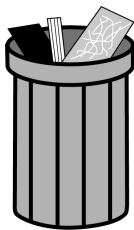


Section 2.4

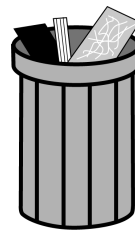
Formulas and Percents

Put litter in its place!



Across the United States, people generate approximately 175 billion pounds of trash in the form of paper and approximately 55 billion pounds of trash in the form of plastic each year.

You will apply the techniques learned in this section of your textbook to determine the weight of all types of trash combined.



First Steps:

- Take comprehensive notes** from your instructor's lecture and insert your notes into this section of the *Learning Guide*. Be sure to write down all examples, definitions, and other key concepts. Additional learning resources include the *Lecture Series on DVD*, the *PowerPoints*, and Section 2.4 of your textbook which begins on page 144.
- Complete the *Concept and Vocabulary Check* on page 152 of the textbook.

Guided Practice:

- Review each of the following *Solved Problems* and complete each *Pencil Problem*.

Objective #1: Solve a formula for a variable.

✓ *Solved Problem #1*

1a. Solve the formula $A = lw$ for l .

$$A = lw$$

$$\frac{A}{w} = \frac{lw}{w}$$

$$\frac{A}{w} = l$$

1b. Solve the formula $2l + 2w = P$ for l .

$$2l + 2w = P$$

$$2l + 2w - 2w = P - 2w$$

$$2l = P - 2w$$

$$\frac{2l}{2} = \frac{P - 2w}{2}$$

$$l = \frac{P - 2w}{2}$$

✎ *Pencil Problem #1* ✎

1a. Solve the formula $d = rt$ for r .

1b. Solve the formula $Ax + By = C$ for x .

1c. Solve the formula $T = D + pm$ for m .

$$T = D + pm$$

$$T - D = pm$$

$$\frac{T - D}{p} = \frac{pm}{p}$$

$$\frac{T - D}{p} = m$$

$$m = \frac{T - D}{p}$$

1c. Solve the formula $y = mx + b$ for m .

1d. Solve the formula $\frac{x}{3} - 4y = 5$ for x .

$$\frac{x}{3} - 4y = 5$$

$$3\left(\frac{x}{3} - 4y\right) = 3 \cdot 5$$

$$3 \cdot \frac{x}{3} - 3 \cdot 4y = 3 \cdot 5$$

$$x - 12y = 15$$

$$x - 12y + 12y = 15 + 12y$$

$$x = 15 + 12y$$

1d. Solve the formula $\frac{c}{2} + 80 = 2F$ for c .

Objective #2: Use the percent formula.

 **Solved Problem #2**

2a. What is 9% of 50?

Use the formula $A = PB$: A is P percent of B .

$$\begin{array}{ccccccc} \text{What} & \text{is} & \text{9\%} & \text{of} & \text{50?} & & \\ \hline \underbrace{A} & = & \underbrace{0.09} & \cdot & \underbrace{50} & & \\ & & A & = & 4.5 & & \end{array}$$

4.5 is 9% of 50.

 **Pencil Problem #2**

2a. What is 3% of 200?

2b. 9 is 60% of what?

Use the formula $A = PB$: A is P percent of B .

$$\begin{array}{l} \boxed{9} \text{ is } \boxed{60\%} \text{ of } \boxed{\text{what?}} \\ \widehat{9} = \widehat{0.60} \cdot \widehat{B} \\ \frac{9}{0.60} = \frac{0.60B}{0.60} \\ 15 = B \end{array}$$

9 is 60% of 15.

2b. 24% of what number is 40.8?

2c. 18 is what percent of 50?

Use the formula $A = PB$: A is P percent of B .

$$\begin{array}{l} \boxed{18} \text{ is } \boxed{\text{what percent}} \text{ of } \boxed{50?} \\ \widehat{18} = \widehat{P} \cdot \widehat{50} \\ 18 = P \cdot 50 \\ \frac{18}{50} = \frac{50P}{50} \\ 0.36 = P \end{array}$$

To change 0.36 to a percent, move the decimal point two places to the right and add a percent sign.

$$0.36 = 36\%$$

18 is 36% of 50.

2c. 3 is what percent of 15?

Objective #3: Solve applied problems involving percent change.

Solved Problem #3

3a. A television regularly sells for \$940. The sale price is \$611.
Find the percent decrease in the television's price.

Use the formula $A = PB$: A is P percent of B .

Find the price decrease: $\$940 - \$611 = \$329$

$$\begin{array}{l} \boxed{\text{The price decrease}} \text{ is } \boxed{\text{what percent}} \text{ of } \boxed{\text{the original price?}} \\ \widehat{329} = \widehat{P} \cdot \widehat{940} \\ 329 = P \cdot 940 \\ \frac{329}{940} = \frac{940P}{940} \\ 0.35 = P \end{array}$$

To change 0.35 to a percent, move the decimal point two places to the right and add a percent sign. $0.35 = 35\%$

There was a 35% decrease.

Pencil Problem #3

3a. Suppose that the local sales tax rate is 6% and you buy a car for \$16,800.
How much tax is due?
What is the car's total cost?

3b. Suppose you paid \$1200 in taxes. During year 1, taxes decrease by 20%. During year 2, taxes increase by 20%.

What do you pay in taxes for year 2?

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.

First, find the amount that the taxes decreased from the original year to year 1: $0.20 \cdot \$1200 = \240

Next, subtract this amount of decrease from the original tax amount to obtain the amount paid in year 1.

Amount paid in year 1: $\$1200 - \$240 = \$960$

Now, find the amount that the taxes increased from year 1 to year 2: $0.20 \cdot \$960 = \192

Next, add this amount of increase to the amount paid in year 1 to obtain the amount paid in year 2.

Amount paid in year 2: $\$960 + \$192 = \$1152$

The taxes for year 2 are less than those originally paid.

Find the tax decrease: $\$1200 - \$1152 = \$48$

$$\begin{array}{ccccccc} \boxed{\text{The tax}} & \boxed{\text{is}} & \boxed{\text{what}} & \boxed{\text{of}} & \boxed{\text{the original}} \\ \boxed{\text{decrease}} & & \boxed{\text{percent}} & & \boxed{\text{tax?}} \\ \hline 48 & = & P & \cdot & 1200 \end{array}$$

$$48 = P \cdot 1200$$

$$\frac{48}{1200} = \frac{1200P}{1200}$$

$$0.04 = P$$

To change 0.04 to a percent, move the decimal point two places to the right and add a percent sign.

$$0.04 = 4\%$$

The overall tax decrease is 4%.

3b. Suppose that you put \$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 the actual percent gain or loss on your original \$10,000 investment?

Answers for Pencil Problems (Textbook Exercise references in parentheses):

1a. $r = \frac{d}{t}$ (2.4 #1) **1b.** $x = \frac{C - By}{A}$ (2.4 #25) **1c.** $m = \frac{y - b}{x}$ (2.4 #9) **1d.** $c = 4F - 160$ (2.4 #17)

2a. 6 (2.4 #27) **2b.** 170 (2.4 #33) **2c.** 20% (2.4 #35)

3a. tax due \$1008; total cost \$17,808 (2.4 #65) **3b.** no; There is a 2% loss. (2.4 #71)

Homework:

Review the Section 2.4 summary on page 200 of the textbook.

Insert your homework into this section of the *Learning Guide*. Show all work neatly and check your answers. Strive to work through difficulties when possible, making note of any exercises where you need additional help. Remember, even if your instructor assigns homework through *MyMathLab*, you should still write out your work.