Section 8.1 Percent, Sales Tax, and Discounts

Objective 8.1.1 – Express a fraction as a percent.

Key Terms
Percents
Fraction
Numerator
Denominator
Quotient

Summary
Percents are the result of expressing numbers as part of 100, and the word percent means *per hundred*. Thus, $97\% = \dfrac{97}{100}$.

To express a **fraction** as a percent, divide the **numerator** by the **denominator**, move the decimal point in the **quotient** two places to the right, and add a percent sign.

For example, express $\dfrac{4}{5}$ as a percent.

Step 1. Divide the numerator by the denominator: $4 \div 5 = 0.8$
Step 2. Multiply the quotient by 100. $0.8 \times 100 = 80$
Step 3. Attach a percent sign. 80%

Thus, $\dfrac{4}{5} = 80\%$.

Guided Example	*Practice* (Exercises 1 & 7, p. 505)
a) Express $\dfrac{1}{8}$ as a percent. Step 1: $\dfrac{1}{8} = 1 \div 8 = 0.125$ Step 2: $0.125 \cdot 100 = 12.5$ Step 3: 12.5% **b)** Express $\dfrac{3}{4}$ as a percent. Step 1: $\dfrac{3}{4} = 3 \div 4 = 0.75$ Step 2: $0.75 \cdot 100 = 75$ Step 3: 75%	Express the fraction as a percent. **1.** $\dfrac{2}{5}$ **2.** $\dfrac{1}{40}$

Objective 8.1.2 – Express a decimal as a percent.

Key Terms
Percent
Decimal number

Summary
To express a **decimal number** as a **percent**, move the decimal point two places to the right and add a percent sign.

For example, express 0.741 as a percent.
Step 1. Move the decimal point two places to the right. 74.1
Step 2. Attach a percent sign. 74.1%

Guided Example	***Practice*** (Exercises 13 & 15, p. 505)
a) Express 0.023 as a percent.	Express the decimal as a percent
Step 1. Move the decimal point two places to the right. 2.3	**3.** 0.3844
Step 2. Attach a percent sign. 2.3%	**4.** 2.87
b) Express 9.83 as a percent.	
Step 1. Move the decimal point two places to the right. 983	
Step 2. Attach a percent sign. 983%	

Objective 8.1.3 – Express a percent as a decimal.

Key Terms
Decimal number
Percent

Summary
To express a **percent** as a **decimal number**, move the decimal point two places to the left and remove the percent sign.

For example, express 43.7% as a decimal.
Step 1. Move the decimal point two places to the left. 0.437%
Step 2. Remove the percent sign. 0.437

Guided Example	***Practice*** (Exercises 21 & 25, p. 505)
Express each percent as a decimal.	Express each percent as a decimal.
a) 67%	**5.** 72%
b) 250%	**6.** 130%
a) 67% = 0.67	
b) 250% = 2.50	

Objective 8.1.4 – Solve applied problems involving sales tax and discounts.

Key Terms
Sales tax
Tax rate
Discount
Discount rate
Sale price

Summary
The percent formula, $A = PB$, means A is P percent of B. We can use this formula to determine the sales tax collected by states, counties, and cities on sales of items to customers.

$$\text{Sales tax amount} = \text{tax rate} \times \text{item's cost}$$

For example, suppose that the local sales tax rate is 8.5% and you purchase a TV for $392.
a. How much tax is paid?
$$\text{Sales tax amount} = \text{tax rate} \times \text{item's cost} = 8.5\% \times \$392 = 0.085 \times \$392 = \$33.32$$
The tax paid is $33.32.

b. What is the total cost of the TV?
$$\text{Total cost} = \$392 + \$33.32 = \$425.32$$
The TV's total cost is $425.32.

Businesses reduce prices, or **discount**, to attract customers and to reduce inventory. The **discount rate** is a percent of the original price.

$$\text{Discount amount} = \text{discount rate} \times \text{original price}$$

For example, a cell phone with an original price of $600 is on sale at 10% off.
a. What is the discount amount?
$$\text{Discount amount} = \text{discount rate} \times \text{original price} = 10\% \times \$600 = 0.10 \times \$600 = \$60$$
The discount amount is $60.

b. What is the cell phone's sale price?
$$\text{Sale price} = \$600 - \$60 = \$540$$
The cell phone's sale prices is $540.

Guided Example	*Practice* (Exercises 47 & 49, p. 505)
Suppose that the local sales tax is 6% and you purchase a tablet for $1260. **a)** How much tax is paid? **b)** What is the computer's total cost? **a)** 6% of $1260 = 0.06×$1260 = $75.60 The tax paid is $75.60 **b)** $1260.00 + $75.60 = $1335.60 The total cost is $1335.60 Noise-canceling headphones with an original price of $380 are on sale at 35% off. **d)** What is the discount amount? **e)** What is the sale price of the headphones?	**7.** Suppose that the local sales tax is 6%. You purchase a car for $32,800. **a)** How much tax is paid? **b)** What is the car's total cost? **8.** An exercise machine with an original price of $860 is on sale at 12% off. **a)** What is the discount amount? **b)** What is the exercise machine's sale price?

d) 35% of $380 = 0.35 × $380 = $133 The discount amount is $133.00. **e)** $380.00 − $133.00 = $247.00 The sale price of the headphones is $247.00.	

Objective 8.1.5 – Determine percent increase or decrease.

Key Terms
Percent increase
Percent decrease

Summary
Percents are used for comparing changes, such as increases or decreases in sales, population, prices, and production. If a quantity changes, its **percent increase** or its **percent decrease** can be found as follows:

1. The fraction for percent increase (or decrease) is: $\dfrac{\text{amount of increase (or decrease)}}{\text{original amount}}$.

2. Find the percent increase (or decrease) by expressing this fraction as a percent.

For example, a coffee shop increases the cost of a mocha from $4.50 to $5. Find the percent increase.
$$\frac{\text{amount of increase}}{\text{original amount}} = \frac{\$5 - \$4.50}{\$4.50} = \frac{\$0.50}{\$4.50} \approx 0.11 = 11\%$$

Guided Example

a) A 70″ LED Smart TV regularly sells for $940. The sale price is $611. Find the percentage decrease of the sale price from the regular price.

Amount of decrease: $940 − $611 = $329

$$\frac{\text{amount of decrease}}{\text{original amount}} = \frac{\$329}{\$940} = 0.35 = 35\%$$

There was a 35% decrease in price.

b) A lawn mower regularly sells for $380. The sale price is $266. Find the percent decrease of the sale price from the regular price.

Amount of decrease: $380 − $266 = $114

$$\frac{\text{amount of decrease}}{\text{original amount}} = \frac{\$114}{\$380} = 0.30 = 30\%$$

There was a 30% decrease in price.

Practice (Exercises 53 & 55, p. 506)

9. The bar graph shows that life expectancy, the number of years newborns are expected to live, has increased dramatically since ancient times. Use this information to find the percent increase in average world life expectancy from the Stone Age to 2016.
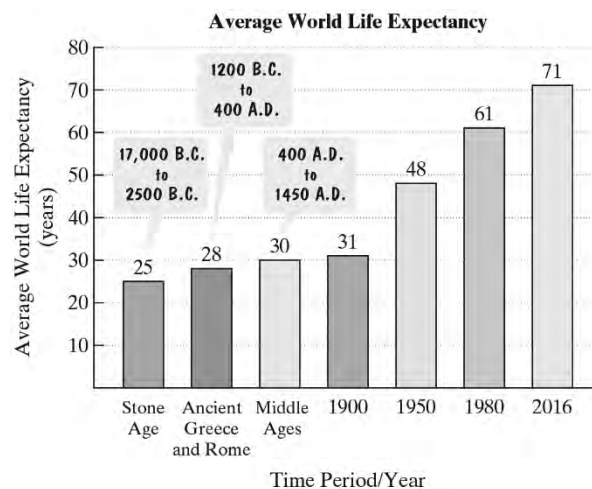
10. A sofa regularly sells for $840. The sale price is $714. Find the percent decrease of the sale price from the regular price.

Objective 8.1.6 – Investigate some of the ways percents can be abused.

Key Terms
Percent increase
Percent decrease
Summary
Confusion can arise when percent increase or decrease refers to a changing quantity that is itself a percent.

Guided Example	*Practice* (Exercise 57, p. 506)
Suppose you paid $1200 in taxes. During year 1, taxes decrease by 20%. During year 2, taxes increase by 20%. **a)** What do you pay in taxes for year 2? **b)** How do your taxes for year 2 compare with what you originally paid, namely $1200? If the taxes are not the same, find the percent increase or decrease. **a)** 20% of $1200 = $0.20 \times \$1200 = \$240$ Taxes for year 1 are $\$1200 - \$240 = \$960$ 20% of $960 = $0.20 \times \$960 = \$192$ Taxes for year 2 are $\$960 + \$192 = \$1152$ **b)** $\dfrac{\$1200 - \$1152}{\$1200} = \dfrac{\$48}{\$1200} = 0.04 = 4\%$ Taxes for year 2 show a 4% decrease from the original amount.	**11.** Suppose that you have $10,000 in a rather risky investment recommended by your financial advisor. During the first year, your investment decreases by 30% of its original value. During the second year, your investment increases by 40% of its first-year value. Your advisor tells you that there must have been a 10% overall increase of your original $10,000 investment. Is your financial advisor using percentages properly? If not, what is your actual percent gain or loss of your original $10,000 investment?