Lesson 6-4

Percent of Change

Interactive Study Guide

See pages 135–136 for:
- Getting Started
- Real-World Link
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Essential Question

How can you use proportional relationships to solve real-world percent problems?

Common Core State Standards

Content Standards
7.RP.3, 7.EE.2, 7.EE.3

Mathematical Practices
1, 3, 4, 6

Vocabulary

percent of change
percent of increase
percent of decrease
percent error

What You'll Learn

- Find percent of increase and decrease.
- Find percent error.

Real-World Link

Movies Movies sure have come a long way! The first known motion picture was filmed in 1888 and lasted for only 2.11 seconds. Today, we watch motion pictures that last an average of about two hours. The price to go to a movie has also gone up. In 1948, the average ticket price was $0.36. In 2012, the average went up to $7.93.

Jasper White CM/Image Source

Key Concept Percent of Change

Words	A **percent of change** is a ratio that compares the change in quantity to the original amount.
Symbols	$\text{percent of change} = \dfrac{\text{amount of change}}{\text{original amount}}$

If the percent is positive, the percent of change is a **percent of increase**. If the percent is negative, the percent of change is called a **percent of decrease**.

Example 1

Tools Tutor

Find the percent of change from 60°F to 84°F. Then state whether the percent of change is an *increase* or a *decrease*.

Step 1 Subtract to find the amount of change.

$84 - 60 = 24$ final amount – original amount

Step 2 $\text{percent of change} = \dfrac{\text{amount of change}}{\text{original amount}}$ Write a ratio that compares the amount of change to the original amount.

$= \dfrac{24}{60}$ Substitution

$= \dfrac{2}{5}$ or 0.4 Simplify.

Step 3 The decimal 0.4 is written as 40%. So, the percent of change is 40%. Since the percent of change is positive, it is a percent of increase.

Got It? Do this problem to find out.

1. Ty had 52 comic books. Now he has 61 books. Find the percent of change. Round to the nearest tenth, if necessary. Then state whether the percent of change is an *increase* or a *decrease*. **17.3%; increase**

Watch Out!

When finding percent of change, don't assume the smaller number is the whole. When the percent of change is a decrease, the original amount will be larger than the new amount.

Real World Example 2

Tools Tutor

McKenna had 318 stamps. Now she has 273 stamps. Find the percent of change. Round to the nearest tenth, if necessary. Then state whether the percent of change is an *increase* or a *decrease*.

$$\text{percent of change} = \frac{\text{amount of change}}{\text{original amount}}$$

$$= \frac{273 - 318}{318} \qquad \frac{\text{final amount} - \text{original amount}}{\text{original amount}}$$

$$= -\frac{45}{318} \qquad \text{Simplify.}$$

$$\approx -0.141509 \qquad \text{Divide. Use a calculator.}$$

To the nearest tenth, the percent of change is −14.2%. Since the percent of change is negative, it is a percent of decrease.

Got It? **Do this problem to find out.**

2. Find the percent of change from 24 points to 18 points. Then state whether the percent of change is an *increase* or a *decrease*. **−25%; decrease**

Key Concept Percent Error

Words	The **percent error** is a measure of the difference between an estimate, prediction, or measurement and the actual value.
Symbols	$\text{percent error} = \frac{\text{amount of error}}{\text{actual value}} \times 100$

The amount of error is nonnegative when calculating percent error.

Real World Example 3

Tutor

Alyssa estimates that her school auditorium has 660 seats. It actually has 750 seats. What is the percent error of her estimate?

Step 1 Find the amount of error.

$660 - 750 = -90$ Subtract the actual value from the estimate.

$|-90| = 90$ Find the absolute value of the difference.

Step 2 Find the percent error.

$\frac{90}{750} \times 100 = 0.12$ $\frac{\text{amount of error}}{\text{actual value}} \times 100$

The percent error is 12%.

Got It? **Do these problems to find out.**

Find the percent error. Round to the nearest tenth, if necessary.

3a. estimated weight: 8 pounds, actual weight: 6.4 pounds **25%**

3b. measured length: 2.5 centimeters, actual length: 2.54 centimeters **1.6%**

Guided Practice

Check

Find the percent of change. Round to the nearest tenth, if necessary. Then state whether the percent of change is an *increase* or a *decrease*. (Example 1)

1. From \$40 to \$32 **—20%; decrease**
2. From 56 inches to 63 inches **12.5%; increase**
3. **Financial Literacy** On Saturday, Smoothie Central made \$1300 in sales. On Sunday, they made \$900 in sales. What is the percent of change from Saturday to Sunday, and is it an increase or decrease? (Example 2) **about —30.8%; decrease**

Find the percent error. (Example 3)

4. estimated distance: 60 miles, actual distance: 75 miles **20%**
5. measured area: 24 square inches, actual area: 22.5 square inches **$6.\overline{6}$%**
6. The estimate for the amount of rain in May in one part of Texas was 5.6 inches. The actual rainfall was 2.4 inches. What was the percent error of the estimate to the nearest percent? **133%**

Independent Practice

Go online for Step-by-Step Solutions

eHelp

Find the percent of change. Round to the nearest tenth, if necessary. Then state whether the percent of change is an *increase* or a *decrease*. (Example 1)

7. From 14 inches to 26 inches **85.7%; increase**
8. From \$36 to \$48 **33.3%; increase**
9. From 82 feet to 74 feet **—9.8%; decrease**
10. From 16 kilograms to 5 kilograms **—68.8%; decrease**
11. From \$128 to \$112 **—12.5%; decrease**
12. From 90 yards to 72 yards **—20%; decrease**
13. From 191 ounces to 270 ounces **41.4%; increase**
14. From 150 minutes to 172 minutes **14.7%; increase**
15. A survey of gas prices in January showed that the cost per gallon one year was \$2.649. The following January, the cost per gallon was \$2.999. Find the percent change in gas prices from one year to the next to the nearest tenth. (Example 2) **13.2%; increase**
16. Jerome High School's football team scored 38 points in their first game. The next week, they only scored 17 points. Find the percent change in the number of points scored by the football team to the nearest tenth. (Example 2) **—55.3%; decrease**

Find the percent error. (Example 3)

17. actual height: 180 meters, estimated height: 200 meters **$11.\overline{1}$%**
18. estimated time: 40 workdays, actual time: 80 workdays **50%**
19. projected cost: \$1250, actual cost: \$2000 **37.5%**
20. actual number: 384, calculated number: 385 **about 0.26%**
21. **STEM** A megabyte is 1024 kilobytes of data. Kevin incorrectly used 1000 instead of 1024. What was the percent error of his calculation to the nearest hundredth? (Example 3) **2.34%**
22. A bottle of vitamins should have 60 vitamins. The actual number is 62. What is the percent error to the nearest hundredth? (Example 3) **3.23%**
23. B For a local telethon 3860 viewers called in and donated money on the first night. The next night, there was a 20% decrease in the number of calls from the first night. How many calls did the telethon receive on the second night? **3088 calls**
24. There were 10,651 athletes who participated in the Summer Olympics one year. Four years later, 11,099 athletes participated. What was the percent of change in the number of athletes participating from one Summer Olympics to the next? Round to the nearest tenth. **4.2%; increase**