

Day 23

Lesson 3-7

Percent of Change

<p>Lesson Objectives</p> <ul style="list-style-type: none"> ▼ Find percent of change ▼ Find percent error 	<p>NAEP 2005 Strand: Number Properties and Operations Topics: Ratios and Proportional Reasoning Local Standards: _____</p>
--	---

Vocabulary

Big # - small #

Percent of change is the ratio $\frac{\text{amount of change}}{\text{original amount}}$ expressed as a percent

Percent of increase is when a value increases from its original amount

Percent of decrease is when a value decreases from its original amount

The greatest possible error in a measurement is one half of that measuring unit

Percent error is the ratio of the greatest possible error + the measurement

Examples

1 **Finding Percent of Change** The price of a skirt decreased from \$32.95 to \$28.95. Find the percent of decrease.

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

$$= \frac{32.95 - 28.95}{32.95}$$

$$= \frac{4}{32.95}$$

$$\approx 0.121 \text{ or } 12.1\%$$

Subtract to find the amount of change.
Substitute the original amount.

Simplify the numerator.

Write as a decimal and then as a percent.

original

12.1

The price of the skirt decreased by about 12%

All rights reserved.

© Pearson Education, Inc., publishing as Pearson Prentice Hall.

② **Applying Percent of Change** Between 1940 and 1980, the federal budget increased from \$9.5 billion to \$725.3 billion. What was the percent of increase in the federal budget?

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

$$= \frac{725.3 - 9.5}{9.5}$$

$$= \frac{715.8}{9.5} \div$$

$$\approx 75.35 \text{ or } 7535\%$$

The federal budget increased by nearly 7535%.

$\frac{\text{Big} - \text{small}}{\text{original}}$

Substitute.

Simplify the numerator.

Write as a decimal and then as a percent.

75.35

Quick Check

1. a. Find the percent of change if the price of a CD increases from \$12.99 to \$13.99. Round to the nearest percent.

$$\frac{\text{Big} - \text{small}}{\text{original}} = \frac{13.99 - 12.99}{12.99} = \frac{1}{12.99} \approx 0.08$$

8%

b. Find the percent of change if the CD is on sale, and its price decreases from \$13.99 to \$12.99. Round to the nearest percent.

original $\frac{13.99 - 12.99}{13.99} = \frac{1}{13.99} = 0.0714$

7%

2. The number of alpaca owners increased from 146 in 1991 to 2,919 in 2000. Find the percent of increase. Round to the nearest percent.

$$2919 - 146 = 2773$$

$$\frac{2773}{146} = 18.99$$

~~1899%~~ 190% 1899%

Examples

3 Finding the Greatest Possible Error You read the bathroom scale as 122 lb.
What is your greatest possible error?

The scale is read to the nearest lb, so the greatest possible error is one half of 1 lb, or lb.

4 Finding Percent Error in Calculating Volume A small jewelry box measures 7.4 cm by 12.2 cm by 4.2 cm. Find the percent error in calculating its volume.

The measurements are to the nearest 0.1 cm. The greatest possible error is cm. $\frac{.1}{2} = .05$

as measured
 $V = \ell \cdot w \cdot h$
 $= 7.4 \cdot \text{[]} \cdot 4.2$
 $\approx \text{[]} \text{ cm}^3$

maximum value
 $V = \ell \cdot w \cdot h$
 $= \text{[]} \cdot 12.25 \cdot 4.25$
 $\approx \text{[]}$

minimum value
 $V = \ell \cdot w \cdot h$
 $= 7.35 \cdot 12.15 \cdot \text{[]}$
 $\approx \text{[]}$

Possible Error: maximum – measured **measured – minimum**
 $387.87 - 379.18 = \text{[]}$ $379.18 - 370.61 = \text{[]}$

Use the difference that shows the greatest possible error to find the percent error.

percent error = $\frac{\text{greatest possible error}}{\text{measurement}}$
 $= \frac{387.87 - \text{[]}}{379.18}$
 $= \frac{\text{[]}}{379.18}$
 $\approx \text{[]}$
 $\approx \text{[]} \%$

Use the percent error formula.
 Substitute.
 Simplify the numerator.
 Write as a decimal.
 Round and write as a percent.

The percent error is about %.

Quick Check

3. You measure a picture for the yearbook and record its height as 9 cm. What is your greatest possible error?

nearest 1 cm

GPE : $\frac{1}{2}(1) = \text{[.5 cm]}$

© Pearson Education, Inc., publishing as Pearson Prentice Hall.

3-7 WKST
② 40 cm to 100 cm (increase)

$$\frac{100 - 40}{\underset{\substack{\rightarrow 40 \\ \text{original}}}{40}} = \frac{60}{40} = 1.5 = 150\% \text{ increase}$$

⑥ \$100 to \$140

$$\frac{140 - 100}{100} = \frac{40}{100} = .4 = 40\% \text{ increase}$$

⑱ $74\frac{3}{4}$ to $66\frac{1}{2}$ decreased

$$\frac{74\frac{3}{4} - 66\frac{1}{2}}{74\frac{3}{4}} = \frac{8.25}{74.75} = .11 = 11\% \text{ decrease}$$

⑳

$$\frac{68 - 16.6}{16.6} = \frac{51.4}{16.6} = 3.096 \approx 3.10 = 310\% \text{ increase}$$

~~20~~ ex

3.74 GPE
hundredth
nearest .01 / 2 = .005

ex

5.6 tenth
nearest tenth .1 / 2 = .05

ex

9
nearest whole #
1 / 2 = .5

Practice 3-7

Percent of Change

Find each percent of change. Describe the percent of change as an increase or decrease. Round to the nearest whole number.

- | | | | |
|--|--|--------------------------------------|--|
| 1. 36 g to 27 g | 2. 40 cm to 100 cm | 3. 90 in. to 45 in. | 4. 500 lb to 1500 lb |
| 5. \$90 to \$84.50 | 6. \$100 to \$140 | 7. \$15 to \$5.50 | 8. 100 mi to 175 mi |
| 9. 280 m to 320 m | 10. 58 to 76 | 11. 60 to 150 | 12. 600 mi to 480 mi |
| 13. 18 to 27 | 14. 290 yd to 261 yd | 15. 26.2 to 22.8 | 16. \$8.50 to \$12.75 |
| 17. $36\frac{1}{2}$ to $29\frac{1}{4}$ | 18. $74\frac{3}{4}$ to $66\frac{1}{2}$ | 19. $6\frac{3}{4}$ to $8\frac{1}{4}$ | 20. $15\frac{1}{2}$ to $18\frac{1}{4}$ |

Find each percent of change. Describe the percent of change as an increase or decrease. Round to the nearest whole number.

21. In 1985, the average price for gasoline was \$1.20/gal. In 2000, the average price for gasoline was \$1.56. Find the percent of change.
22. In 1980, Texas had 27 U.S. Representatives. That number increased to 30 in 2000. Find the percent of change.
23. In 1980, the average annual tuition charge for a four-year public university was \$840. The average annual tuition charge in 2000 was \$3356. What is the percent of change?
24. The United States imported 6,909,000 barrels of oil per day in 1980. In 2000, the United States imported 11,459,000 barrels of oil per day. What is the percent of change?
25. In 1977, the average number of households with cable television was 16.6%. In 2000, the average number of households with cable television was 68%. What is the percent of change?
26. In 1989, there were 38,000 licensed drivers under the age of 16. In 1999, the total number of licensed drivers under 16 was 33,248. Find the percent of change.
27. In 1990, Atlanta, GA, failed to meet air quality standards on 42 days. In 1999, Atlanta failed to meet air quality standards on 61 days. What is the percent of change?

Find the greatest possible error and the percent error for each measurement.

- | | | |
|------------|-------------|------------|
| 28. 3 cm | 29. 0.5 cm | 30. 6 cm |
| 31. 16 in. | 32. 36.85 g | 33. 0.9 cm |

Find the minimum and maximum possible areas for rectangles with the following measurements.

- | | | |
|------------------|-------------------|----------------|
| 34. 8 cm × 10 cm | 35. 3 in. × 5 in. | 36. 8 m × 12 m |
|------------------|-------------------|----------------|

Find the minimum and maximum possible volume for a rectangular solid with the following measurements.

- | | | |
|------------------------------|---------------------------|---------------------|
| 37. 16 in. × 22 in. × 18 in. | 38. 13 cm × 15 cm × 18 cm | 39. 3 m × 4 m × 5 m |
|------------------------------|---------------------------|---------------------|

All rights reserved. © Pearson Education, Inc., publishing as Pearson Prentice Hall.