Exercise 3.2

Q.1

Given Data:

y **varies directly as** x

$y = 8$ when $x = 2$

Required

(i) y in terms of x

(ii) $y = ?$ when $x = 5$

(iii) $x = ?$ when $y = 28$

Solution:

Here $y \propto x$

$y = kx \rightarrow (i)$

For value of k

Put $y = 8$, $x = 2$

$(8) = k(2)$

$\Rightarrow k = 4$

(i) **y in terms of x:** **(A.B + K.B)**

Put $k = 4$ in equation (i)

$y = 4x$

(ii) **For value of y:** **(A.B + K.B)**

Put $x = 5$ and $k = 4$, we get

$y = (4)(5)$

$y = 20$

(iii) **For value of x:** **(A.B + K.B)**

Put k and y in the equation (i), we get

$28 = 4x$

$\Rightarrow x = 7$

Result

(i) y = $4x$

(ii) y = 20 when $x = 5$

(iii) $x = 7$ when $y = 28$

Q.2

Given Data:

$y \propto x$

y = 7 when $x = 3$

Required

(i) y in term of x

(ii) **(a)** $x = ?$ when $y = 35$ **(A.B)**

(b) $y = ?$ when $x = 18$ **(A.B)**

Solution:

Here, $x \propto$ y or $y \propto x$

$y = kx \rightarrow (i)$

For value of k

Put $y = 7, x = 3$

$7 = k(3)$

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

(i) **y in terms of x** **(A.B)**

$y = kx$

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

(ii) **For values of x:** **(A.B)**

Put y = 35 in equation (i), we get

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

$\frac{35 \times 3}{7} = x$

$\Rightarrow x = 15$

For value of y

Put x = 18 in equation (i), we get;

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

y = 7(6)

y = 42

Result

(i) y = $\frac{7}{3}x$

(ii) **(a)** $x = 15$

(b) $y = 42$

Q.3 **(A.B + U.B)**

Given Data:

$R \propto T$

$R = 5 \text{ when } T = 8$

Required

Equation connecting R and T.

$R = ?$ when $T = 64$

$T = ?$ when $R = 20$

Solution:

Here, $R \propto T$

$R = kT$

For value of k

Put R=5 and T=8

$5 = 8(k)$

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

The equation connecting R and T is:

$$R = \frac{5}{8}T \rightarrow (i)$$

For value of R

By putting $T = 64$ in equation (i), we get;

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

$$R = 5(8)$$

$$R = 40$$

For value of T

By putting $R = 20$ in equation (i), we get;

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

$$20 \times \frac{8}{5} = T$$

$$\Rightarrow T = 32$$

Result

$$R = \frac{5}{8}T$$

$R = 40$ when $T = 64$

$T = 32$ when $R = 20$

Q.4 **(A.B + U.B)**

Given Data:

$R \propto T^2$

$R = 8 \text{ when } T = 3$

Required

$R = ?$ when $T = 6$

Solution:

$R \propto T^2$

$R = kT^2 \rightarrow (i)$

For value of k

Put $R = 8, T = 3$ in equation (i), we get

$8 = k(3)^2$

$8 = k(9)$

$\frac{8}{9} = k$

$\Rightarrow k = \frac{8}{9}$

$\therefore R = \frac{8}{9}T^2 \rightarrow (ii)$

For value of R

Put $T = 6$ in equation (ii), we get

$$R = \frac{8}{9}(6)^2$$

$$R = \frac{8}{9}(36)$$

$$R = 8(4)$$

$$R = 32$$

Result:

$R = 32$ when $T = 6$

Q.5 **(A.B)**

Given Data:

$V \propto R^3$

$V = 5$ when $R = 3$

Required data:

$R = ?$ when $V = 625$

Solution:

Here, $V \propto R^3$

$V = kR^3 \rightarrow (i)$

For value of k

Put $V = 5$ and $R = 3$ in equation (i), we get

$5 = k(3)^3$

$5 = 27k$

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

$$V = \frac{5}{27}R^3$$

For value of R

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

$$\frac{625\times 27}{5} = R^3$$
$$125\times 27 = R^3$$
$$3375 = R^3$$

Taking cube root on both sides

$$\Rightarrow \sqrt[3]{R^3} = \sqrt[3]{3375}$$
$$R = 15$$

Result

$R = 15$ when $V = 625$

Q.6 **(A.B)**

Given Data:

$w \propto u^3$

$w = 81$ when $u = 3$

Required data:

$w = ?$ when $u = 5$

Solution

Here, $w \propto u^3$

$w = ku^3 \rightarrow (i)$

For value of k

Put $w = 81, u = 3$ in equation (i), we get

$$(81) = k(3)^3$$
$$81 = k(27)$$
$$\frac{81}{27} = R$$
$$k = 3$$
$$\therefore w = 3u^3 \rightarrow (ii)$$

Put $u = 5$ in equation (ii), we get

$$w = 3(5)^3$$
$$w = 3(125)$$
$$w = 375$$

Result

$w = 375$ when $u = 5$

Q.7 **(A.B)**

Given Data:

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

$y = 7$ when $x = 2$

Required data:

$y = ?$ when $x = 126$

Solution:

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

$$y = k\frac{1}{x} \rightarrow (i)$$

For value of k

Put $y = 7$ and $x = 2$ in equation (i), we get

$$7 = \frac{k}{2}$$
$$\Rightarrow k = 7(2)$$
$$k = 14$$
$$\therefore y = \frac{14}{x} \rightarrow (ii)$$

For value of y

Put $x = 126$ in equation (ii), we get

$$y = \frac{14}{126}$$
$$y = \frac{1}{9}$$

Result:

$y = \frac{1}{9}$ when $x = 126$

Q.8 **(A.B + U.B)**

Given Data:

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

$y = 4$ when $x = 3$

Required data:

$x = ?$ when $y = 24$

Solution:

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

$$y = \frac{k}{x} \rightarrow (i)$$

For value of k

Put $y = 4$ and $x = 3$ in equation (i), we get

$$4 = \frac{k}{3}$$
$$\Rightarrow k = 12$$
$$\therefore y = \frac{12}{x} \rightarrow (ii)$$

For value of x

Put $y = 24$ in equation (ii), we get

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

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

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

Result:

$x = \frac{1}{2}$ when $y = 24$

Q.9 **(A.B + U.B)**

Given Data:

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

$w = 5$ when $z = 7$

Required data:

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

Solution:

Here, $w \propto \frac{1}{z}$

$w = \frac{k}{z} \rightarrow (i)$

For value of k

Put $w = 5$ and $z = 7$ in equation (i), we get

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

$$\Rightarrow k = 35$$

$$\therefore w = \frac{35}{z} \rightarrow (ii)$$

For value of w

Put $z = \frac{175}{4}$ in equation (ii), we get

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

$$w = 35 \div \frac{175}{4}$$

$$w = 35 \times \frac{4}{175}$$

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

Result:

$w = \frac{4}{5}$ when $z = \frac{175}{4}$

Q.10 **(A.B + U.B)**

Given Data:

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

$A = 2$ when $r = 3$

Required data:

$r = ?$ when $A = 72$

Solution:

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

$$A = \frac{k}{r^2}$$

For value of k

$$A = \frac{k}{r^2}$$

Put $A = 2$ and $r = 3$

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

$$18 = k$$

Or $k = 18$

$$A = \frac{18}{k}$$

For value of r

$$A = \frac{k}{r^2}$$

Put $A = 72$ and $k = 18$

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

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

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

Taking square root

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

Result:

$r = \pm\frac{1}{2}$ when $A = 72$

Q.11 **(A.B + U.B)**

Given Data:

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

$a = 3$ when $b = 4$

Required data:

$a = ?$ when $b = 8$

Solution:

$$a = \frac{1}{b^2}$$

$$a = \frac{k}{b^2} \rightarrow (i)$$

For value of k

Put the value $a = 3$ and $b = 4$ in eq (i), we get

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

$$3(16) = k$$

$$\Rightarrow k = 48$$

$$\therefore a = \frac{48}{b^2} \rightarrow (ii)$$

For value of a

Put $b = 8$ in equation (ii), we get

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

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

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

Result:

$a = \frac{3}{4}$ when $b = 8$

Q.12 **(A.B + U.B)**

Given data:

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

$V = 5$ when $r = 3$

Required data:

$V = ?$ when $r = 6$

$r = ?$ when $V = 320$

Solution:

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

$$V = \frac{k}{r^3} \rightarrow (i)$$

For value of k

Put $V = 5$ and $r = 3$ in equation (i), we get

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

$$5(27) = k$$

$$k = 135$$

$$\therefore V = \frac{135}{r^3} \rightarrow (ii)$$

For value of V

Put $r = 6$ in equation (ii), we get

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

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

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

For value of r

Put $V = 320$ in equation (ii), we get

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

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

Taking cube root on both sides, we get

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

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

Result

$V = \frac{5}{8}$ when $r = 6$

$r = \frac{3}{4}$ when $V = 320$

Q.13 **(SGD 2014)** **(A.B + U.B)**

Given

$m \propto \frac{1}{n^3}$ and m = 2 when n = 4

Required data:

(i) m = ? When n = 6

(ii) n = ? when m = 432

Solution

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

$$m = k \times \frac{1}{n^3}$$

$$m = \frac{k}{n^3} \rightarrow (i)$$

For value of k

Put $m = 2,\ n = 4$ in equation (i)

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

$$2 \times 64 = k$$

$$k = 2 \times 64$$

$$k = 128$$

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

For value of m

Put $k = 128,\ n = 6$

$$\text{m} = \frac{128}{(6)^3} \quad \because n = 6$$

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

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

For value of n

$$m = \frac{k}{n^3}$$

$$432 = \frac{128}{n^3} \quad \because m = 432$$

$$432\left(n^3\right) = 128$$

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

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

$$n^3 = \frac{32}{108}$$

$$n^3 = \frac{16}{54}$$

$$n^3 = \frac{8}{27}$$

Taking cube root on both sides

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

Result:

$$m = \frac{16}{27} \text{ when } n = 6$$

$$n = \frac{2}{3} \text{ when } m = 432$$