

Look for the following words:

y varies directly with x

y varies with x

y is directly proportional to x

y is proportional to x

Replace these words with the following equation:

$$y = kx$$

The variable "k" is called the "constant of variation" or sometimes called "the constant of proportionality"

Ex 1) Find the constant of variation and the equation of variation where y varies directly with x, and where  $y = 32$  when  $x = 2$ .

(I)

$$y = k \cdot x$$
$$\frac{32}{2} = \frac{k \cdot 2}{2}$$
$$16 = k$$

Ex 2) If  $y$  varies directly with  $x$ , and  $y = 15$  when  $x = 24$ , find  $x$  when  $y = 25$ .

① Find the constant of variation.

$$y = k \cdot x$$

$$15 = k \cdot 24$$

$$\frac{15}{24} = \frac{k \cdot 24}{24}$$

$$k = \frac{5}{8}$$

② Replace  $k$  with  $\frac{5}{8}$  & solve the rest of the problem.

$$y = \frac{5}{8} \cdot x$$

$$25 = \frac{5}{8} \cdot x$$

$$\frac{8}{5} \cdot \frac{5}{1} \cdot \frac{25}{1} = \frac{5}{8} \cdot x \cdot \frac{8}{5}$$

$$x = 40$$

Ex 3) The electric current (I), in amperes, in a circuit varies directly as the Voltage (V). When 12 volts are applied the current is 4 amperes. What is the current when 18 volts are applied?

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*v is 12*  
*I is 4*  
*v is 18*  
*solve for I*

$$\textcircled{\text{I}} \quad I = k \cdot V$$
$$\frac{4}{12} = \frac{k \cdot 12}{12}$$
$$k = \frac{1}{3}$$

$$\textcircled{\text{II}} \quad I = \frac{1}{3} V$$
$$I = \frac{1}{3} (18)$$
$$I = 6$$

Ex 4) The period of a pendulum is directly proportional to the square root of the length of the pendulum. If a pendulum 64 cm long has a period of 1.6 seconds, what is the period of a pendulum 1m (100 cm) long?

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$$\textcircled{\text{I}} \quad P = k \cdot \sqrt{L}$$

$$1.6 = k \sqrt{64}$$

$$\frac{1.6}{8} = \frac{k \cdot 8}{8}$$

$$k = 0.2$$

$$\textcircled{\text{II}} \quad P = 0.2 \sqrt{L}$$

$$P = 0.2 \sqrt{100}$$

$$P = (0.2)(10)$$

$$P = 2 \text{ seconds}$$

If  $a$ ,  $b$ , and  $c$  are positive,  
and  $\frac{a}{b} = \frac{b}{c}$ , then  $b$  is the  
geometric mean of  $a$  &  $c$ .

EX 5 Find the geometric mean between 4 and 20

$$\frac{4}{b} = \frac{b}{20}$$

$$b^2 = 80$$

$$\sqrt{b^2} = \sqrt{80}$$

$$b = \sqrt{16} \sqrt{5}$$

$$b = 4\sqrt{5}$$