

1.10 Mod. Var.

$$y = kx - \text{Direct}$$

$$y = \frac{k}{x} \text{ or } y = k \cdot \frac{1}{x} - \text{inverse}$$

$$y = k^2 x - \text{Square}$$

"K" is the constant of variation

write an eq. that expresses the statement

ex. 1

T varies directly as x.

↓
 $T = kx$

"="

↑
multi.
k

by "x"

ex. 2

ω is proportional to the product of m and n.

ω = kmn

ex. 3

$$A = k \dots$$

$$x^2$$

A is proportional to the square x and inversely proportional to the cube of t .
 t^3 → divide or put in denom

$$A = \frac{kx^2}{t^3}$$

ex. 4 ⁽¹⁾ Express as eq. and find (2) constant of proportionality (k)

~~1~~ ① y is directly proportional to x

② If $x=6$, then $y=42$

① write eq.

$$y = kx$$

② Sub in variable. solve for k

$$\frac{42}{6} = \frac{k(6)}{6}$$

$$\boxed{7 = k}$$

③ $y = 7x$ eq. with k sub. in.

ex. 5

t is proportional to the product of x and y and inversely proportional to r.

If $x=2, y=3$ and $r=12$, then $t=25$

$$t = \frac{kxy}{r} \leftarrow \text{eq.}$$

$$t = \frac{50xy}{r}$$

$$25 = \frac{k \cdot 2 \cdot 3}{12}$$

$$25 = \frac{6k}{12}$$

$$(2) 25 = \frac{k}{2} (2)$$

$$\boxed{50 = k}$$

1.10 Modeling Variation

Direct Variation

$$y = k \cdot x \quad ; \text{ direct or proportional to.}$$

multiply

Inverse Variation

$$y = \frac{k}{x} \quad ; \text{ inversely}$$

or

$$y = k \cdot \frac{1}{x}$$

"k" is the constant of Proportionality.

Write an equation that expresses the Statement.

ex. 1

P is directly Proportional to w.

$P = k \cdot w$

multiply

ex. 2

Z is proportional to the square root y.

$$Z = k\sqrt{y}$$

ex. 3

R is ~~prop.~~ Prop. to the product of the squares of P and t, and inversely prop. to the cube of b.

Divide or Put in denom.

$$R = \frac{k P^2 t^2}{b^3}$$

- ① Express Statement as eq.
- ② Find constant of Proportionality. (K)

ex. 4

R is inversely proportional to the square root of x. If $x=121$, then $R=2.5$.

$$\text{① } R = \frac{k}{\sqrt{x}}$$

② sub. in variables and solve for k.

$$2.5 = \frac{k}{\sqrt{121}}$$

$$(11) 2.5 = \frac{k}{11} \quad (11)$$

$$\boxed{27.5 = k}$$

ex. 5

multiply (Product)

H is jointly proportional to the squares of l and w. If $l=2$ and $w=\frac{1}{3}$, then $H=36$.

$$\text{① } H = k l^2 w^2$$

$$\text{② } 36 = k (2)^2 \left(\frac{1}{3}\right)^2$$

$$36 = k (4) \left(\frac{1}{9}\right)$$

$$\left(\frac{9}{4}\right) 36 = k \left(\frac{4}{9}\right) \cdot \left(\frac{9}{4}\right)$$

$$\frac{324}{4} = k$$

$$\boxed{k = 81}$$