

INTERMEDIATE ALGEBRA

GPS # 29

6.6 MODELING WITH PROPORTIONS AND VARIATIONS

NAME: Kelly Fenton

Useful Definitions: [k is a constant.]

* Proportion: A statement that two ratios are equal. Example: $\frac{x}{2} = \frac{3}{4}$

* $y = kx$: y varies directly as x . Example: $V = \frac{4}{3}\pi r^3$ (volume of a sphere)
 → x increase, so y increase

* $y = \frac{k}{x}$: y varies inversely as x . Example: $r = \frac{d}{t}$ (speed of a vehicle)
 → when x increase, y decrease

* $y = kxz$: y varies jointly as x and z . Example: $I = prt$ (simple interest of an investment)
 → more than 2

1. Find the missing number in the proportion.

a) $\frac{x}{10} = \frac{7}{5}$ LCD: 10
 $x = 14$

b) $\frac{k}{2} = \frac{4}{3}$ LCD: 6
 $3k = 8$ $k = \frac{8}{3}$

c) $\frac{3}{4} = \frac{x}{16}$ LCD: 16
 $12 = x$
 $x = 12$

d) $\frac{y}{30} = \frac{30}{45}$ LCD: 90
 $3y = 60$ $y = 20$

2. The voltage in a simple electrical circuit is directly proportional to the resistance. If the voltage is 5 volts when the resistance is 15 ohms, find the voltage when the resistance is 24 ohms.

$y = kx$
 Voltage - directly resistance ($y = kx$)
 $5 = k(15)$
 $\frac{5}{15} = \frac{k}{15}$ $k = \frac{1}{3}$
 $y = \frac{1}{3}x$ (slope = $\frac{1}{3}$)
 Find y when $x = 24$
 $y = \frac{1}{3}(24)$
 $y = 8$ volts (answer)

3. Body mass index, or BMI, is used by physicians to access a person's level of fatness. A BMI from 19 through 25 is considered desirable. BMI varies directly as an individual's weight in pounds and inversely as the square of the individual's height in inches. A person who weights 120 lbs and is 60 in. tall has a BMI of 20. (Source: Washington Post.) Find the BMI of a person who weights 150 lb with a height of 60 in.

BMI = 19-25
 let weight = x
 height = y
 $BMI = \frac{kx}{y^2}$
 $20 = \frac{k(120)}{(60)^2}$
 $30 \cdot 20 = \frac{k}{30} \cdot 30$
 $k = 600$
 $BMI = \frac{600x}{y^2}$
 $= \frac{(600)(150)}{(60)^2} = \frac{150}{6} = 25$

4. As simple interest varies jointly as principal and time, if your investment of \$1,000, left in a mutual fund for 2 years, earned you an interest of \$200. How much interest would you expect to earn in 10 years?

$I = prt$ → $I = \frac{1}{10}pt$
 $I = kpt$
 $200 = k(1,000)(2)$
 $\frac{200}{2000} = \frac{2000k}{2000}$
 $k = \frac{1}{10}$ or 10%
 $I = \frac{1}{10}(1,000)(10)$
 $= \$1,000.00$

Good job!