PROPORTIONS AND VARIATION

RATIO = A QUOTIENT OF TWO QUANTITIES THAT HAVE THE SAME UNIT (OF MEASUREMENT)

$800 , $150

$$\frac{\$150}{\$800} = \frac{\cancel{150}^{3}}{\cancel{800}_{16}} = \frac{3}{16} \quad \text{(NO UNIT)}$$

RATE = A QUOTIENT OF TWO QUANTITIES THAT HAVE DIFFERENT UNITS

$$\frac{120 \text{ miles}}{3 \text{ gal}} = 40 \text{ miles/gal}$$

PROPORTION: EQUALITY OF TWO RATIOS OR RATES.

$$\frac{90 \text{ miles}}{3 \text{ hours}} = \frac{120 \text{ miles}}{4 \text{ hours}}$$

↑ EQUATION

Ex1

COST : $24,000
TAX : $1320
TAX : ?
COST : $29,000

COST : TAX

$$\frac{24{,}000}{29{,}000} = \frac{1320}{x}$$

$$\frac{\cancel{24{,}000}}{\cancel{29{,}000}} = \frac{1320}{x}$$

$$\frac{24}{29} = \frac{1320}{x}$$

$$24x = 29 \cdot 1320$$

$$\begin{array}{r} 1320 \\ \times \quad 29 \\ \hline 11880 \\ 2640 \\ \hline 38{,}280 \end{array}$$

$$\begin{array}{r} 1595 \\ 24\overline{)38280} \\ 24 \\ \hline 142 \\ 120 \\ \hline 228 \\ 216 \\ \hline 120 \\ 120 \\ \hline 0 \end{array}$$

$$\frac{24x}{24} = \frac{38,280}{24}$$

$$x = 1595$$

Ex2

50 SHARES $\longrightarrow$ DIVIDEND \$106

? $\longrightarrow$ \$424

SHARES : DIVIDEND

$$\frac{50}{50+x} = \frac{106}{424} \quad \frac{53}{212} \quad \frac{1}{4}$$

$$\frac{50}{50+x} = \frac{1}{4}$$

$$50 \cdot 4 = 1 \cdot (50+x)$$

$$200 = 50 + x$$

$$-50 \qquad -50$$

$$\boxed{150 = x}$$

Ex3

2 lb $\longrightarrow$ \$5.80

15 lb $\longrightarrow$?

$$\frac{2}{15} = \frac{5.80}{x}$$

$$2x = 15 \cdot 5.80$$

$$\frac{2x}{2} = \frac{87.00}{2}$$

$$x = \$43.50$$

DIRECT VARIATION

TWO QUANTITIES RELATED BY:

$$y = k \cdot x$$

↑ CONSTANT OF VARIATION

Ex CIRCLE: $C = \pi \cdot d$

C → CIRCUMFERENCE; d → DIAMETER

Ex 4 $A = k \cdot W$

$W = 50\,kg$ ... $2\,ml = A$

$W = 75\,kg$ ... ?

M1

$$\frac{W}{\frac{2}{3}\ \cancel{10}\ \cancel{50}} = \frac{A}{2} = \frac{75}{x}$$

$$\frac{2}{3} = \frac{2}{x}$$

$$\frac{2x}{2} = \frac{6}{2}$$

$x = 3$ ml

$$50\overline{)200}\ \ 0.04$$

M2

$$A = k \cdot W$$

$$\frac{2}{50} = \frac{k \cdot \cancel{50}}{\cancel{50}}$$

$0.04 = k$ → CONSTANT OF VARIATION

$$A = 0.04 \cdot 75$$

$$= 3\ ml.$$

Ex 5

(s) (t)

$S = k \cdot t^2$ ⟶ $64 = k \cdot (2)^2$

64 ft ... 2 sec

? ... 5 sec

$\frac{64}{4} = \frac{k \cdot 4}{4}$

$16 = k$

$S = 16 \cdot (5)^2$

$= 16 \cdot 25$

$= 400$ ft

Remark : $y = k \cdot x$ ⟶ DIRECT LINEAR VARIATION

$y = k \cdot x^2$ ⟶ DIRECT QUADRATIC VARIATION

$y = k \cdot x^3$ ⟶ DIRECT CUBIC VARIATION

DON'T APPLY (0/1).

INVERSE VARIATION

$y = \frac{k}{x}$ ← CONSTANT OF VARIATION

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

OR : $xy = k$

Ex7 (S) (P)

$S = \frac{K}{P}$

2,000 ---- 900

? 800

$\frac{2000}{1} = \frac{K}{900}$

$900 \cdot 2{,}000 = 1 \cdot K$

$1{,}800{,}000 = K$

$S = \frac{1{,}800{,}000}{800} = \frac{4500}{2} = 2250$

Ex8 (s) (w), (d) (L)

Ex8 (R) (d)

0.5 0.01 cm

? 0.02 cm

$R = \frac{K}{d^2}$

$0.5 = \frac{K}{(0.01)^2}$ $\quad \frac{0.5}{1} = \frac{K}{0.0001}$

$0.5 \cdot 0.0001 = K$

$0.00005 = K$

$R = \frac{0.00005}{(0.02)^2} = \frac{0.00005}{0.0004} = \frac{5}{40} = \frac{1}{8}$

$= 0.125$ ohm