Math Connections Worksheets

MAT0028C Developmental Math II

Chapter 3

Problem Solving

Chapter 3   PROBLEM SOLVING

3.1 Ratios and Proportions

KEY VOCABULARY

Term	Definition	Example
Ratio		
Unit Ratio		
Proportion		
Congruent angles		
Similar figures		

KEY PROPERTIES, PROCEDURES, OR STRATEGIES

Proportions and Their Cross Products

In the Language of Math	In Your Own Words

Solving a Proportion

Solving Proportion Application Problems

(blank box)

GUIDED EXAMPLE

Solve for the missing number in the proportion.

$$\frac{-4}{3} = \frac{16}{x}$$

Solution

$$\frac{-4}{3} = \frac{16}{x}$$

____ · ____ = ____   ____ · ____ = ____   **Calculate the cross products.**

☐ = ☐   **Set the cross products equal to each other.**

☐ = ☐   **Divide both sides by the coefficient of x.**

The solution is ☐

NOTES

PRACTICE PROBLEMS

Write the ratio in simplest form.

1. One molecule of methanol contains 1 carbon atom, 4 hydrogen atoms, and 1 oxygen atom. Write the ratio of carbon atoms to total atoms in the molecule.

1._____

2. The back wheel of a bicycle rotates $1\frac{2}{7}$ times with $1\frac{3}{11}$ rotations of the pedals. Write the ratio of back wheel rotations to pedal rotations in simplest form.

2._____

Write each as a unit ratio.

3. Oscar drove 95 miles and used 5 gallons of gas. What is the unit ratio of miles to gallons? Interpret the answer.

3._____

4. The same kind of sparkling water comes in two types of cartons.
Carton A: Six 10-oz bottles for $3.99
Carton B: Four 12-oz bottles for $2.39
Which carton is the better buy?

4._____

Determine whether the ratios are equal.

5. $\dfrac{14}{15} \overset{?}{=} \dfrac{42}{45}$

5._____

6. $\dfrac{9.6}{6.3} \overset{?}{=} \dfrac{48.0}{25.2}$

7. $\dfrac{1\frac{1}{5}}{4\frac{1}{4}} \overset{?}{=} \dfrac{4\frac{4}{5}}{12\frac{3}{4}}$

Solve for the missing number.

8. $\dfrac{24}{23} = \dfrac{x}{4.6}$
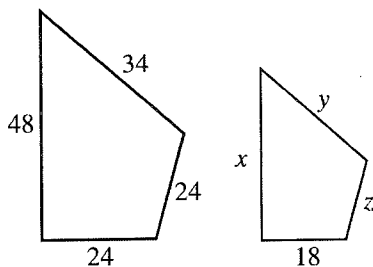
9. $\dfrac{-14}{n} = \dfrac{12}{48}$

Solve.

10. A car travels 887 kilometers in 13 days. At this rate, how far would it travel in 39 days?

Find the missing lengths in the similar figures.

11.

Chapter 3   PROBLEM SOLVING

3.2 Percents

KEY VOCABULARY

Term	Definition	Example
Percent		

KEY PROPERTIES, PROCEDURES, OR STRATEGIES

Rewriting a Percent

Writing a Fraction or Decimal as a Percent

Translating Simple Percent Sentences

Solving Percent Application Problems

GUIDED EXAMPLES

1. Write 45% as a decimal and as a fraction in simplest form.

Solution

$$45\% = \frac{\boxed{}}{100}$$ **Write as a ratio with 100 in the denominator.**

$$= \boxed{}$$ **Write the decimal form.**

$$= \boxed{}$$ **Write the fraction form.**

$$= \boxed{}$$ **Simplify to lowest terms.**

2. 60% of what number is 48?

Solution

Note the three pieces:

60%	of	what number	is	48?
↑		↑		↑
Percent	of	the whole	is	the part.

Method 1. Word-for-word translation:

60% of what number is 48?

$$\downarrow \qquad \downarrow \qquad \downarrow$$
$$0.60 \;\cdot\; n \;= 48$$

$$\boxed{} = \boxed{}$$

$$\boxed{} = \boxed{}$$

$$\boxed{} = \boxed{}$$

Method 2. Proportion:

$$\text{Percent} = \frac{\text{Part}}{\text{Whole}}$$

$$\frac{\boxed{}}{100} = \frac{\boxed{}}{\boxed{}} \qquad \begin{array}{l} \leftarrow \text{ Part} \\[6pt] \leftarrow \text{ Whole} \end{array}$$

$$\boxed{} = \boxed{}$$

$$\boxed{} = \boxed{}$$

$$\boxed{} = \boxed{}$$

Name: Date:

Instructor: Section:

PRACTICE PROBLEMS

Write each percent as a decimal and as a fraction in simplest form.

1.   65%

1._____

2.   9.25%

2._____

3. $14\frac{1}{3}\%$

3._____

Write as a percent rounded to the nearest tenth if necessary.

4. $\dfrac{4}{6}$

4._____

5.   0.05

5._____

6. $\dfrac{5}{9}$

6._____

Translate word for word or translate to a proportion; then solve.

7.   70% of 410 is what number?

7._____

8.   What is $75\frac{1}{2}\%$ of \$8610?

8._____

9. 51.85 is 61% of what number?

9._____

10. What percent of 88 is 22?

10._____

Solve.

11. Mary earns $340 per week and has 25% of this amount withheld for taxes, Social Security, and Medicare. Find the amount withheld.

11._____

12. A football player made 659 field goals of 1018 attempts. What percent of his field goal attempts did he make? Round to the nearest tenth of a percent.

12._____

13. The sales tax rate in Kentucky is 6%. How much tax is charged on a purchase of 4 telephones at $39 apiece? What is the total price?

13._____

14. During a sale, a dress decreased in price from $90 to $63. What was the percent decrease in the price of the dress?

14._____

15. Due to a slump in the economy, a mutual fund has dropped by 30% from last year to this year. If the fund is now worth $12,495, how much was the fund worth last year?

15._____

Chapter 3   PROBLEM SOLVING

3.3 Problems with Two or More Unknowns

KEY VOCABULARY

Term	Definition	Example
Complementary angles		
Supplementary angles		

KEY PROPERTIES, PROCEDURES, OR STRATEGIES

Solving Problems with Two or More Unknowns

NOTES

Name: Date:

Instructor: Section:

GUIDED EXAMPLE

A textbook has 20 more than three times the number of pages as a workbook. Combined, they have 200 pages. Find the number of pages in each.

Solution

Understand There are two unknowns in the problem. We must find:

_____ and

_____ .

Relationship 1: The textbook has 20 more than three times the number of pages in the workbook.
Relationship 2: The total number of pages in the textbook and the workbook is 200.

Plan   Translate the relationships to an equation and then solve.

Execute   Use the first relationship to determine which unknown will be represented by a variable and represent the other unknown in terms of that variable.

Relationship 1: The textbook has 20 more than three times the number of pages in the workbook.

Number of pages in the workbook: _____

Number of pages in the textbook: _____

Now use the second relationship to write an equation.

Relationship 2: The total number of pages in the textbook and the workbook is 200.

Number of pages   Number of pages
    in the   +   in the   = 200
  workbook   textbook

┌──────────┐   ┌──────────┐
│   │ + │   │ = 200
└──────────┘   └──────────┘

┌──────────┐
│   │ = 200   **Combine like terms.**
└──────────┘

┌──────────┐   ┌──────┐
│   │ = │   │   **Isolate the variable.**
└──────────┘   └──────┘

┌──────────┐   ┌──────┐
│   │ = │   │
└──────────┘   └──────┘

Answer   Number of pages in the workbook: ┌──────────┐
                                               │   │
                                               └──────────┘

             Number of pages in the textbook: ┌──────────┐
                                               │   │
                                               └──────────┘

Check   Verify that the total number of pages in both books is 200.

62

PRACTICE PROBLEMS

Translate to an equation and then solve.

1. A Special Olympics event has 4 more boys than girls competing. The total number of participants is 1000. How many boys competed and how many girls competed?

    1._____

2. The length of a rectangular mailing label is 3 centimeters less than twice the width. The perimeter is 30 centimeters. Find the dimensions of the label.

    2._____

3. Two angles are supplementary. One is 90° more than twice the other. Find the measures of the angles.

    3._____

4. The sum of three consecutive even integers is 180. What are the integers?

    4._____

5. The sum of three consecutive integers is 186. What are the integers?

5._____

6. Find three consecutive even integers such that twice the smallest plus four times the largest will result in the middle integer plus 84.
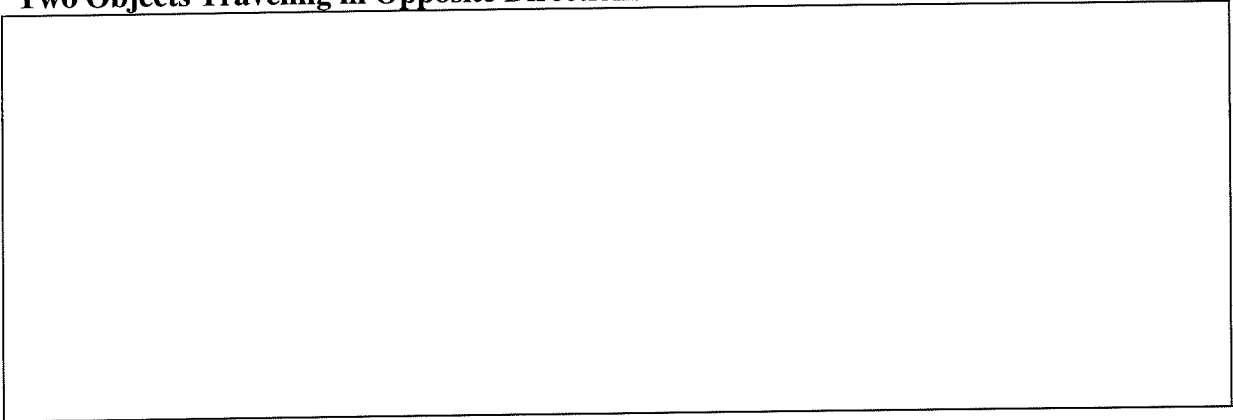
6._____
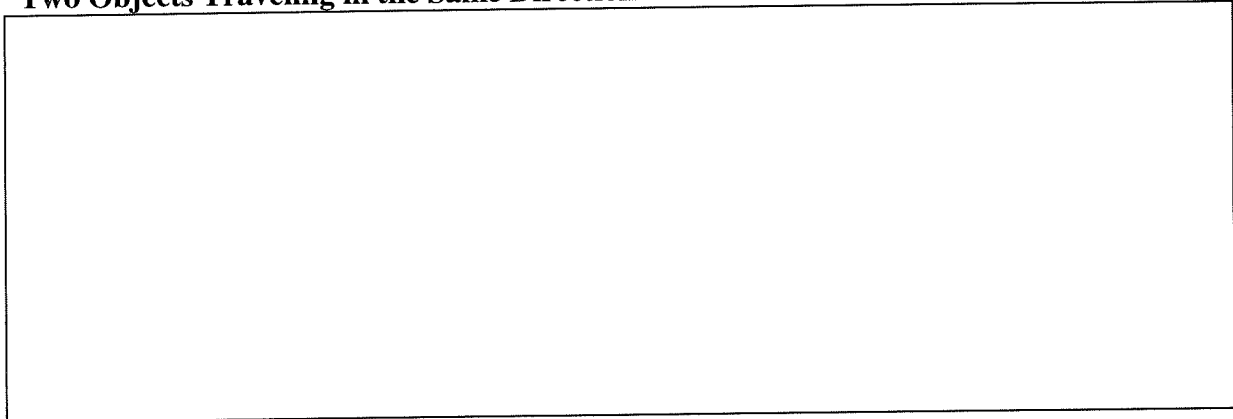
Chapter 3   PROBLEM SOLVING

3.4 Rates

KEY PROPERTIES, PROCEDURES, OR STRATEGIES

Two Objects Traveling in Opposite Directions

Two Objects Traveling in the Same Direction

NOTES

GUIDED EXAMPLE

A freight train leaves a station and travels north at 60 miles per hour. Four hours later, a passenger train leaves on a parallel track and travels north at 100 miles per hour. How long will it take the passenger train to overtake the freight train? How far from the station will they meet?

Solution

Understand To determine the time it takes for the passenger train to overtake the freight train, use a table to organize the rates and times.

Let t represent the time for the passenger train to catch up to the freight train. Add 4 hours to t to represent the freight train's time. Use the formula $d = rt$.

Categories	Rate	Time	Distance
Freight train			
Passenger train			

Plan   Set the expressions for the individual distances equal and solve for t.

Execute   Freight train's distance = Passenger train's distance

Length of time the freight train has traveled: _____ hours

Distance the freight train has traveled: _____ miles

Length of time the passenger train has traveled: _____ hours

Distance the passenger train has traveled: _____ miles

Answer   It will take the passenger train _____ hours to catch up to the freight

train. At that time, the trains have each traveled _____ miles.

Check   Verify that the trains have traveled the same distance after each train has traveled its respective length of time.

PRACTICE PROBLEMS

The following exercises involve people or objects moving in opposite directions. Complete a table, write an equation, and then solve.

1. Adam left Cleveland traveling north at an average speed of 61 miles per hour. Two hours later Kris left Cleveland traveling south at an average speed of 58 miles per hour. How long will it take after Adam left for them to be 955 miles apart?

    1._____

2. A train leaves Dallas and travels north at 85 kilometers per hour. Another train leaves at the same time and travels south at 70 kilometers per hour. How long will it take before they are 620 kilometers apart?

    2._____

3. Two cars pass each other traveling in opposite directions. One car is going $1\frac{1}{2}$ times as fast as the other car. At the end of $5\frac{1}{2}$ hours, they are 440 miles apart. Find each car's rate.

    3._____

The following exercises involve people or objects moving in the same direction. Complete a table, write an equation, and then solve.

4. A truck enters a highway driving 60 miles per hour. A car enters the highway at the same place 8 minutes later and drives 68 miles per hour in the same direction. From the time the car enters the highway, how many minutes will it take the car to pass the truck?

4._____

5. Two cars start driving in the same direction from the same place. If one travels 52 miles per hour and the other 61 miles per hour, how long will it take them to be 63 miles apart?

5._____

6. Allison drove for 2 hours on the freeway, then decreased her speed by 20 miles per hour and drove 4 more hours on a country road. If her total trip was 268 miles, then what was her speed on the freeway?

6._____

Application of Percent: Interest

Solve

55. Iris receives an inheritance of 50,000 and decides to invest it. She places it in a bank account that receives 4% interest for 3 years. How much interest will she earn? How much money will be in the account at the end of the 3 years?

56. Carol invests $300 in an account that receives 2% interest for 7 years. How much interest will she earn? How much money will be in the account?

57. Renee wants to invest for his retirement. He invests $90 in an account that receives 2% interest for 20 years. How much interest will he earn? How much money will be in the account?

58. Oscar deposits $950 in an account earning 5% interest for 10 years. How much interest will she earn? How much money will be in the account?

Chapter 3 PROBLEM SOLVING

3.1 Ratios and Proportions

1. $\dfrac{1}{6}$ 2. $\dfrac{99}{98}$ 3. $\dfrac{19}{1}$; for every 19 miles, he uses 1 gallon of gas.

4. Carton B; the unit price for carton B is about $0.050 and the unit price for carton A is

about $0.067.   5. yes   6. no   7. no   8. 4.8   9. -56

10. 2661 km   11. $x = 36$; $y = 25.5$; $z = 18$

3.2 Percents

1. 0.65; $\dfrac{13}{20}$ 2. 0.0925; $\dfrac{37}{400}$ 3. $0.14\overline{3}$; $\dfrac{43}{300}$ 4. 66.7%

5. 5%   6. 55.6%   7. 287   8. $6500.55   9. 85   10. 25%

11. $85.00   12. 64.7%   13. $9.36; $165.36   14. 30%   15. $17,850

3.3 Problems with Two or More Unknowns

1. 502 boys and 498 girls

2. width: 6 cm; length: 9 cm   3. 30°; 150°   4. 58, 60, 62

5. 61, 62, 63   6. 14, 16, 18

3.4 Rates

1. 9 hr.   2. 4 hr.   3. faster car: 48 mph; slower car: 32 mph

4. 60 min.   5. 7 hr.   6. 58 mph

3.5 Investment and Mixture

55. $6000/$56,000

56. $42/$3420

57. $360/$450

58. $475/$1425