Direct Variation

If y varies directly as x then $y = kx$, where k is the constant of variation.

$x + y = 20$ $\qquad$ $xy = 20$ $\qquad$ * $\frac{x}{y} = 20$

$\frac{x}{y} = \frac{20}{1}$

$\frac{20y}{20} = \frac{x}{20}$

$y = \frac{1}{20}x$ $\quad$ cov $= \frac{1}{20}$

1. Find the constant of variation if the first variable varies directly as the second variable.

a) $x = 15,\ y = 3$

$x = k \cdot y$

$\frac{15}{3} = \frac{k \cdot 3}{3}$

$\boxed{k = 5}$

b) $a = -120,\ b = 30$

$a = k \cdot b$

$\frac{-120}{30} = \frac{k \cdot 30}{30}$

$\boxed{k = -4}$

c) $y = 4.5,\ x = 15$

$y = k \cdot x$

$\frac{4.5}{15} = \frac{k \cdot 15}{15}$

$\frac{4.5}{150} = \frac{45 \div 15}{150 \div 15} = \frac{3}{10}$

$\boxed{k = \frac{3}{10}}$

d) $A = 212,\ P = 200$

$A = k \cdot P$

$\frac{212}{200} = \frac{k \cdot 200}{200}$

$\frac{212 \div 4}{200 \div 4} = \frac{53}{50}$

$\boxed{k = \frac{53}{50}}$

2. Determine if y varies directly as x. If it does, find the constant of variation.

a)

x	2	6	10
y	-3	-9	-15

$y = K \cdot x$

$\frac{-3}{2} = \frac{K \cdot 2}{2}$

$K = -\frac{3}{2}$ *

$\frac{-9}{6} = \frac{K \cdot 6}{6}$

$K = -\frac{3}{2}$ *

$\frac{-15}{10} = \frac{K \cdot 10}{10}$

$K = \frac{-3}{2}$ *

$\boxed{\text{Yes, y varies directly as x } K = \frac{-3}{2}}$

b)

x	4	5	6
y	6	8	10

$y = K \cdot x$

$\frac{6}{4} = \frac{K \cdot 4}{4}$

$K = \frac{3}{2}$ *

$\frac{8}{5} = \frac{K \cdot 5}{5}$

$K = \frac{8}{5}$ *

$\boxed{\text{y does not vary directly as x}}$

3. If y varies directly as x, find the missing value.

a) $y = 14$ when $x = 2$. Find x when $y = 21$.

$y = K \cdot x$

$\frac{14}{2} = \frac{K \cdot 2}{2}$

$K = 7$

$y = K \cdot x$

$\frac{21}{7} = \frac{7 \cdot x}{7}$

$\boxed{x = 3}$

$\frac{y_1}{x_1} = \frac{y_2}{x_2}$

$\frac{14}{2} = \frac{21}{x}$

$\frac{14x}{14} = \frac{42}{14}$

$\boxed{x = 3}$

b) $y = 35$ when $x = -5$. Find y when $x = -20$.

$y = k \cdot x$

$\frac{35}{-5} = \frac{k \cdot (-5)}{-5}$

$k = -7$

$y = kx$

$y = (-7)(-20)$

$\boxed{y = 140}$

$\frac{x_1}{y_1} = \frac{x_2}{y_2}$

$\frac{-5}{35} = \frac{-20}{y}$

$\frac{-5y}{-5} = \frac{-700}{-5}$

$\boxed{y = 140}$