→ two ratios are equal.

i.e. $\dfrac{3}{12} = \dfrac{1}{4}$ is a Proportion

How to expressed?

$3 : 12 = 1 : 4$ or $3 : 12 :: 1 : 4$ //

⇒) Types of Proportion.

i) Third proportion:

– if $a : b :: b : c$, then c is called 3rd proportional to

a and b.

$a : b :: b : c$ or $a : b = b : c$ or $\dfrac{a}{b} = \dfrac{b}{c}$

∴ $c = \dfrac{b^2}{a}$ //

Ex: find the third proportion of 0.36 & 0.48.

$c = \dfrac{b^2}{a}$ where $a = 0.36$ & $b = 0.48$

$= \dfrac{0.48 \times 0.48}{0.36}$ $= 0.64$ //

ii) Fourth proportion :

it $a:b::c:d$ then d is called 4th proportional

↑ ↑ ↑ ↑
t m n e to a, b & c.

$a:b::c:d$ or $a:b=c:d$ or $\dfrac{a}{b}=\dfrac{c}{d}$

$\Rightarrow a\times d = b\times c \Rightarrow d = \dfrac{bc}{a}$ //

Ex: find the fourth proportion of 3, 6 and 12.

$$d = \dfrac{bc}{a} \quad \text{when} \quad a=3, b=6 \text{ & } c=12$$

$$= \dfrac{6\times 12}{3} = 24 \text{ //}$$

iii) Mean Proportion :-

it a and b are given then $\sqrt{ab}$ is mean proportion.

it mean Proportion bet^n a and b is A

$$a:A::A:b \Rightarrow A^2 = ab \Rightarrow A = \sqrt{ab} \text{ //}$$

Ex: find the mean proportion beth 9 and 16.

$$\Rightarrow \sqrt{ab}$$

$$\Rightarrow \sqrt{9 \times 16} = \sqrt{144} = 12 //$$

ix) Continued Proportion :-

Three quantities a, b, c of somekind and it said to be continued it

$$a : b = b : c$$

$$b^2 = ac$$

(middle no.)^2 = first no. + last number.

Ex: If 3, x, 27 are in continued Proportion, then find x.

$$\underset{a}{3}, \underset{b}{x}, \underset{c}{27}$$

$$b^2 = ac$$

$$= 3 \times 27$$

$$b^2 = 81$$

$$b = \sqrt{81} = 9 //$$

$\Rightarrow$ Relation among the quantities more than two

Given a : b = x : y

$$b : c = m : n$$

then these three quantities are related as.

$$a : b = x : y$$
$$b : c = m : n$$

$a : b : c =$ $xm : my : yn$

$$a : c = xm : yn_{//}$$

=) some useful results on Proportion :

if four quantities a, b, c, d are said to be proportion if and only if.

$$a : b = c : d$$

=→ extremes

↓ → middle or mean.

$$a\,d = b\,c \quad (\because \text{product of extremes} = \text{product of means})$$

=) Componendo and Dividendo :

if $a:b$ is equal to $c:d$

$$\frac{a}{b} = \frac{c}{d}$$

$a + b$ $c + d$

$$b \qquad d$$

i) Componendo Rule — $\dfrac{a+b}{b} = \dfrac{c+d}{d.}$

ii) Dividendo Rule — $\dfrac{a-b}{b} = \dfrac{c-d}{d.}$

iii) Componendo & — $\dfrac{a+b}{a-b} = \dfrac{c+d}{c-d}$ //
    dividendo