Helpful Hint

Are you preparing for your test? Don't forget to take the Chapter 5 Test on page 406. Then check your answers at the back of the text and use the Chapter Test Prep Videos to see the fully worked-out solutions to any of the exercises you want to review.

5 Chapter Highlights

Definitions and Concepts	Examples
Section 5.1 Ratio and Proportion	
A **ratio** is the quotient of two quantities.	The ratio of 3 to 4 can be written as $\frac{3}{4}$ (fraction notation) or $3:4$ (colon notation)
Rates are used to compare different kinds of quantities.	Write the rate 12 spikes every 8 inches as a fraction in simplest form. $\frac{12 \text{ spikes}}{8 \text{ inches}} = \frac{3 \text{ spikes}}{2 \text{ inches}}$
A **unit rate** is a rate with a denominator of 1.	Write as a unit rate: 117 miles on 5 gallons of gas $\frac{117 \text{ miles}}{5 \text{ gallons}} = \frac{23.4 \text{ miles}}{1 \text{ gallon}}$ or 23.4 miles per gallon or 23.4 miles/gallon
A **proportion** is a statement that two ratios or rates are equal.	$\frac{1}{2} = \frac{4}{8}$ is a proportion.
Using Cross Products to Determine Whether Proportions Are True or False	Is $\frac{6}{10} = \frac{9}{15}$ a true proportion?
Cross products: $a \cdot d$ and $b \cdot c$ of $\frac{a}{b} = \frac{c}{d}$	Cross products: $6 \cdot 15$ and $10 \cdot 9$ of $\frac{6}{10} = \frac{9}{15}$
If cross products are equal, the proportion is true. If $ad = bc$, then the proportion is true. If cross products are not equal, the proportion is false. If $ad \neq bc$, then the proportion is false.	$6 \cdot 15 \stackrel{?}{=} 10 \cdot 9$ Are cross products equal? $90 = 90$ Since cross products are equal, the proportion is a true proportion.

Definitions and Concepts	Examples
Section 5.1 Ratios and Proportion (*continued*)	
FINDING AN UNKNOWN VALUE n IN A PROPORTION **Step 1.** Set the cross products equal to each other.	Find n: $\frac{n}{7} = \frac{5}{8}$ **Step 1.** $\frac{n}{7} = \frac{5}{8}$ $n \cdot 8 = 7 \cdot 5$ Set the cross products equal to each other. $n \cdot 8 = 35$ Multiply.
Step 2. Divide the number not multiplied by n by the number multiplied by n.	**Step 2.** $n = \frac{35}{8}$ Divide 35 by 8, the number multiplied by n. $n = 4\frac{3}{8}$
Section 5.2 Introduction to Percent	
Percent means "per hundred." The % symbol denotes percent.	$51\% = \frac{51}{100}$ 51 per 100 $7\% = \frac{7}{100}$ 7 per 100
To write a percent as a decimal, replace the % symbol with its decimal equivalent, 0.01, and multiply.	$32\% = 32(0.01) = 0.32$
To write a decimal as a percent, multiply by 100%.	$0.08 = 0.08(100\%) = 08\% = 8\%$
Section 5.3 Percents and Fractions	
To write a percent as a fraction, replace the % symbol with its fraction equivalent, $\frac{1}{100}$, and multiply.	$25\% = \frac{25}{100} = \frac{\overset{1}{\cancel{25}}}{4 \cdot \underset{1}{\cancel{25}}} = \frac{1}{4}$
To write a fraction as a percent, multiply by 100%.	$\frac{1}{6} = \frac{1}{6} \cdot 100\% = \frac{1}{6} \cdot \frac{100}{1}\% = \frac{100}{6}\% = 16\frac{2}{3}\%$
Section 5.4 Solving Percent Problems Using Equations	
Three key words in the statement of a percent problem are **of,** which means **multiplication** ($\cdot$) **is,** which means **equals** ($=$) **what** (or some equivalent word or phrase), which stands for **the unknown number**	Solve: 6 is 12% of what number? $\downarrow \downarrow \downarrow \downarrow \downarrow$ $6 = 12\% \cdot n$ $6 = 0.12 \cdot n$ Write 12% as a decimal. $\frac{6}{0.12} = n$ Divide 6 by 0.12, the number multiplied by n. $50 = n$ Thus, 6 is 12% of 50.

Definitions and Concepts	Examples
Section 5.5 Solving Percent Problems Using Proportions	
PERCENT PROPORTION $\frac{\text{amount}}{\text{base}} = \frac{\text{percent}}{100}$ ← always 100 or $\frac{\text{amount} \to a}{\text{base} \to b} = \frac{p}{100}$ ← percent	Solve: 20.4 is what percent of 85? ↓ ↓ ↓ amount percent base $\frac{\text{amount} \to 20.4}{\text{base} \to 85} = \frac{p}{100}$ ← percent $20.4 \cdot 100 = 85 \cdot p$ Set cross products equal. $2040 = 85 \cdot p$ Multiply. $\frac{2040}{85} = p$ Divide 2040 by 85, the number multiplied by p. $24 = p$ Simplify. Thus, 20.4 is 24% of 85.
Section 5.6 Applications of Percent	
PERCENT OF INCREASE $\text{percent of increase} = \frac{\text{amount of increase}}{\text{original amount}}$ **PERCENT OF DECREASE** $\text{percent of decrease} = \frac{\text{amount of decrease}}{\text{original amount}}$	A town with a population of 16,480 decreased to 13,870 over a 12-year period. Find the percent decrease. Round to the nearest whole percent. $\text{amount of decrease} = 16{,}480 - 13{,}870 = 2610$ $\text{percent of decrease} = \frac{\text{amount of decrease}}{\text{original amount}} = \frac{2610}{16{,}480} \approx 0.16 = 16\%$ The town's population decreased by 16%.
Section 5.7 Percent and Problem Solving: Sales Tax, Commission, and Discount	
SALES TAX AND TOTAL PRICE $\text{sales tax} = \text{sales tax rate} \cdot \text{purchase price}$ $\text{total price} = \text{purchase price} + \text{sales tax}$	Find the sales tax and the total price of a purchase of \$42 if the sales tax rate is 9%. sales tax = sales tax rate · purchase price ↓ ↓ ↓ sales tax = 9% · \$42 $= 0.09 \cdot \$42$ $= \$3.78$ The total price is total price = purchase price + sales tax ↓ ↓ ↓ total price = \$42 + \$3.78 $= \$45.78$

Definitions and Concepts	Examples
Section 5.7 Percent and Problem Solving: Sales Tax, Commission, and Discount (*continued*)	
COMMISSION commission = commission rate · total sales	A salesperson earns a commission of 3%. Find the commission from sales of \$12,500 worth of appliances. commission = commission rate · sales commission = 3% · \$12,500 = 0.03 · 12,500 = \$375
DISCOUNT AND SALE PRICE amount of discount = discount rate · original price sale price = original price − amount of discount	A suit is priced at \$320 and is on sale today for 25% off. What is the sale price? amount of discount = discount rate · original price amount of discount = 25% · \$320 = 0.25 · 320 = \$80 sale price = original price − amount of discount sale price = \$320 − \$80 = \$240 The sale price is \$240.
Section 5.8 Percent and Problem Solving: Interest	
SIMPLE INTEREST interest = principal · rate · time where the rate is understood to be per year.	Find the simple interest after 3 years on \$800 at an interest rate of 5%. interest = principal · rate · time interest = \$800 · 5% · 3 = \$800 · 0.05 · 3 Write 5% as 0.05. = \$120 Multiply. The interest is \$120.
Compound interest is computed not only on the principal, but also on interest already earned in previous compounding periods. (See Appendix B.3 for various compound interest factors.) $A = P\left(1 + \frac{r}{n}\right)^{n \cdot t}$ where n is the number of times compounded per year.	\$800 is invested at 5% compounded quarterly for 10 years. Find the total amount at the end of 10 years. $A = \$800\left(1 + \frac{0.05}{4}\right)^{4 \cdot 10}$ $= \$800\,(1.0125)^{40}$ $\approx \$1314.90$