Mini Lecture 3.1
Further Problem Solving

Learning Objectives:

1. Solve simple interest problems.
2. Solve mixture problems.
3. Solve motion problems.

Examples:

1. Given the formula $I = Prt$ (Interest = Principal • rate • time), calculate the interest on a $2000 deposit at 3% for 2 years.

2. If you invest $12,000, part at 6% simple interest and the remainder at 4% simple interest, the total interest after one year will be $640. Find the amount invested at each rate.

3. A 40 milliliter solution of bleach water contains 24% bleach. How much bleach is in the solution?

4. A chemist needs to mix a 20% acid solution with a 60% solution to obtain 40 milliliters of 50% solution. How many milliliters of each of the acid solutions must be used?

5. Use the formula $D = rt$ (Distance = rate · time) to calculate the average rate of an automobile that travels 300 miles in 5 hours.

6. Two cars leave from the same place, traveling in opposite directions. One car travels at 70 miles per hour and the other at 55 miles per hour. In how many hours will the cars be 250 miles apart?

Teaching Notes:

Suggested techniques for successful problem solving:

- Read the problem aloud if possible.
- Organize information in a table.
- Visualize the problem by sketching the information.
- Relate the problem to others similar in format.

Answers: 1. $120 2. $8000 @ 6%, $4000 @ 4% 3. 9.6 ml 4. 10 ml of 20%, 30 ml of 60% 5. 60 mph 6. 2 hours

Mini Lecture 3.2

Ratio and Proportion

Learning Objectives:

1. Find ratios.
2. Solve proportions.
3. Solve problems using proportions.

Examples:

1. Write a ratio for the given information first using a colon and then write the ratio as a fraction.

   a. The chances of winning the lottery are 1 in 1,000,000. Give the ratio of winning to losing.

   b. A recipe calls for 2 cups sugar for every 3 cups of flour. Give the ratio of sugar to flour.

   c. At Austin College, the women out number the men 4 to 1. Give the ratio of women to men.

2. Write the ratio as a fraction in lowest terms.

   a. 6 : 15 b. 18 : 3 c. 14 to 20 d. 12 to 10

3. Verify that each proportion is true.

   a. $\frac{16}{28} = \frac{8}{14}$ b. $\frac{9}{6} = \frac{18}{12}$ c. $\frac{17}{51} = \frac{4}{12}$

4. Use cross products to solve each proportion for x.

   a. $\frac{5}{6} = \frac{x}{18}$ b. $\frac{\frac{3}{4}}{x} = \frac{5}{4}$ c. $\frac{1.6}{x} = \frac{0.56}{2.1}$ d. $\frac{3}{15} = \frac{23}{x}$

Teaching Notes:

- Have students give examples of real life situations where ratios are used.
- Remind students that ratios compare two (2) different things.
- It should be stressed to students that when using proportions to solve word problems the ratios must have the kinds of units in the numerators and the same kinds of things in the denominators.
- Word problems that can be solved using proportions are easy!

Answers: 1. a. 1:1,000,000; $\frac{1}{1{,}000{,}000}$ b. 2:3; $\frac{2}{3}$ c. 4:1; $\frac{4}{1}$

2. a. $\frac{2}{5}$ b. $\frac{6}{1}$ c. $\frac{7}{10}$ d. $\frac{6}{5}$

3. a. $16 \cdot 14 = 28 \cdot 8$ b. $9 \cdot 12 = 6 \cdot 18$ c. $17 \cdot 12 = 51 \cdot 4$
   $224 = 224$ $108 = 108$ $204 = 204$

4. a. $x = 15$ b. $x = \frac{3}{5}$ c. $x = 6$ d. $x = 115$

Mini Lecture 3.3

Problem Solving in Geometry

Learning Objectives:

1. Solve problems using formulas for perimeter and area.
2. Solve problems using formulas for a circle's area and circumference.
3. Solve problems using formulas for volume.
4. Solve problems involving the angles of a triangle.
5. Solve problems involving complementary and supplementary angles.

Examples:

1. A triangular flower bed has an area of 48 square feet and a height of 12 feet. Find the base of the flower bed.

2. The diameter of a fish pond is 6 feet. Find the area and circumference of the fish pond. First express answer in terms of π, then round both answers to the nearest square foot and foot respectively.

3. Which is the better buy: a 3 liter bottle of soft drink for \$2.99 or a 1.2 liter bottle for \$1.10?

4. Find the volume of a cylinder with a radius of 2 inches and height of 6 inches. Give answer in π form and then round answer to nearest cubic inch.

5. A volleyball has a radius of 3 inches. Find how much air is needed to fill the ball. Give answer in π form and then round answer to nearest cubic inch.

6. Given a right triangle and knowing that the two acute angles are complementary, find the measure of each if one angle is twice the measure of the other.

Teaching Notes:

- Make sure to emphasize the formulas outlined in the section.
- Write formula, substitute the given values and solve for the unknown.

Answers: 1. base = 8 ft. 2. area = 9π ft^2, 28 ft^2; circumference = 6π ft., 19 ft. 3. 1.2 liter bottle 4. 24π in^3, 75 ft^3 5. 36π in^3, 113 in^3 6. 30°, 60°