



STEPPING STONE SCHOOL (HIGH)

Topic - RATIO AND PROPORTION

Basics : Already you have learnt the ratio of two quantities of the same kind and in the same units is a comparison obtained by dividing the first quantity by the other.

Here we will give more illustration and operating rules of ratio and proportion.

Remember : i) In the ratio $a:b$; 'b' should not be zero
 ii) A ratio must be always expressed in lowest term i.e both the terms should be co-prime, hence H.C.F between the terms will '1'.

E.g.:- $\frac{2}{3}$ Can be written in many forms by multiplying the same common factor to both the terms i.e you can write $\frac{2}{3} = \frac{4}{6} = \frac{10}{15} = \frac{20}{30} = \dots$ infinite ways and all this ratio are called equivalence ratio to the original ratio $\frac{2}{3}$.

Examples : ① If $a:b = 5:3$; find $(5a+8b):(6a-7b)$

ANS Let the common ratio be x ; then $a = 5x$ and $b = 3x$

Hence $\frac{5a + 8b}{6a - 7b} = \frac{5 \times 5x + 8 \times 3x}{6 \times 5x - 7 \times 3x} = \frac{49x}{9x} = \frac{49}{9}$

Ex-2) What quantity should be added to the ratio 8:15 so that it becomes equal to 3:5?

Ans: Let x be added to each term of the ratio.

So $\frac{8+x}{15+x} = \frac{3}{5} \Rightarrow 40 + 5x = 45 + 3x$

$\Rightarrow x = 5/2$

Ex-3: i) If $\frac{a}{b}$ and $\frac{c}{d}$ are two ratios, then $ac:bd$ is called compound ratio

ii) Duplicate ratio of $\frac{a}{b}$ is $\frac{a^2}{b^2}$

iii) Triplicate ratio of $\frac{a}{b}$ is $\frac{a^3}{b^3}$

iv) Sub-duplicate ratio of $\frac{a}{b}$ is $\frac{\sqrt{a}}{\sqrt{b}}$ and

v) Sub-triplicate ratio of $\frac{a}{b}$ is $\frac{\sqrt[3]{a}}{\sqrt[3]{b}}$ or $\frac{a^{1/3}}{b^{1/3}}$

Ex-4: If $m:n$ is the duplicate ratio of

$(m+x):(n+x)$; show that, $x^2 = mn$.

Ans: As given; $\frac{m}{n} = \frac{(m+x)^2}{(n+x)^2} \Rightarrow$

$\frac{m}{n} = \frac{m^2 + 2mx + x^2}{n^2 + 2nx + x^2} \Rightarrow$

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$$\Rightarrow mn^2 + 2mnx + mx^2 = m^2n + 2mnx + nx^2$$

$$\Rightarrow (m-n)x^2 = mn(m-n) \Rightarrow x^2 = mn \text{ ; if } m \neq n$$

Ex-5) Find the compound ratio of
 $(a-b) : (a+b)$; $(a+b)^r : (a^r+b^r)$ and $(a^4-b^4) : (a^r-b^r)^2$

Ans. Required compound ratio -

$$= \frac{(a-b)(a+b)^r(a^4-b^4)}{(a+b)(a^r+b^r)(a^r-b^r)^2} = \frac{(a-b)(a+b)^r(a^2+b^2)(a-b)(a+b)}{(a+b)(a^r+b^r)(a-b)(a+b)(a^r+b^r)}$$

$$= (a-b)(a+b) : (a+b)(a-b) = 1$$

EXERCISES: (1) If $r^2 = pq$; show that, $p : q$ is the

duplicate ratio of $(p+r) : (q+r)$.

(2) If $2a = 3b$ and $4b = 5c$ find $a : c$.

(3) Find sub duplicate ratio of $(x-y)^4 : (x+y)^4$

(4) If $\frac{m+n}{m+3n} = \frac{2}{3}$; find $\frac{2n^2}{3m^2+mn}$.

(5) If $3A = 4B = 6C$; find $A : B : C$

(6) If $(3x-9) : (5x+4)$ is the triplicate ratio of

$3 : 4$ find the value of x

(7) Divide Rs 1200 into A, B, C, s.t. $A : B = 2 : 5$ and $B : C = 4 : 3$. END.