



-   **Got It?** 5. **Reasoning** If the gift box's dimensions in Problem 5 were measured to the nearest half inch, how would the greatest possible error be affected?



## Lesson Check

### Do you know HOW?

- Running** Last year, an athlete's average time to run a mile was 6 min 13 s. This year, the athlete's average time is 6 min 5 s. What is the percent decrease?
- Cars** A used-car dealership buys a car for \$2800 and then sells it for \$4500. What is the percent increase?
- Horses** A veterinarian measures a horse to be 7.5 ft tall at the shoulder to the nearest half foot. What are the minimum and maximum possible heights of the horse?

### Do you UNDERSTAND? MATHEMATICAL PRACTICES

- Vocabulary** Determine whether each situation involves a percent increase or a percent decrease.
  - A hat that originally costs \$12 sold for \$9.50.
  - You buy a CD for \$10 and sell it for \$8.
  - A store buys glasses wholesale for \$2 per glass. The store sells them for \$4.50.
- Reasoning** What is the greatest possible error of a measurement taken to the nearest tenth of a meter?
- Writing** How is calculating percent increase different from calculating percent decrease?



## Practice and Problem-Solving Exercises MATHEMATICAL PRACTICES



### Practice

Tell whether each percent change is an increase or decrease. Then find the percent change. Round to the nearest percent.

 See Problems 1 and 2.

- |   |   |   |
|---|---|---|
| 7. original amount: 12<br>new amount: 18          | 8. original amount: 9<br>new amount: 6            | 9. original amount: 15<br>new amount: 14            |
| 10. original amount: 7.5<br>new amount: 9.5       | 11. original amount: 40.2<br>new amount: 38.6     | 12. original amount: 2008<br>new amount: 1975       |
| 13. original amount: 14,500<br>new amount: 22,320 | 14. original amount: 195.50<br>new amount: 215.25 | 15. original amount: 1325.60<br>new amount: 1685.60 |
16. **Employment** An employee was hired at a wage of \$8 per hour. After a raise, the employee earned \$8.75 per hour. What was the percent increase?
17. **Climate** On June 1, 2007, there were about 18.75 h of daylight in Anchorage, Alaska. On November 1, 2007, there were about 8.5 h of daylight. What was the percent decrease?

Find the percent error in each estimation. Round to the nearest percent.

 See Problem 3.

- You estimate that your friend's little brother is about 8 years old. He is actually 6.5 years old.
- You estimate that your school is about 45 ft tall. Your school is actually 52 ft tall.

A measurement is given. Find the minimum and maximum possible measurements.

See Problem 4.

20. A doctor measures a patient's weight as 162 lb to the nearest pound.  
 21. An ostrich egg has a mass of 1.1 kg to the nearest tenth of a kilogram.  
 22. The length of an onion cell is 0.4 mm to the nearest tenth of a millimeter.

23. **Geometry** The table below shows the measured dimensions of a prism and the minimum and maximum possible dimensions based on the greatest possible error. What is the greatest possible percent error in finding the volume of the prism?

See Problem 5.

Dimensions	Length	Width	Height
Measured	10	6	4
Minimum	9.5	5.5	3.5
Maximum	10.5	6.5	4.5

24. **Geometry** The side lengths of the rectangle at the right have been measured to the nearest half of a meter, as shown. What is the greatest possible percent error in finding the area of the rectangle?



**B Apply**

Find the percent change. Round to the nearest percent.

25. 2 ft to  $5\frac{1}{2}$  ft      26. 18 lb to  $22\frac{1}{4}$  lb      27.  $140\frac{1}{4}$  g to  $80\frac{3}{4}$  g  
 28. \$8.99 to \$15.99      29. \$168.45 to \$234.56      30. \$4023.52 to \$982.13

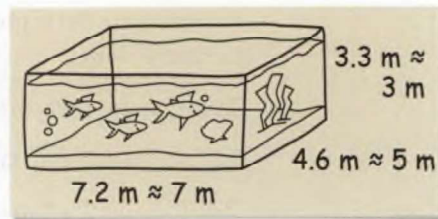
The measured dimensions of a rectangle are given to the nearest whole unit. Find the minimum and maximum possible areas of each rectangle.

31. 7 m by 8 m      32. 18 in. by 15 in.      33. 24 ft by 22 ft

34. **Writing** How are percent change and percent error similar?  
 35. **Open-Ended** Write a percent change problem that you recently experienced.  
 36. **Think About a Plan** In one season, an average of 6500 fans attended each home game played by the basketball team at a college. In the next season, the average number of fans per game increased by about 12%. What was the average number of fans per game for that season?  
 • What is missing—the new amount or the original amount?  
 • How can a percent change help you find the missing amount?  
 37. **Error Analysis** A student is trying to find the percent of change when an amount increases from 12 to 18, as shown. Describe and correct the student's error.

$$\begin{aligned}
 & \frac{\text{new amount} - \text{original amount}}{\text{original amount}} \\
 &= \frac{18 - 12}{18} \\
 &= \frac{6}{18} \approx 0.33, \text{ or } 33\%
 \end{aligned}$$

38. **Rounding Error** Your science class visits an aquarium. In a report on your class's visit, you sketch one of the fish tanks and round the dimensions as shown in the diagram at the right. You use the rounded dimensions to state the tank's volume is approximately  $(7\text{ m})(5\text{ m})(3\text{ m}) = 105\text{ m}^3$ . What is the percent error in your volume calculation due to rounding?



39. **Student Discounts** You show your student identification at a local restaurant in order to receive a 5% discount. You spend \$12 for your meal at the restaurant. How much would your meal cost without the discount?



**Challenge**

40. **Geometry** The height of a cylinder is 2 ft. The diameter of the base is 5 ft. Each dimension is accurate to the nearest foot. What is the greatest possible error in calculating the volume of the cylinder? Use 3.14 for  $\pi$ .
41. a. The sides of a square that measures 4 m by 4 m increased in length by 10%. Find the percent of increase in the area.  
 b. The sides of a square that measures 6 m by 6 m increased in length by 10%. Find the percent of increase in the area.  
 c. **Reasoning** Predict the percent of increase in the area of a square that measures 8 m by 8 m if the side lengths increase by 10%. Explain and check your answer.

## Standardized Test Prep



SAT/ACT

42. Marcus bought a shirt that was marked \$28, but it was on sale for 15% off the marked price. What was the price of the shirt after the discount?  
 (A) \$4.20      (B) \$23.80      (C) \$24.80      (D) \$32.20
43. What equation do you get when you solve  $ax + bx = c$  for  $x$ ?  
 (F)  $x = c - ab$       (G)  $x = c - a - b$       (H)  $x = \frac{c}{a - b}$       (I)  $x = \frac{c}{a + b}$
44. A teacher wants to give each student 2 pencils. A store is selling pencils in boxes of 24. If the teacher has a total of 125 students, how many boxes of pencils should he buy?  
 (A) 5      (B) 6      (C) 10      (D) 11

## Mixed Review

Solve each percent problem.

◀ See Lesson 2-9.

45. What percent of 12 is 8?      46. What is 35% of 185?      47. 20% of what number is 4.2?

**Get Ready!** To prepare for Lesson 3-1, do Exercises 48–51.

Graph the numbers on the same number line. Then order them from least to greatest.

◀ See Lesson 1-3.

48.  $-3$       49.  $\frac{1}{2}$       50.  $2$       51.  $-2.8$