2.5 Variations

$d = rt \Rightarrow d = 50t$

① Direct variation:

y varies directly with x

y is directly proportional to x

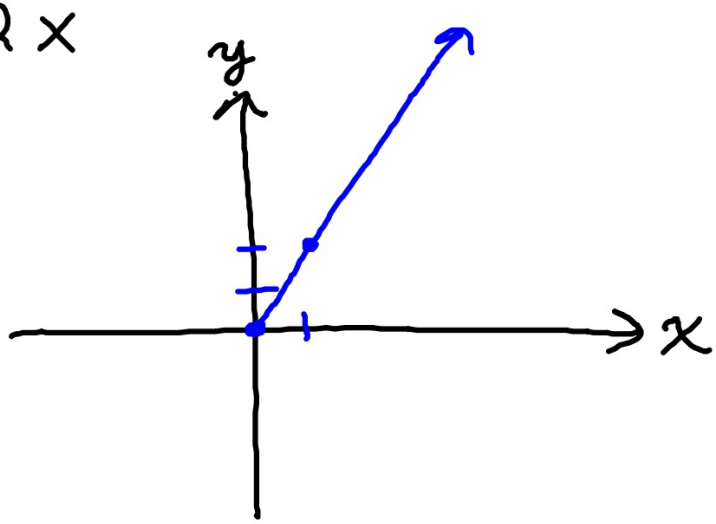
Equation: $y = K \cdot x$

$x \geq 0$
$y \geq 0$

K is the constant of proportionality.

Ex: $y = 2x$

x	y
0	0
1	2
2	4
3	6
⋮	⋮



(2) Inverse variation

y varies inversely with x

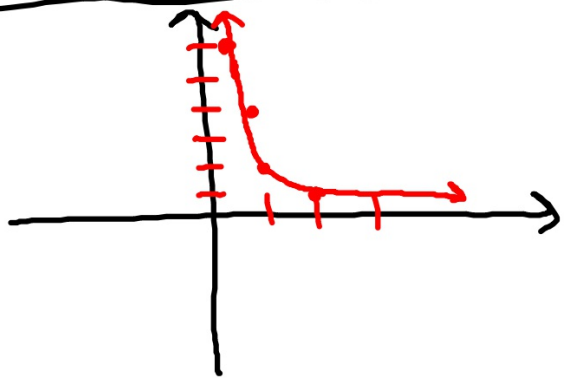
y is inversely proportional to x

Equation: $y = \frac{K}{x}$

$x > 0$
$y > 0$

Ex: $y = \frac{2}{x}$

x	y
$\frac{1}{3}$	6
$\frac{1}{2}$	4
1	2
2	1
3	$\frac{2}{3}$



③

joint variation:

z varies jointly with x and y.

$$\boxed{z = kxy}$$

Ex: Write the general formula for the following.

① y varies directly with x.
$y = 10$ when $x = 2$.

① $y = kx$ ② $10 = k(2)$ ③ $\boxed{y = 5x}$

$k = 5$

② y varies inversely with $\sqrt{x}$.

$y = 2$ when $x = 9$.

① $y = \frac{k}{\sqrt{x}}$ ② $2 = \frac{k}{\sqrt{9}}$

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

$k = 6$

③ $\boxed{y = \frac{6}{\sqrt{x}}}$

③ The square of T varies directly with the cube of a and inversely with the square of d.

$T = 2$ when $a = 2$ and $d = 4$.

① $T^2 = \frac{K a^3}{d^2}$

② $(2)^2 = \frac{K(2)^3}{(4)^2}$

$4 = \frac{8K}{16}$ → $4 = \frac{K}{2}$

$8 = K$

③ $T^2 = \frac{8a^3}{d^2}$

Problem 2.5.34 in book

① $I = \frac{K}{d^2}$

$I = 0.075$ foot-candle

$d = 2$ meters

$0.075 = \frac{K}{(2)^2}$

$0.075 = \frac{K}{4}$

$4(0.075) = K$

$K = 0.3$

Gen. formula: $I = \frac{0.3}{d^2}$

$I = ?$ $d = 5$ meters.

$I = \frac{0.3}{(5)^2} = \frac{0.3}{25}$

$I = 0.012$ foot-candle

$K = Kmv^2$

$\frac{1250}{100} = K(25)\left(\frac{10}{100}\right)^2$

$12.5 = 25K$

$.5 = K$

$K = \frac{1}{2}mv^2$

$K = \frac{1}{2}(25)(15)^2$

$K = 2812.5$ Joules