7-7 Percents

OK 2.2c Estimate and find solutions to single and multi-step problems using whole numbers, decimals, fractions, and percents (e.g., $\frac{7}{8} + \frac{8}{9}$ is . . . about 2, 0.9 + 0.3 is about 1).

Learn to write percents as decimals and as fractions.

Vocabulary

percent

Most states charge sales tax on items you purchase. Sales tax is a percent of the item's price. A **percent** is a ratio of a number to 100.

At a sales tax rate of 8%, the tax on this wakeskate would be $12.80.

You can remember that *percent* means "per hundred." For example, 8% means "8 per hundred," or "8 out of 100."

Notes/ Teacher Table

If a sales tax rate is 8%, the following statements are true:

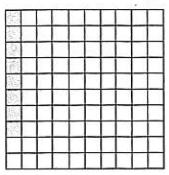
- For every $1.00 you spend, you pay $0.08 in sales tax.
- For every $10.00 you spend, you pay $0.80 in sales tax.
- For every $100 you spend, you pay $8 in sales tax.

Because *percent* means "per hundred," 100% means "100 out of 100." This is why 100% is often used to mean "all" or "the whole thing."

EXAMPLE 1 Modeling Percents

Interactivities Online ▶

Use a 10-by-10-square grid to model 8%.



A 10-by-10-square grid has 100 squares.

8% means "8 out of 100," or $\frac{8}{100}$.

Shade 8 squares out of 100 squares.

EXAMPLE 2 Writing Percents as Fractions

Write 40% as a fraction in simplest form.

$40\% = \frac{40}{100}$ *Write the percent as a fraction with a denominator of 100.*

$\frac{40 \div 20}{100 \div 20} = \frac{2}{5}$ *Write the fraction in simplest form.*

Written as a fraction, 40% is $\frac{2}{5}$.

EXAMPLE 3 *Life Science Application*

Up to 55% of the heat lost by your body can be lost through your head. Write 55% as a fraction in simplest form.

$55\% = \frac{55}{100}$ *Write the percent as a fraction with a denominator of 100.*

$\frac{55 \div 5}{100 \div 5} = \frac{11}{20}$ *Write the fraction in simplest form.*

Written as a fraction, 55% is $\frac{11}{20}$.

EXAMPLE 4 Writing Percents as Decimals

Write 24% as a decimal.

Remember!

To divide by 100, move the decimal point two places to the left.

$24 \div 100 = 0.24$

$24\% = \frac{24}{100}$ *Write the percent as a fraction with a denominator of 100.*

$$\begin{array}{r} 0.24 \\ 100\overline{)24.00} \\ -200 \\ \hline 400 \\ -400 \\ \hline 0 \end{array}$$ *Write the fraction as a decimal.*

Written as a decimal, 24% is 0.24.

EXAMPLE 5 *Earth Science Application*

The water frozen in glaciers makes up almost 75% of the world's fresh water supply. Write 75% as a decimal.

$75\% = \frac{75}{100}$ *Write the percent as a fraction with a denominator of 100.*

$75 \div 100 = 0.75$ *Write the fraction as a decimal.*

Written as a decimal, 75% is 0.75.

Think and Discuss

1. **Give an example** of a situation in which you have seen percents.
2. **Tell** how much sales tax you would have to pay on \$1, \$10, and \$100 if your state had a 5% sales tax rate.
3. **Explain** how to write a percent as a fraction.
4. **Write** 100% as a decimal and as a fraction.

7-7 Exercises

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Exercises 1–33, 35, 37, 39, 41, 43, 45, 47

GUIDED PRACTICE

See Example 1 **Use a 10-by-10-square grid to model each percent.**

1. 45% **2.** 3% **3.** 61%

See Example 2 **Write each percent as a fraction in simplest form.**

4. 25% **5.** 80% **6.** 54%

See Example 3 **7. Social Studies** Belize is a country in Central America. Of the land in Belize, 92% is made up of forests and woodlands. Write 92% as a fraction in simplest form.

See Example 4 **Write each percent as a decimal.**

8. 72% **9.** 4% **10.** 90%

See Example 5 **11.** About 64% of the runways at airports in the United States are not paved. Write 64% as a decimal.

INDEPENDENT PRACTICE

See Example 1 **Use a 10-by-10-square grid to model each percent.**

12. 14% **13.** 98% **14.** 36% **15.** 28%

See Example 2 **Write each percent as a fraction in simplest form.**

16. 20% **17.** 75% **18.** 11% **19.** 72%

20. 5% **21.** 64% **22.** 31% **23.** 85%

See Example 3 **24.** Nikki must answer 80% of the questions on her final exam correctly to pass her class. Write 80% as a fraction in simplest form.

See Example 4 **Write each percent as a decimal.**

25. 44% **26.** 13% **27.** 29% **28.** 51%

29. 60% **30.** 92% **31.** 7% **32.** 87%

See Example 5 **33.** Brett was absent 2% of the school year. Write 2% as a decimal.

PRACTICE AND PROBLEM SOLVING

Extra Practice
See page EP15.

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

34. 23% **35.** 1% **36.** 49% **37.** 70% **38.** 10%

39. 37% **40.** 85% **41.** 8% **42.** 63% **43.** 75%

44. 94% **45.** 100% **46.** 0% **47.** 52% **48.** 12%

49. Model 15%, 52%, 71%, and 100% using different 10-by-10 grids. Then write each percent as a fraction in simplest form.

7-8 Percents, Decimals, and Fractions

OK 2.2c Estimate and find solutions to single and multi-step problems using whole numbers, decimals, fractions, and percents (e.g., $\frac{7}{8} + \frac{8}{9}$ is . . . about 2, 0.9 + 0.3 is about 1).

Learn to write decimals and fractions as percents.

Percents, decimals, and fractions appear in newspapers, on television, and on the Internet. To fully understand the data you see in your everyday life, you should be able to change from one number form to another.

In Lesson 7-7, you learned how to write a percent as a fraction or as a decimal. You can also express decimals and fractions as percents.

Notes

$$\frac{1}{2} = 0.5 = 50\%$$

EXAMPLE 1 Writing Decimals as Percents

Interactivities Online ▶

Write each decimal as a percent.

Method 1: Use place value.

A 0.3

$0.3 = \frac{3}{10}$ *Write the decimal as a fraction.*

$\frac{3 \cdot 10}{10 \cdot 10} = \frac{30}{100}$ *Write an equivalent fraction with 100 as the denominator.*

$\frac{30}{100} = 30\%$ *Write the numerator with a percent symbol.*

B 0.43

$0.43 = \frac{43}{100}$ *Write the decimal as a fraction.*

$\frac{43}{100} = 43\%$ *Write the numerator with a percent symbol.*

Method 2: Multiply by 100:

C 0.7431

$0.7431 \cdot 100$ *Multiply by 100.*

74.31% *Add the percent symbol.*

D 0.023

$0.023 \cdot 100$ *Multiply by 100.*

2.3% *Add the percent symbol.*

EXAMPLE 2 Writing Fractions as Percents

Write each fraction as a percent.

Helpful Hint

When the denominator is a factor of 100, it is often easier to use method 1. When the denominator is not a factor of 100, it is usually easier to use method 2.

Method 1: Write an equivalent fraction with a denominator of 100.

A $\frac{4}{5}$

$\frac{4 \cdot 20}{5 \cdot 20} = \frac{80}{100}$ *Write an equivalent fraction with a denominator of 100.*

$\frac{80}{100} = 80\%$ *Write the numerator with a percent symbol.*

Method 2: Use division to write the fraction as a decimal.

B $\frac{3}{8}$

$$8\overline{)3.000}$$ *Divide the numerator by the denominator.*

$0.375 = 37.5\%$ *Multiply by 100 by moving the decimal point right two places. Add the percent symbol.*

EXAMPLE 3 *Earth Science Application*

About $\frac{39}{50}$ of Earth's atmosphere is made up of nitrogen. About what percent of the atmosphere is nitrogen?

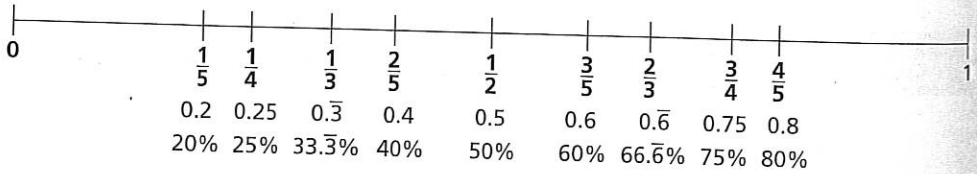
$\frac{39}{50}$

$\frac{39 \cdot 2}{50 \cdot 2} = \frac{78}{100}$ *Write an equivalent fraction with a denominator of 100.*

$\frac{78}{100} = 78\%$ *Write the numerator with a percent symbol.*

About 78% of Earth's atmosphere is made up of nitrogen.

The number line below shows common equivalent fractions, decimals, and percents.



Think and Discuss

1. **Tell** which method you prefer for converting decimals to percents—using equivalent fractions or multiplying by 100. Why?
2. **Give** two different ways to write three-tenths.
3. **Explain** how to write fractions as percents using two different methods.

Exercises

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Exercises 1–26, 31, 33, 39, 43, 49, 55, 59

GUIDED PRACTICE

See Example 1 **Write each decimal as a percent.**

1. 0.39 **2.** 0.125 **3.** 0.8 **4.** 0.112

See Example 2 **Write each fraction as a percent.**

5. $\frac{11}{25}$ **6.** $\frac{7}{8}$ **7.** $\frac{7}{10}$ **8.** $\frac{1}{2}$ **9.** $\frac{9}{15}$

See Example 3 **10.** Patti spent $\frac{3}{4}$ of her allowance on a new backpack. What percent of her allowance did she spend?

INDEPENDENT PRACTICE

See Example 1 **Write each decimal as a percent.**

11. 0.6 **12.** 0.55 **13.** 0.34 **14.** 0.308 **15.** 0.62

See Example 2 **Write each fraction as a percent.**

16. $\frac{3}{5}$ **17.** $\frac{3}{10}$ **18.** $\frac{24}{25}$ **19.** $\frac{9}{20}$ **20.** $\frac{17}{20}$

21. $\frac{1}{8}$ **22.** $\frac{11}{16}$ **23.** $\frac{37}{50}$ **24.** $\frac{2}{5}$ **25.** $\frac{18}{45}$

See Example 3 **26.** About $\frac{1}{125}$ of the people in the United States have the last name *Johnson.* What percent of people in the United States have this last name?

PRACTICE AND PROBLEM SOLVING

Extra Practice
See page EP15.

Write each decimal as a percent and a fraction.

27. 0.04 **28.** 0.32 **29.** 0.45 **30.** 0.59 **31.** 0.01

32. 0.81 **33.** 0.6 **34.** 0.39 **35.** 0.14 **36.** 0.62

Write each fraction as a percent and as a decimal. Round to the nearest hundredth, if necessary.

37. $\frac{4}{5}$ **38.** $\frac{1}{3}$ **39.** $\frac{5}{6}$ **40.** $\frac{7}{12}$ **41.** $\frac{17}{50}$

42. $\frac{2}{30}$ **43.** $\frac{1}{25}$ **44.** $\frac{8}{11}$ **45.** $\frac{4}{15}$ **46.** $\frac{22}{35}$

Compare. Write <, >, or =.

47. 70% ☐ $\frac{3}{4}$ **48.** $\frac{5}{8}$ ☐ 6.25% **49.** 0.2 ☐ $\frac{1}{5}$ **50.** 1.25 ☐ $\frac{1}{8}$

51. 0.7 ☐ 7% **52.** $\frac{9}{10}$ ☐ 0.3 **53.** 37% ☐ $\frac{3}{7}$ **54.** $\frac{17}{20}$ ☐ 0.85

55. Language Arts The longest word in all of Shakespeare's plays is *honorificabilitudinitatibus.* About what percent of the letters in this word are vowels? About what percent of the letters are consonants?