1. If y varies directely as x, and $y = 8$ when $x = 2$, find

(i). y in terms of x

Solution:

Given that y varies directly as x,

Therefore $y \propto x$ $i.e. y = kx$ ________ (i), where k is constant of variation

Putting $y = 8$ & $x = 2$ in eq.

$8 = 2k$

$k = \frac{8}{2}$

$k = 4$

Putting in eq (i) $k = 4$

$y = 4x$

(ii). y when $x = 5$

Solution:

$y \propto x$ $i.e. y = kx$ _______ (i), where k is constant of variation

Put $x = 5, k = 4$ in eq(i)

$y = (4)(5)$

$y = 20$

(iii). x when $y = 28$

Solution:

$y \propto x$ $i.e. y = kx$ _________(i), where k is constant of variation

Put $y = 28, k = 4$

$28 = (4)(x)$

$x = \frac{28}{4}$

$x = 7$

2. If $y \propto x$, and $y = 7$ when $x = 3$ find

(i). y in terms of x

Solution:

Given that y varies directly as x

$y \propto x$ $i.e. y = kx$ ________(i), where k is constant of variation

Putting $y = 7$ and $x = 3$ in eq(i)

$7 = (k)(3)$

$k = \frac{7}{3}$

Putting $k = \frac{7}{3}$ in eq(i)

$y = \frac{7}{3}x$

(ii). x when $y = 35$ and y when $x = 18$

Solution:

x When $y = 35$

Given that y varies directly as x

$y \propto x$ $i.e. y = kx$ ________(i), where k is constant of variation

Putting $y = 35$ & $k = \frac{7}{3}$ in eq(i)

$35 = \left(\frac{7}{3}\right)(x)$

$x = \frac{(35)(3)}{7}$

$x = 15$

y When $x = 18$

$y \propto x$ $i.e. y = kx$ ________(i), where k is constant of variation

Putting $x = 18$ & $k = \frac{7}{3}$

$y = \left(\frac{7}{3}\right)(18)$

$y = 42$

3. If $R \propto T$ and $R = 5$ when $T = 8$, find the equation connecting R and T. Also find R when $T = 64$ & T when $R = 20$.

Solution:

Given that R varies directly as T

$R \propto T$ i.e. $R = kT$ ________(i), where k is constant of variation

Putting $R = 5$ & $T = 8$ in eq(i)

$5 = (k)(8)$

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

R when $T = 64$

Putting $T = 64$ & $k = \frac{5}{8}$ in eq(i)

$R = \left(\frac{5}{8}\right)(64)$

$R = 40$

T when $R = 20$.

Putting $R = 20$ & $k = \frac{5}{8}$ in eq(i)

$20 = \left(\frac{5}{8}\right)(T)$

$T = \frac{(20)(8)}{5}$

$T = 32$

4. $R \propto T^2$ and $R = 8$ when $T = 3$, find R when $T = 6$.

Solution:

Given that R *varies directly as* T^2

Therefore, $R \propto T^2$ $i.e$ $R = kT^2$ ________(i), where k is constant of variation

Putting $R = 8$ & $T = 3$ in eq(i)

$8 = (k)(3)$

$k = \frac{8}{3}$

R when $T = 6$

Putting $k = \frac{8}{3}$ in eq(i)

$R = (\frac{8}{3})T^2$

R when $T = 6$

Putting $T = 6$ & $k = \frac{8}{3}$ in eq(i)

$R = (\frac{8}{3})(6)^2$

$R = \left(\frac{8}{3}\right)(36)$

$R = 32$

5. If $V \propto R^3$ and $V = 5$ when $R = 3$ find R when $V = 625$.

Solution:

Given that V *varies directly as* R^3

Therefore, $V \propto R^3$

$i.e.$ $V = kR^3$ ________(i), where k is constant of variation

Putting $V = 5$ & $R = 3$ in eq(i)

$5 = (k)(3)^3$

$5 = 27k$

$k = \frac{5}{27}$

R when $V = 625$

Putting $V = 625$ & $k = \frac{5}{27}$ in eq(i)

$625 = (\frac{5}{27})(R)^3$

$R^3 = \frac{(625)(27)}{5}$

$R^3 = (125)(27)$

$R^3 = (5)^3(3)^3$

Taking cube root on both sides,

$\sqrt[3]{R^3} = \sqrt[3]{(5)^3(3)^3}$

$R = (5)(3)$

$R = 15$

6. ***If w varies directly as u^3 and $w = 81$ when $u = 3$, find w when $u = 5$.***

Solution:

Given that w *varies directly as* u^3

Therefore, $w \propto u^3$

i.e. $w = ku^3$ ________(i), where k is constant of variation

Putting $w = 8$ & $u = 3$ in eq(i)

$81 = (k)(3)^3$

$81 = 27k$

$k = \frac{81}{27}$

$k = 3$

w when $u = 5$

Putting $u = 5$ & $k = 3$ in eq(i)

$w = (3)(5)^3$

$w = (3)(125)$

$w = 375$

7. $\boldsymbol{If\ y\ varies\ inversly\ as\ x\ and\ y = 7\ when\ x = 2, find\ y\ when\ x = 126.}$

Solution:

Given that $y\ varies\ inversly\ as\ x$

Therefore, $y \propto \frac{1}{x}$

$i.e.\, y = \frac{k}{x}$ ________(i), where k is constant of variation

Putting $y = 7$ & $x = 2$ in eq(i)

$7 = \frac{k}{2}$

$k = (7)(2)$

$k = 14$

$\boldsymbol{y\ when\ x = 126}$

Putting $x = 126$ & $k = 14$ in eq(i)

$y = \frac{14}{126}$

$y = \frac{1}{9}$

8. $\boldsymbol{If\ y \propto \frac{1}{x}}$ & $\boldsymbol{y = 4\ when\ x = 3, find\ x\ when\ y = 24.}$

Solution:

Given that $y \propto \frac{1}{x}$

Therefore, $y = \frac{k}{x}$ ________(i), where k is constant of variation

Putting $y = 4$ & $x = 3$ in eq(i)

$4 = \frac{k}{3}$

$(4)(3) = k$

$k = 12$

$\boldsymbol{x\ when\ y = 24}$

Putting $y = 24$ & $k = 12$ in eq(i)

$24 = \frac{12}{x}$

$x = \frac{12}{24}$

$x = \frac{1}{2}$

9. $\boldsymbol{If\ w \propto \frac{1}{z}}$ **&** $\boldsymbol{w = 5\ when\ z = 7, find\ w\ when\ z = \frac{175}{4}}$.

Solution:

Given that $w \propto \frac{1}{z}$

Therefore, $w = \frac{k}{z}$ _________(i), where k is constant of variation

Putting $w = 5$ & $z = 7$ in eq(i)

$5 = \frac{k}{7}$

$(5)(7) = k$

$k = 35$

$\boldsymbol{w\ when\ z = \frac{175}{4}}$

Putting $z = \frac{175}{4}$ & $k = 35$ in eq(i)

$w = \left(\frac{35}{\frac{175}{4}}\right)$

$w = \frac{(35)(4)}{175}$

$w = \frac{4}{5}$

10. $\boldsymbol{A \propto \frac{1}{r^2}}$ **&** $\boldsymbol{A = 2\ when\ r = 3, find\ r\ when\ A = 72.}$

Solution:

Given that $A \propto \frac{1}{r^2}$

Therefore, $A = \frac{k}{r^2}$ ________(i), where k is constant of variation

Putting $A = 2$ & $r = 3$ in eq(i)

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

$2 = \frac{k}{9}$

$(2)(9) = k$

$k = 18$

$\boldsymbol{r\ when\ A = 72}$

Putting $A = 72$ & $k = 18$ in eq(i)

$72 = \frac{18}{r^2}$

$r^2 = \frac{18}{72}$

$r^2 = \frac{1}{4}$

$r^2 = (\frac{1}{2})^2$

Taking square root on both sides

$$\sqrt{r^2} = \sqrt{(\frac{1}{2})^2}$$

$$r = \pm\frac{1}{2}$$

11. $\boldsymbol{a \propto \frac{1}{b^2}}$ & $\boldsymbol{a = 3\ when\ b = 4, find\ a\ when\ b = 8.}$

Solution:

Given that $a \propto \frac{1}{b^2}$

Therefore, $a = \frac{k}{b^2}$ ________(i), where k is constant of variation

Putting $a = 3$ & $b = 4$ in eq(i)

$$3 = \frac{k}{4^2}$$

$$3 = \frac{k}{16}$$

$$(3)(16) = k$$

$$k = 48$$

$\boldsymbol{a\ when\ b = 8}$

Putting $b = 8$ & $k = 48$

$$a = \frac{48}{(8)^2}$$

$$a = \frac{48}{64}$$

$$a = \frac{3}{4}$$

12. $\boldsymbol{V \propto \frac{1}{r^3}\ and\ V = 5\ when\ r = 3, find\ V\ when\ r = 6\ and\ r\ when\ V = 320.}$

Solution:

Given that $V \propto \frac{1}{r^3}$

Therefore, $V = \frac{k}{r^3}$ ________(i), where k is constant of variation

Putting $V = 5$ & $r = 3$ in eq(i)

$$5 = \frac{k}{(3)^3}$$

$$5 = \frac{k}{27}$$

$$(5)(27) = k$$

$$k = 135$$

$\boldsymbol{V \text{ when } r = 6}$

Putting $r = 6$ & $k = 135$ in eq(i)

$$V = \frac{135}{(6)^3}$$

$$V = \frac{135}{216}$$

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

$\boldsymbol{r \text{ when } V = 320}$

Putting $V = 320$ & $k = 135$ in eq(i)

$$320 = \frac{135}{r^3}$$

$$r^3 = \frac{135}{320}$$

$$r^3 = \frac{27}{64}$$

Taking cube root on both sides

$$\sqrt[3]{r^3} = \sqrt[3]{\frac{27}{64}}$$

$r = \frac{3}{4}$

13. $\boldsymbol{m \propto \frac{1}{n^3}}$ ***and*** $\boldsymbol{m = 2}$ ***when*** $\boldsymbol{n = 4}$, ***find*** $\boldsymbol{m}$ ***when*** $\boldsymbol{n = 6}$ ***and*** $\boldsymbol{n}$ ***when*** $\boldsymbol{m = 432}$.

Solution:

Given that $m \propto \frac{1}{n^3}$

Therefore, $m = \frac{k}{n^3}$ ________(i), where k is constant of variation

Putting $m = 2$ & $n = 4$ in eq(i)

$2 = \frac{k}{(4)^3}$

$2 = \frac{k}{64}$

$(2)(64) = k$

$k = 128$

$\boldsymbol{m}$ ***when*** $\boldsymbol{n = 6}$

Putting $n = 6$ & $k = 128$ in eq(i)

$m = \frac{128}{(6)^3}$

$m = \frac{128}{216}$

$m = \frac{16}{27}$

$\boldsymbol{n}$ ***when*** $\boldsymbol{m = 432}$

Putting $m = 432$ & $k = 128$ in eq(i)

$432 = \frac{128}{n^3}$

$n^3 = \frac{128}{432}$

$$n^3 = \frac{64}{216}$$

$$n^3 = (\frac{4}{6})^3$$

Taking cube root on both sides

$$\sqrt[3]{n^3} = \sqrt[3]{(\frac{4}{6})^3}$$

$$n = \frac{4}{6}$$

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