

Name: _____

Modeling with Linear Equations

For each problem: define the variable, write the equation and solve.

1. Find the two consecutive integers whose product is 5 less than the square of the smaller number.

$$n(n+1) = n^2 - 5$$
$$n^2 + n = n^2 - 5$$
$$n = -5$$
$$-4$$

2. A picture frame has a total perimeter of 2 meters. The height of the frame is 0.62 times its width.

- a) Write h in terms of w and write an equation for the perimeter in terms of w .

$$h = 0.62w$$

$$P = 2w + 2(0.62w) = 3.24w$$

- b) Find the dimensions of the picture frame.

$$2 = 3.24w$$

$$\frac{2}{3.24} = w \approx 0.617$$
$$h \approx 0.383$$

3. Suppose you are taking a course that has four tests. The first three tests are 100 points each and the fourth test is 200 points. To get an A in the course, you must have an average of at least 90% on the four tests. Your scores on the first three tests were 87, 92, and 84. What must you score on the fourth test to get an A (90%) for the course?

$$\text{Total Points } 3 \times 100 + 200 = 500 \text{ pts}$$

$$\text{Points Earned to get } 90\% \rightarrow 0.9(500)$$
$$= 450$$

$$450 - 87 - 92 - 84 = 187 \text{ pts}$$
$$93.5\%$$

4. Students are traveling in two cars to a football game 135 miles away. The first car leaves on time and travels at an average speed of 45 miles per hour. The second car starts $\frac{1}{2}$ hour later and travels at an average speed of 55 miles per hour. How long will it take the second car to catch up to the first car before the first car arrives at the game? Will the second car catch up to the first car before the first car arrives at the game?

	D	R	t
A	135	45	t
B	135	55	$t - \frac{1}{2}$

$$D = D$$
$$45t = 55(t - \frac{1}{2})$$
$$t = 2.75$$

5. Two cars start at a given point and travel in the same direction at average speeds of 40 miles per hour and 55 miles per hour. How much time must elapse before the two cars are 5 miles apart?

$$\begin{array}{l} A \quad D \quad R \quad t \\ \quad D_A = 40 \cdot t \\ B \quad D_B = 55 \cdot t \end{array}$$

$$D_A + 5 = D_B$$

$$40t + 5 = 55t$$

$$t = \frac{1}{3} = 20 \text{ min}$$

6. A truck driver traveled at an average speed of 55 miles per hour on a 200 mile trip to pick up a load of freight. On the return trip (with the truck fully loaded), the average speed was 40 miles per hour. Find the average speed for the round trip.

$$\begin{array}{l} A \quad D = R \cdot t \\ \quad 200 \quad 55 \quad t_A \rightarrow \frac{200}{55} = 3.\overline{63} \\ B \quad 200 \quad 40 \quad t_B \rightarrow \frac{200}{40} = 5 \end{array}$$

$$\text{Avg Speed} = \frac{\text{Total Dist}}{\text{Total Time}}$$

$$= \frac{400}{5 + 3.\overline{63}} \approx 46.4$$

7. An automobile dealer has \$60,000 of inventory in compact cars and midsize cars. The profit on a compact car is 24% and the profit on a midsize car is 28%. The profit for the entire stock is 25%. How much was invested in each type of car?

$$X + Y = 60000$$

$$.24X + .28Y = .25(60000)$$

$$X = 45000$$

$$Y = 15000$$

8. A 100% concentrate is to be mixed with a mixture having a concentration of 40% to obtain 55 gallons of a mixture with a concentration of 75%. How much of the 100% mixture will be needed? 100% 40%

$$X + Y = 55$$

$$\frac{X + .4Y}{55} = .75 \rightarrow$$

$$X + .4(55 - X) = 41.25$$

$$.6X + 22 = 41.25$$

$$.6X = 19.25$$

$$X = 32.08$$