2 Write the percent as a decimal.

$$15\% = 0.15$$

 $0.15 \text{ of } 300 = 0.15 \times 300$
 $= 45$

So, 45 students have cheese as a snack.

Check Use a bar diagram.





Got it? Do this problem to find out.

a. Find the number of students at Ajyad Middle School that have chips as a snack.

Percents Greater Than 100% and Less Than 1%

You may choose whether to write a percent as a fraction or as a decimal based on the problem.

Examples

2. Find 145% of 320.

$$145\% = \frac{145}{100} \text{ or } \frac{29}{20}$$

Write 145% as a rate per 100. Then simplify.

$$145\% \text{ of } 320 = \frac{29}{20} \times 320$$

$$29 \times 320$$

Write the multiplication problem.

$$=\frac{29}{20}\times\frac{320}{1}$$

Divide the numerator and denominator by 20.

$$= 29 \times 16$$

Simplify.

$$= 464$$

Multiply.

So, 145% of 320 is 464.

3. Find 220% of 65.

$$220\% = \frac{220}{100} \text{ or } \frac{}{}$$

Write 220% as a fraction in simplest form.

Write the multiplication problem.

Divide by the GCF.

Simplify.

Multiply.

So, 220% of 65 is

4. Find 0.25% of 58.

$$0.25\% = 0.0025$$

Write 0.25% as a decimal.

$$0.25\%$$
 of $58 = 0.0025 \times 58$

Write the multiplication problem

$$= 0.145$$

Multiply.

So, 0.25% of 58 is 0.145.

Got it? Do these problems to find out.

Find the percent of each number.

- **b.** 128% of 550
- **c.** 0.3% of 200
- **d.** 0.85% of 600



b .		

C.	







Example

5. In a recent state Special Olympics meet, Abu Dhabi sent a team of 70 players. Twenty percent of the team competed in soccer. How many athletes competed in soccer?

20% = 0.20 Write 20% as a decimal.

20% of $70 = 0.2 \times 70$ Write the multiplication problem.

= 14 Multiply.

So, 14 team members were soccer players.

Got it? Do this problem to find out.

e. In the same meet, 15% of the team from Sharjah competed in tennis. If there were 20 members on the team, how many competed in tennis?



Guided Practice



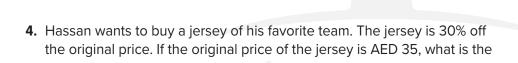
Find the percent of each number. (Examples 1–4)

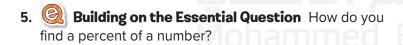
ind the percent of each number. (Examples 1-4

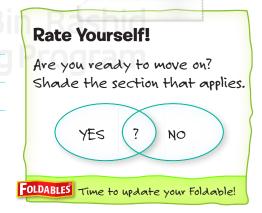
amount Hassan will save? (Example)

1. 32% of 60 =

- **2.** 0.55% of 220 =
- **3.** 275% of 4 = _____







Independent Practice

The cafeteria at a middle school surveyed 575 students about their favorite food. Find the number of students that responded for each of the following. (Example 1)



Find the percent of each number. (Examples 2–4)

9. The original price of a pair of shoes is AED 42. The sale price is 20% off the original price. What is the amount off the original price?

(Example 5)

- **10.** Ibtisam had AED 20 to buy a birthday present for her dad. She decided to buy a DVD for AED 18. The sales tax is 7%. Does she have enough money? Explain your reasoning.
- **11.** Twenty-four students in Jamal's class are wearing tennis shoes. There are thirty students in his class. Jamal says that 70% of his class is wearing tennis shoes. Is Jamal correct? Explain your reasoning.
- **12. (D) Use Math Tools** Mariam keeps track of her weekly quiz grades as shown in the table.
 - **a.** Complete the table.
 - **b.** In which class did Mariam have the higher score?

Test	Number Correct	Score	Total
Math	68		85
Science		90%	70

c. Suppose Mariam scored a 96% on an English test. There were 50 questions on the test. How many did Mariam answer correctly?

13. WP Use Math Tools Use the graphic organizer to compare and contrast percents and fractions. Use the phrases less than, equal to, and greater than to complete each statement. Write an example in the space provided.

Percent	Shared Concept	Fraction
A whole is represented by a percent		A whole is represented by a fraction with a numerator
that is 100%.	whole	that is the denominator.
Example:		Example:
Part of a whole is represented by a		Part of a whole is represented by a fraction with a
percent that is 100%.	part of a whole	numerator that is the denominator.
Example:	3	Example:
An amount that is greater than one		An amount that is greater than one is represented by
is represented by a percent that is		a fraction with a numerator that is
100%.	more than one	the denominator.
Example:	P Linds	Example:

	A	
Á	力	
		1
C		1

H.O.T. Problems Higher Order Thinking

- 14. MP Model with Mathematics Write and solve a real-world problem in which the part of a whole results in a number greater than the whole itself.
- 15. WP Justify Conclusions Is 16% of 40 the same as 40% of 16? Explain your reasoning.
- 16. MP Persevere with Problems Find 15% of 15% of 15% of 500. How does this compare to finding 45% of 500?
- **17. Persevere with Problems** A number n is 25% of some number a and 35% of a number b. Is a > b, a < b, or is it impossible to determine the relationship? Explain.

Extra Practice

Find the percent of each number.

5.7



$$0.06 \times 95 = 5.7$$

- **26.** Khuloud completes 65% of her first serves. If she attempted 80 first serves last match, how many did she complete?
- **27.** Masoud is mixing a cleaning solution that is 12% bleach. After mixing the solution, Masoud has 150 ounces of cleaning solution. How many ounces of bleach did Masoud use?

28. What is 38% of 250?

29. 76% of 524 is what number?

30. What is 26% of 360?

- **31.** 55% of 387 is what number?

Week Number	Ski Equipment Sales (AED)	Percent of Total Sales	Total Sales (AED)
1		50	400
2	175		250
3		65	300
4	110		275

Power Up! Test Practice

33. What expression can be used to find the total discount? Select all that apply.



- 0.3 × 42
- $\frac{3}{10} \times 42$
- 0.03×42
- 3 × 4.2
- **34.** There are 450 vehicles in a car lot. Select the correct value for the number of vehicles of each type that are in the lot.

Type of Vehicle	Percent of All Cars	Number of Cars
hybrid	28	
sport utility	20	
sedan	38	

90	171
95	180
126	200
135	

Spiral Review

Multiply.

37.
$$0.6 \times 15 =$$

- **38.** Hala has 4 trading cards. Khuloud has 8 trading cards. How many times more cards does Khuloud have than Hala?
- **39.** The art club had the members vote on three places to take a field trip. The results are in the table. If all of the members voted, what part of the club voted for the Sharjah Museum of Islamic Culture?

Trip	Part of Club	
Sharjah Museum		
Al Ain Palace Museum	0.20	
Dubai Museum	0.48	

Vocabulary Start-Up



percent

% of 5 = 2

A **proportion** is an equation that shows that two ratios are equivalent. In a percent proportion, one ratio compares a part to the whole. The other ratio is the equivalent percent written as a fraction with a denominator of 100.



fraction

whole

What do you call the part?

the whole?

ratio

Using the information in the first ratio, fill in the others.

Essential Question

WHEN is it better to use a fraction, a decimal, or a percent?



Vocabulary

proportion percent proportion

MP Mathematical Practices

1, 2, 3, 4, 7



Real-World Link

Basketball Manal is on her school basketball team. She has completed 9 out of 12 free throw shots successfully. Write the ratio as a percent and as a fraction in simplest form.

Which Mathematical Practices did you use? Shade the circle(s) that applies.

- 1 Persevere with Problems
- 2 Reason Abstractly 3 Construct an Argument
- 4 Model with Mathematics
- (5) Use Math Tools
- 6 Attend to Precision
- (7) Make Use of Structure
- 8 Use Repeated Reasoning



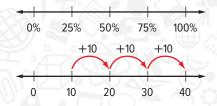
Use Number Lines to Find the Whole

If you know the part and the percent, you can find the whole, or the total. You have used bar diagrams to solve percent problems. Double number lines are another way to illustrate percents.

Examples

1. 10 is 25% of what number?

Use double number lines to model 25% and 10.



To model 25%, divide the number line into four parts.

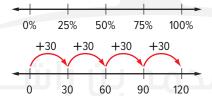
Write 10 at the 25% mark. Add 10 at each mark to find the whole.

The number 40 is at the 100% mark.

So, 10 is 25% of 40.

2. UAE songs make up 75% of Abdalla's collection. If he has downloaded 90 UAE songs, how many songs does Abdalla have in his collection?

Use double number lines to model 75% and 90.



To model 75%, divide the number line into four parts.

 $90 \div 3 = 30$. Add 30 at each mark to find the whole

The number 120 is at the 100% mark.

So, Abdalla has 120 songs in his collection.

Check Look back at the number lines. The number 90 should line up with 75%. 🗸

Got it? Do these problems to find out.

- a. 30 is 50% of what number?
- **b.** 60 is 20% of what number?
- c. Suad spent 60% of her money to buy a new television. If the television cost AED 300, how much money did she have?



b.

C.

Use the Percent Proportion

The diagram uses a percent proportion to show that 75% of 32 is 24.

$$\frac{\text{part}}{\text{whole}} \longrightarrow \frac{24}{32} = \frac{75}{100}$$
 percent

Examples

3. 15 is 30% of what number?

Words

15 is 30% of what number?

$$\frac{\text{part}}{\text{whole}} \xrightarrow{\longrightarrow} \frac{15}{\blacksquare} = \frac{30}{100}$$
 percer

$$\frac{15}{\blacksquare} = \frac{30}{100}$$

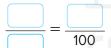
Write the proportion.

$$\frac{\cancel{15}}{50} = \frac{\cancel{30}}{\cancel{100}}$$

Since 15 is one half of 30, divide 100 by 2.

4. 225 is 75% of what number?

Write the proportion.



Since $75 \times \square = 225$, multiply 100 by

So, 225 is 75% of _____.

Got it? Do these problems to find out.

- d. 75 is 15% of what number?
- e. 9 is 36% of what number?
- f. 7 is 70% of what number?
- g. 7 is 35% of what number?



Write a percent proportion below to show that 50 is 25% of 200.



4

e. _____

£.







Example

5. Before 1982, coins were 95% zinc and 5% copper. If 100 coins minted in 1980 have an approximate mass of 15 grams of copper, what is the total mass of 100 coins?

The percent is 5 and the part is 15. You need to find the whole.

$$\frac{15}{\blacksquare} = \frac{5}{100}$$

Write the proportion.

$$\frac{15}{300} = \frac{5}{100}$$

The total mass of 100 coins is 300 grams.

Guided Practice



Use double number lines to find the whole. (Example 1)

1. 40 is 20% of what number?

2. 90 is 25% of what number?



Write a percent proportion and solve each problem. (Examples 3 and 4)

3. 120 is 30% of what number?

- **4.** 60 is 15% of what number?
- **5.** In the first year of ownership, a new car can lose 20% of its value. If a car lost AED 4,200 of value in the first year, how much did the car originally cost? (Examples 2 and 5)
- **Building on the Essential Question** How can you use proportions to solve percent problems?

Rate Yourself!

How well do you understand percent problems? Circle the image that applies.







Clear

Somewhat Clear

Not So

FOLDABLES Time to update your Foldable!

Independent Practice

Use double number lines to find the missing number. (Example 1)

1. 63 is 90% of what number?

2. 80 is 25% of what number?



Write a percent proportion and solve each problem. (Examples 3 and 4)

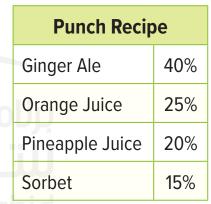
3. 22 is 44% of what number?

- **4.** 450 is 75% of what number?
- **5.** A store is having a sale where winter clothes are 60% of the original price. A sweater is on sale for AED 30. What was the original price of the sweater? (Examples 2 and 5)
- 6. Ali calculates that he spends 15% of a school day in science class. If he spends 75 minutes in science class, how many minutes does Ali spend in school?

(Examples 2 and 5)

For Exercises 7-9, use the table.

- 7. If you have 3 cups of pineapple juice, how many total cups of punch can you make?
- **8.** How many cups of sorbet are used in 8 cups of punch?
- 9. Maysa does not like sorbet, so she omits that ingredient and adds 5 percent of each of the other ingredients. How many cups of punch will she have if she uses 6 cups of orange juice?





10. (a) Identify Structure Complete the following graphic organizers. Identify the missing information.

a.	$\frac{3}{4}$	part	3
		whole	

b. | Part | whole | 100%

c. 12% of Part 12% 225 whole d. 120 out Part of 400 whole

e. How does identifying the part and the whole help you to write the percent proportion?

H.O.T. Problems Higher Order Thinking

- 11. Reason Abstractly Write a percent proportion where the part and the whole are known. Solve the problem to find the percent.
- 12. Persevere with Problems Using what you know about percents, explain why a commercial that says "80% of dentists use this toothpaste" might be misleading.

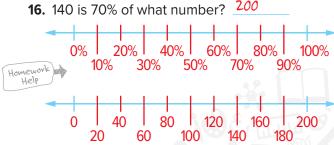
13. PReason Inductively The purity of gold is listed in karats. Refer to the table. If a necklace is 75% gold, what karat is it? Explain your reasoning.

Karats	Pure Gold (%)	
24	100	
12	50	

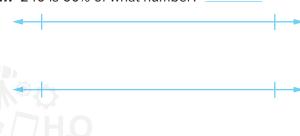
- **14. Construct an Argument** Omar scored an 82% on his first test of the quarter. Will a score of 38 out of 50 on the second test help or hurt his grade? Explain your reasoning.
- **15. Persevere with Problems** At a zoo, an Asian elephant is about 3000 kg and eats about 150 kg of food a day. What percentage of its body weight does the elephant eat each day?

Extra Practice

Use double number lines to find the missing number.



17. 240 is 60% of what number?



Write a percent proportion and solve each problem.

18. 95 is 95% of what number?

19. 270 is 90% of what number?

20. MP Justify Conclusions Action movies make up 85% of Daoud's movie collection. If he has 20 movies, how many action movies are in Daoud's collection? Explain your reasoning to a classmate.

21. The art club held a car wash on Saturday and Sunday. They washed a total of 60 cars. If they washed 40% of the cars on Sunday, how many cars did they wash on Sunday?

22. A tiger can eat food that weighs up to 15% of its body weight. If a tiger can eat 36 kilograms of food, how much does a tiger weigh?

23. According to the school survey, 12% of the students at Al Tala'eh Junior High School speak English. There are 36 students at the school who speak English. How many students were surveyed?

24. A music shop has a sale on music CDs. All music CDs are discounted 15%. Mariam's receipt indicates that she saved AED 3 on her CD purchase. What is the full price of her music CD before the discount?

25. The interior paint color, Melon Madness, is 30% yellow. Raouf used 72 ounces of yellow paint to mix the last batch. How many ounces of Melon Madness did he make in the last batch?

Power Up! Test Practice

26. Al Jumairah club held a canned food drive. On Wednesday, they collected 63 cans, which was 21% of the total cans collected during the food drive. Complete the table to show the number of cans collected on Thursday and Friday.

Day	Percent of Total Collected	Number of Cans
Wednesday	21	63
Thursday	46	
Friday	33	

27. Refer to the survey results shown. Suppose 150 students were surveyed. How many students chose math as their favorite subject?

Favorite Subject		
English 2	23%	
Science	30%	
Social Studies	15%	
Math		
Music	12%	

Spiral Review

Find the equivalent fraction.

28.
$$\frac{84}{120} = \frac{}{10}$$

29.
$$\frac{60}{98} = \frac{30}{100}$$

30.
$$\frac{40}{64} = \frac{5}{64}$$

31.
$$\frac{32}{41} = \frac{96}{}$$

32.
$$\frac{13}{15} = \frac{13}{60}$$

33.
$$\frac{24}{32} = \frac{12}{32}$$

- **34.** A store has a sale for $\frac{3}{10}$ off gloves. Write $\frac{3}{10}$ as a decimal.
- 35. Salman runs 1.2 kilometers each day. How far has he run at the end of 6 days?

2 ST CENTURY CAREER

in Movies

Special Effects Animator

Are you fascinated by how realistic the special effects in movies are today? If you have creative talent and are good with computers, a career in special effects animation might be a great fit for you. Special effects animators use their artistic ability and expertise in computer-generated imagery (CGI) to simulate real-life objects like water and fire. They are also able to create fantastic images like flying superheroes, exploding asteroids, and monsters taking over cities.



Is This the Career for You?

Are you interested in a career as a special effects animator? Take some of the following courses in high school.

- Digital Animation
- **♦** Calculus
- Geometry
- Physics
- **♦** Art/Sculpture

Turn the page to find out how math relates to a career in Movies.

The Effects are Amazing!

Special effects animators must specify when objects fade or change color. Table 1 shows when an object starts fading out. Table 2 shows the percent of an object's total lifetime that it has the initial color, cross-fading of colors, and the final color. Use the tables to solve each problem.

- Express the part of total lifetime for each object in Table 1 as a fraction in simplest form.
- 2. At what percent of the light beam's total lifetime does it begin to fade out?
- **3.** In Table 2, express the percents for the crossfading of both objects as decimals.

robot's lifetime in which it has the initial		

- **5.** What fraction of the tornado's lifetime does it have the initial color?
- **6.** What fraction of the robot's lifetime does it have the final color?

Table 1 Fading Out an Object			
Object	Part of Total Lifetime		
Explosion	0.72		
Fog	0.24		
Light beam	0.65		

Table 2 Changing Color of an Object				
	Percent of Total Lifetime			
Object	Initial Color	Cross- Fading	Final Color	
Robot	30%	15%	55%	
Tornado	12%	77%	11%	

Career Project

It's time to update your career profile! Choose one of your favorite movies. Use the Internet to research how the movie's special effects were created. Write a brief description of the processes used by the special effects animators.

List several jobs that are created by the movie industry.

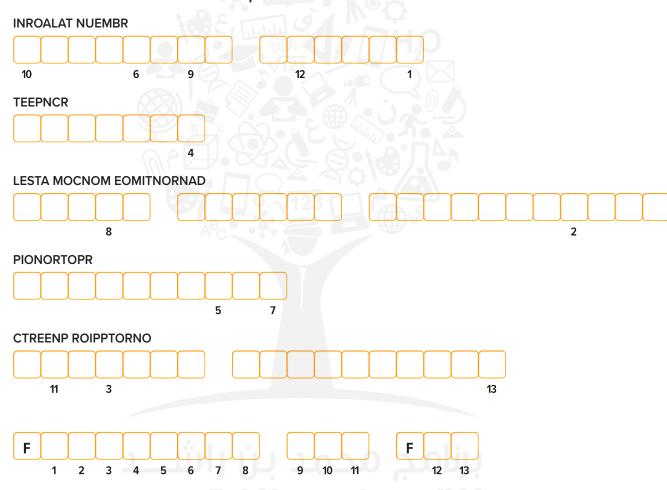
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Vocabulary Check



Unscramble each of the clue words. After unscrambling all of the terms, use the numbered letters to find the phrase.



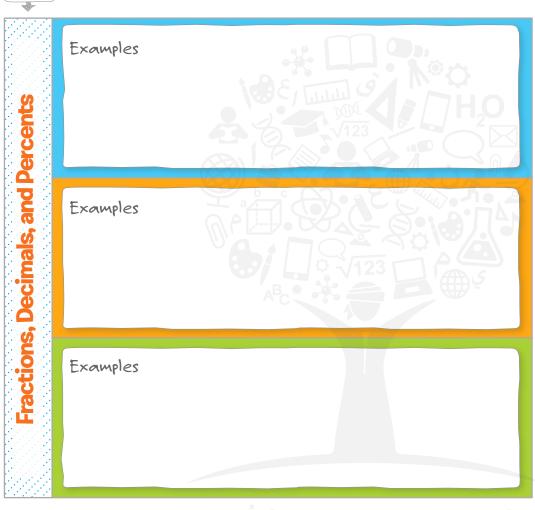
Complete each sentence using one of the unscrambled words above.

- **1.** A ______ is a ratio that compares a number to 100.
- **2.** A ______ is an equation that shows that two ratios are equivalent.
- 3. In a ______, one ratio compares a part to a whole.
- **4.** A number that can be written as a fraction is a ______.
- **5.** The ______ is the least common multiple of the denominators of two or more fractions.

Key Concept Check

Use Your FOLDABLES

Use your Foldable to help review the chapter.



Got it?

The problems below may or may not contain an error. If the problem is correct, write a "√" by the answer. If the problem is not correct, write an "X" over the answer and correct the problem.

1.
$$\frac{4}{5} = 0.4$$

The first one is alone for you.

$$\frac{4}{5} \rightarrow 5)4.0$$

$$-40$$

2.
$$0.55 = \frac{11}{20}$$

2.
$$0.55 = \frac{11}{20}$$
 3. $120\% = \frac{3}{25}$





Essential Question

HOW can mathematical ideas be represented?



The standard algorithm used to multiply and divide whole numbers can be applied to operations with decimals. In this chapter, you will multiply and divide multi-digit decimals.



Chapter 4

Models and equations can be used to represent real-world situations involving operations with fractions. In this chapter, you will multiply and divide fractions by whole numbers and by fractions.



Chapter 5 **ersand the**

Integers, terminating decimals, and repeating decimals are rational numbers. In this chapter, you will compare and order rational numbers and graph points in four quadrants of the coordinate plane.



Project 2 Preview

Get Out the Map! Maps have been around for thousands of years. Over time maps have become more detailed and accurate. Today, using a map is as simple as turning on a GPS device and typing in an address.

Let's make a map of your neighborhood. Choose three or four locations in your neighborhood that you visit, such as a friend's house or the library. On the coordinate plane below, plot points to represent these locations in relation to your home.

At the end of Chapter 5, you'll complete a project that will teach you about using a map to travel somewhere new. So, bring your sense of adventure and get ready to explore someplace new!

