EXERCISE 3.2

Q.1 If y varies directly as x, and y = 8 when x = 2, find

(i) y in terms of x

(ii) y when x = 5

(iii) x when y = 28

Solution: $\boxed{y \propto x}$ $\boxed{y=8,\ x=2}$ $\boxed{y=?,\ x=5}$ $\boxed{x=?,\ y=28}$

(i) $y \propto x$

$y = kx$ .....(i)

To find k,

Put $y = 8$ and $x = 2$ in equation (i)

$8 = k(2)$

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

$4 = k \Rightarrow \boxed{k = 4}$

(ii) To find y,

Put $k = 4$ in equation (i)

$y = kx$

$y = 4x$ .....(ii)

Now Put $x = 5$ in equation (ii)

$y = 4x$

$y = 4(5)$

$\boxed{y = 20}$

(iii) To find x,

Put $y = 28$ in equation (ii)

$y = 4x$

$28 = 4(x)$

$28 = 4(x)$

$7 = x \Rightarrow \boxed{x = 7}$

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

(i) y in terms of x

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

Solution:

$\boxed{y \propto x}$ $\boxed{y=7,\ x=3}$ $\boxed{x=?,\ y=35}$ $\boxed{x=18,\ y=?}$

(i) $y \propto x$

$y = kx$ .....(i)

To find k,

Put $y = 7$ and $x = 3$ in equation (i)

$7 = k(3)$

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

Put it in equation (i)

$y = kx$

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

To find *x*,

Put $y = 35$ in equation (ii)

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

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

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

$3 \times 5 = x$

$15 = x \Rightarrow \boxed{x = 15}$

To find *y*,

Put $k = \frac{7}{3}$ and $x = 18$ in equation (i)

$y = kx$

$y = \frac{7}{\cancel{3}}(\cancel{18}^{6})$

$y = 7(6)$

$\boxed{y = 42}$

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

Solution: $\boxed{R \propto T}$ $\boxed{R=5,\ T=8}$ $\boxed{R=?,\ T=64}$ $\boxed{R=20,\ T=?}$

$R \propto T$

$R = KT$ .....(i)

To find k,

Put $R = 5$ and $T = 8$ in equation (i)

$5 = K(8)$

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

Put $k = \frac{5}{8}$ in equation (i)

R=kT

$R = \frac{5}{8}T$ .....(ii)

To find *R*,

Put $T = 64$ in equation (ii)

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

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

$$R = 5(8)$$

$$\boxed{R = 40}$$

To find *T*,

Put $K = \frac{5}{8}$ and $R = 20$ in equation (i)

$$R = KT$$

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

$$T = \frac{\overset{4}{\cancel{20}} \times 8}{\cancel{5}}$$

$$4 \times 8 = T$$

$$32 = T \quad \Rightarrow \quad \boxed{T = 32}$$

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

Solution: $\boxed{R \propto T^2}$ $\boxed{\begin{matrix} R = 8 \\ T = 3 \end{matrix}}$ $\boxed{\begin{matrix} R = ? \\ T = 6 \end{matrix}}$

$$R \propto T^2$$

$$R = kT^2 \quad \text{.....(i)}$$

To find k,

Put R = 8 and T = 3 in equation (i)

$$8 = k(3)^2$$

$$8 = k(9)$$

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

To find R,

Put $k = \frac{8}{9}$ and T = 6 in equation (i)

$$R = kT^2$$

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

$$R = \frac{8\left(\overset{4}{\cancel{36}}\right)}{\cancel{9}}$$

$$R = 8(4) \quad \Rightarrow \quad \boxed{R = 32}$$

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

Solution: $\boxed{V \propto R^3}$ $\boxed{\begin{matrix} V = 5 \\ R = 3 \end{matrix}}$ $\boxed{\begin{matrix} R = ? \\ V = 625 \end{matrix}}$

$$V \propto R^3$$

$$V = kR^3 \quad \text{.....(i)}$$

To find k,

Put V = 5 and R = 3 in equation (i)

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

$$5 = k(27)$$

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

Put $k = \frac{5}{27}$ in equation (i)

$$V = kR^3$$

$$V = \frac{5}{27}R^3 \quad \text{.....(ii)}$$

To find R,

Now put $V = 625$ in equation (ii)

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

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

$$27 \times 125 = R^3$$

$$R^3 = 3^3 \times 5^3$$

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

$$R^3 = (15)^3$$

Taking cube root of both sides

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

$$R^{3 \times \frac{1}{3}} = 15^{3 \times \frac{1}{3}}$$

$$\boxed{R = 15}$$

Q.6 If w varies directly as u^3 and w = 81 when u =3. Find w, when u =5.

Solution: $\boxed{w \propto u^3}$ $\boxed{\begin{matrix} w=81 \\ u=3 \end{matrix}}$ $\boxed{\begin{matrix} w=? \\ u=5 \end{matrix}}$

$$w \propto u^3$$

$$w = ku^3 \quad \ldots\ldots\ldots\ldots\ldots\ldots (i)$$

To find k,

Put $w = 81$ and $u = 3$ in equation (i)

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

$$81 = k(27)$$

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

$$3 = k \Rightarrow \boxed{k = 3}$$

Put $k = 3$ in equation (i)

$$w = ku^3$$

$$w = 3u^3 \quad \ldots\ldots\ldots\ldots\ldots\ldots (ii)$$

To find w,

Now put u = 5 in equation (ii)

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

$$w = 3(125)$$

$$\boxed{w = 375}$$

Q.7 If y varies inversely as x and y = 7 when x = 2, find y, when x = 126.

Solution: $\boxed{y \propto \frac{1}{x}}$ $\boxed{\begin{matrix} y=7 \\ x=2 \end{matrix}}$ $\boxed{\begin{matrix} y=? \\ x=126 \end{matrix}}$

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

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

To find k,

Put $y = 7$ and $x = 2$

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

$$7 \times 2 = k$$

$$14 = k \Rightarrow \boxed{k = 14}$$

Put $k = 14$ in equation (i)

$$y = \frac{k}{x} = \frac{14}{x}$$

$$\Rightarrow y = \frac{14}{x} \quad \ldots\ldots\ldots (ii)$$

To find y,

Now put x = 126 in equation (ii)

$$y = \frac{14}{x} = \frac{14}{126} = \frac{\cancel{14}^{1}}{\cancel{126}\,9}$$

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

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

Solution: $\boxed{y \propto \frac{1}{x}}$ $\boxed{\begin{matrix} y=4 \\ x=3 \end{matrix}}$ $\boxed{\begin{matrix} x=? \\ y=24 \end{matrix}}$

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

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

To find k,

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

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

$$4 \times 3 = k$$

$$12 = k \Rightarrow \boxed{k = 12}$$

Put k = 12 in equation (i)

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

$$y = \frac{12}{x} \quad \ldots\ldots\ldots\ldots\ldots\ldots (ii)$$

To find x,

Now put y = 24 in equation (ii)

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

$$24x = 12$$

$$x = \frac{12}{24} = \frac{\cancel{12}^{1}}{\cancel{24}^{2}}$$

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

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

Solution: $\boxed{w \propto \frac{1}{z}}$ $\boxed{\begin{matrix} w = 5 \\ z = 7 \end{matrix}}$ $\boxed{\begin{matrix} w = ? \\ z = \frac{175}{4} \end{matrix}}$

$$w \propto \frac{1}{z} \qquad \text{(given)}$$

$$w = \frac{k}{z} \quad \ldots\ldots\ldots\ldots\ldots \text{(i)}$$

To find k,

Put w = 5 and z = 7 in equation (i)

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

$$5 \times 7 = k$$

$$35 = k \quad \Rightarrow \quad \boxed{k = 35}$$

Put K = 35 in equation (i)

$$w = \frac{k}{z} = \frac{35}{z} \Rightarrow w = \frac{35}{z} \ldots\ldots\ldots\ldots \text{(ii)}$$

To find w,

Now put $z = \frac{175}{4}$ in equation (ii)

$$w = \frac{35}{z} = 35 \div z$$

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

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

$$w = \frac{\cancel{140}}{\cancel{175}} \cancel{35}1 \times \frac{4}{\cancel{175}5}$$

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

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

Solution: $\boxed{A \propto \frac{1}{r^2}}$ $\boxed{\begin{matrix} A = 2 \\ r = 3 \end{matrix}}$ $\boxed{\begin{matrix} A = 72 \\ r = ? \end{matrix}}$

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

$$A = \frac{k}{r^2} \quad \ldots\ldots\ldots\ldots\ldots \text{(i)}$$

To find k,

Put A = 2 and r = 3 in equation (i)

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

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

$$2 \times 9 = k$$

$$18 = k \quad \Rightarrow \quad \boxed{k = 18}$$

Put k = 18 in equation (i)

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

$$A = \frac{18}{r^2} \ldots\ldots\ldots\ldots \text{(ii)}$$

To find r,

Now put A = 72 in equation (ii)

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

$$72r^2 = 18$$

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

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

Taking square root of both sides

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

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

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

Solution: $\boxed{a \propto \frac{1}{b^2}}$ $\boxed{\begin{matrix} a = 3 \\ b = 4 \end{matrix}}$ $\boxed{\begin{matrix} a = ? \\ b = 8 \end{matrix}}$

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

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

To find k,

Put a = 3 and b = 4 in equation (i)

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

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

$$3 \times 16\ k$$

$$48 = k \Rightarrow \boxed{k = 48}$$

Put K = 48 in equation .....(i)

$$a = \frac{k}{b^2} \Rightarrow a = \frac{48}{b^2} \text{.....(ii)}$$

To find a,

Now, put b = 8 in equation .....(ii)

$$a = \frac{48}{b^2} = \frac{48}{(8)^2} = \frac{48}{64}$$

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

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

Solution:

$\boxed{V \propto \frac{1}{r^3}}$ $\boxed{V = 5,\ r = 3}$ $\boxed{V = ?,\ r = 6}$ $\boxed{v = 320,\ r = ?}$

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

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

To find k,

Put V = 5 and r = 3 in equation (i)

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

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

$$5 \times 27 = k \quad \Rightarrow \quad \boxed{k = 135}$$

Put k = 135 in equation .....(i)

$$V = \frac{135}{r^3} \text{.....(ii)}$$

To find V, Put r = 6 in equation (ii)

$$V = \frac{135}{(6)^3} = \frac{135}{216}$$

$$\boxed{V = \frac{5}{8}} \textit{ (Dividing by 27)}$$

To find r, put v = 320 in equation (ii)

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

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

$$r^3 = \frac{135}{320} = \frac{27}{64}$$

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

$$r^3 = \left(\frac{3}{4}\right)^3 \text{ taking cube root}$$

$$\sqrt[3]{r^3} = \sqrt[3]{\left(\frac{3}{4}\right)^3}$$

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

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

Solution:

$\boxed{m \propto \frac{1}{n^3}}$ $\boxed{m = 2,\ n = 4}$ $\boxed{m = ?,\ n = 6}$ $\boxed{n = ?,\ m = 432}$

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

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

To find k,

Put m = 2 and n = 4 in equation (i)

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

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

$$2 \times 64 = k$$

$$128 = k \quad \Rightarrow \quad \boxed{k = 128}$$

Put k = 128 in equation .....(i)

$$m = \frac{128}{n^3} \text{.....(ii)}$$

To find m,

put n = 6 in equation (ii)

$$m = \frac{128}{(6)^3} = \frac{128}{216} = \frac{32}{54} = \frac{16}{27}$$

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

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

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

$$3 \times 16\ k$$

$$48 = k \Rightarrow \boxed{k = 48}$$

Put K = 48 in equation .....(i)

$$a = \frac{k}{b^2} \Rightarrow a = \frac{48}{b^2} \text{.....(ii)}$$

To find a,

Now, put b = 8 in equation .....(ii)

$$a = \frac{48}{b^2} = \frac{48}{(8)^2} = \frac{48}{64}$$

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

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

Solution:

$\boxed{V \propto \frac{1}{r^3}}$ $\boxed{\begin{matrix} V = 5 \\ r = 3 \end{matrix}}$ $\boxed{\begin{matrix} V = ? \\ r = 6 \end{matrix}}$ $\boxed{\begin{matrix} v = 320 \\ r = ? \end{matrix}}$

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

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

To find k,

Put V = 5 and r = 3 in equation (i)

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

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

$$5 \times 27 = k \quad \Rightarrow \quad \boxed{k = 135}$$

Put k = 135 in equation .....(i)

$$V = \frac{135}{r^3} \text{.....(ii)}$$

To find V, Put r = 6 in equation (ii)

$$V = \frac{135}{(6)^3} = \frac{135}{216}$$

$$\boxed{V = \frac{5}{8}} \textit{(Dividing by 27)}$$

To find r, put v = 320 in equation (ii)

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

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

$$r^3 = \frac{135}{320} = \frac{27}{64}$$

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

$$r^3 = \left(\frac{3}{4}\right)^3 \text{ taking cube root}$$

$$\sqrt[3]{r^3} = \sqrt[3]{\left(\frac{3}{4}\right)^3}$$

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

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

Solution:

$\boxed{m \propto \frac{1}{n^3}}$ $\boxed{\begin{matrix} m = 2 \\ n = 4 \end{matrix}}$ $\boxed{\begin{matrix} m = ? \\ n = 6 \end{matrix}}$ $\boxed{\begin{matrix} n = ? \\ m = 432 \end{matrix}}$

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

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

To find k,

Put m = 2 and n = 4 in equation (i)

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

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

$$2 \times 64 = k$$

$$128 = k \quad \Rightarrow \quad \boxed{k = 128}$$

Put k = 128 in equation .....(i)

$$m = \frac{128}{n^3} \text{.....(ii)}$$

To find m,

put n = 6 in equation (ii)

$$m = \frac{128}{(6)^3} = \frac{128}{216} = \frac{32}{54} = \frac{16}{27}$$

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

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

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

$$3 \times 16\ k$$

$$48 = k \Rightarrow \boxed{k = 48}$$

Put K = 48 in equation .....(i)

$$a = \frac{k}{b^2} \Rightarrow a = \frac{48}{b^2} \text{.....(ii)}$$

To find a,

Now, put b = 8 in equation .....(ii)

$$a = \frac{48}{b^2} = \frac{48}{(8)^2} = \frac{48}{64}$$

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

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

Solution:

$\boxed{V \propto \frac{1}{r^3}}$ $\boxed{\begin{matrix} V = 5 \\ r = 3 \end{matrix}}$ $\boxed{\begin{matrix} V = ? \\ r = 6 \end{matrix}}$ $\boxed{\begin{matrix} v = 320 \\ r = ? \end{matrix}}$

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

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

To find k,

Put V = 5 and r = 3 in equation (i)

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

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

$$5 \times 27 = k \quad \Rightarrow \quad \boxed{k = 135}$$

Put k = 135 in equation .....(i)

$$V = \frac{135}{r^3} \text{.....(ii)}$$

To find V, Put r = 6 in equation (ii)

$$V = \frac{135}{(6)^3} = \frac{135}{216}$$

$$\boxed{V = \frac{5}{8}} \textit{(Dividing by 27)}$$

To find r, put v = 320 in equation (ii)

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

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

$$r^3 = \frac{135}{320} = \frac{27}{64}$$

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

$$r^3 = \left(\frac{3}{4}\right)^3 \text{ taking cube root}$$

$$\sqrt[3]{r^3} = \sqrt[3]{\left(\frac{3}{4}\right)^3}$$

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

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

Solution:

$\boxed{m \propto \frac{1}{n^3}}$ $\boxed{\begin{matrix} m = 2 \\ n = 4 \end{matrix}}$ $\boxed{\begin{matrix} m = ? \\ n = 6 \end{matrix}}$ $\boxed{\begin{matrix} n = ? \\ m = 432 \end{matrix}}$

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

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

To find k,

Put m = 2 and n = 4 in equation (i)

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

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

$$2 \times 64 = k$$

$$128 = k \quad \Rightarrow \quad \boxed{k = 128}$$

Put k = 128 in equation .....(i)

$$m = \frac{128}{n^3} \text{.....(ii)}$$

To find m,

put n = 6 in equation (ii)

$$m = \frac{128}{(6)^3} = \frac{128}{216} = \frac{32}{54} = \frac{16}{27}$$

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

To find n,

Put m = 432 in equation (ii)

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

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

$$n^3 = \frac{128}{432} \quad (\textit{dividing by } 16)$$

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

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

$$n^3 = \left(\frac{2}{3}\right)^3$$

Taking cube of root

$$\sqrt[3]{n^3} = \sqrt[3]{\left(\frac{2}{3}\right)^3}$$

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

Third Proportional

If three quantities a, b and c are related as a : b : : b : c.

Then c is called the third proportion.

Example 1: Find a third proportional of x + y and $x^2 - y^2$.

Solution: Let c be the third proportional.

then $x + y : x^2 - y^2 : : x^2 - y^2 : c$

Product of Extremes = Product of Means

$$c(x + y) = (x^2 - y^2)(x^2 - y^2)$$

$$c = \frac{(x^2-y^2)(x^2-y^2)}{x+y} = \frac{(x^2-y^2)(x-y)\cancel{(x+y)}}{\cancel{x+y}}$$

$$c = (x + y)(x - y)(x - y)$$

$$c = (x + y)(x - y)^2$$

Fourth Proportional

If four quantities a, b, c and d are related as

a : b : : c : d

then d is called the fourth proportional.

Example 2: Find fourth proportional of $a^3 - b^3$, a + b and $a^2 + ab + b^2$

Solution: Let x be the fourth proportional

then $(a^3 - b^3) : (a + b) : : (a^2 + ab + b^2) : x$

Product of Extremes = Product of Means:

$$x(a^3 - b^3) = (a + b)(a^2 + ab + b^2)$$

$$x = \frac{(a+b)(a^2+ab+b^2)}{a^3-b^3}$$

$$x = \frac{(a+b)\cancel{(a^2+ab+b^2)}}{(a-b)\cancel{(a^2+ab+b^2)}}$$

$$x = \frac{a+b}{a-b}$$

Mean Proportional

If three quantities a, b and c are related as a : b : : b : c, then b is called the mean proportional.

Example 3: Find the mean proportional of $9p^6q^4$ and r^8.

Solution: Let m be the mean proportional,

then $9p^6q^4 : m : : m : r^8$

Product of Extremes = Product of Means:

$$m \cdot m = 9p^6q^4(r^8)$$

$$m^2 = 9p^6q^4r^8$$

$$\sqrt{m^2} = \pm\sqrt{9p^6q^4r^8}$$

$$m = \pm\left(3^2p^6q^4r^8\right)^{\frac{1}{2}}$$

$$2\times\frac{1}{2}\quad 6\times\frac{1}{2}\quad 4\times\frac{1}{2}\quad 8\times\frac{1}{2}$$

$$m = \pm\ 3\quad p\quad q\quad r$$

$$\boxed{m = \pm\ 3p^3q^2r^4}$$

Continued Proportion

If three quantities a, b and c are related as

a : b : : b : c

Where a is first, b is the mean and c is the third proportional, then a, b and c are in continued proportion.

Example 4: Find p, if 12, p and 3 are in continued proportion.

Solution: Since 12, p and 3 are in continued proportion.

$\therefore$ 12 : p : : p : 3 i.e

Product of means = Product of extremes

$p \cdot p = (12)(3)$

$\Rightarrow$ $p^2 = 36$

$$\sqrt{p^2} = \pm\sqrt{36}$$

Thus $\boxed{p = \pm 6}$