Ratio & Proportion

When we compare 2 quantities we do it in ratios

Say P = 5Q
10 = 50 Km/hr
P : 9
50 : 1
5 : 1 //

$a:b \rightarrow \frac{a}{b}$, $b:a \rightarrow \frac{b}{a}$

When we compare and equate we call it proportion

$a:b = c:d$

$\frac{a}{b} = \frac{c}{d}$ $\quad a:b :: c:d$ (as)

Tips

$\frac{a}{b} = \frac{c}{d} \Rightarrow ad = bc$

$\frac{a}{b} \frac{c}{d} \Rightarrow ad > bc \Rightarrow \frac{a}{b}$ is greater than $\frac{c}{d}$

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

$\frac{a}{b} = \frac{c}{d} = \frac{a-b}{b} = \frac{c-d}{d}$ — Dividendo

$$\frac{\frac{a+b}{b}}{\frac{a-b}{b}} = \frac{\frac{c+d}{d}}{\frac{c-d}{d}} = \frac{a+b}{a-b} = \frac{c+d}{c-d}$$ //

$\frac{a}{b} = \frac{c}{d} = \frac{b}{a} = \frac{d}{c}$ — a:b :: b:c — a:b:c (Extremes; 1st, 2nd, 3rd Prop.)

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

To get actual values

$\frac{5}{6} = 5:6$ $\quad 5K:6K$

1. Which of the following two ratios are greater.

17:18 & 10:11

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

$\frac{17}{18} : \frac{10}{11} = 17\times11 :: 10\times18$

$187 > 180$

17:18 is greater.

2. The 3rd Proportional to 18 & 54 is?

a=18 b=54 c=?

$a:b :: b:c$

$\frac{a}{b} = \frac{b}{c} = b^2 = ac$

$54\times54 = 18(c)$

$c = 162$ //

3) What is the 4th Proportional in 9, 13 & 153

$a:b::c:d$

$\frac{a}{b} = \frac{c}{d} \quad \frac{9}{13} = \frac{c}{d}$

$d = \frac{bc}{a} = \frac{13 \times 153}{9} = 221$

4) Find the mean Proportion between 7 & 63

$a:b::b:c$

$\frac{a}{b} = \frac{b}{c} \quad = b^2 = ac \quad b^2 = 7 \times 63 \quad = b = 21$

5) $\frac{10}{15} = \frac{11}{28} = \frac{21}{11} = \frac{12}{4} = K$

$\frac{10+11+21+12}{15+28+11+4} \quad = K = \frac{54}{63} = \frac{6}{7}$

6) Income ratio of Ramesh & Suresh is 5:6. Their Spending ratio is 7:9. Ramesh Saves 4000 Suresh Saves 3000. Income & Spending are?

Use that k trick

$5k:6k$

Income = Spend + Saving

Spending = Income - Saving

$\frac{7}{9} = \frac{5K - 4000}{6K - 3000}$ $= 42K - 21000$

$K = 5000$

Subin K

$25000 - 4000 = 21,000$

$30000 - 27000 = 27000$

7.) a:b = 3:7 & b:c = 9:5 what is a:b:c

make B values Same

a:b 3:7 9:5

$3 \times 9 : 7 \times 9 :: 9 \times 7 : 5 \times 7$

$27 : 63 :: 63 : 35$

$27 : 63 : 35$

8.) How to Divide 3395 in ratio of 42:32:23

Method 1

$\frac{42}{42+32+23} \times 3395 = 42 \times 35 = 1470$

$\frac{32}{97} \times 3395 = 1120$

add and subtract

$1470 + 1120 - 3395$

0805

method -

$42K + 32K + 23K = 3395$

$97K = 3395$

$K = 35$

$42(35) = 1470$

$32(35) = 1120$

9.) 285 is summation of 3 numbers. Ratio between 2nd and 3rd numbers 6:5, Ratio between 1st & 2nd is 3:7. The 3rd number is

$3:7 :: 6:5$

b is not same make it same

$3\times6 : 7\times6 :: 6\times7 : 5\times7$

$18 : 42 :: 42 : 35$

$18 : 42 : 35$

we need only 35

$$\frac{35}{18+42+35} \times 285 = 105$$

10.) Ratio of two numbers is 3:8. on adding 5 to both numbers, the ratio becomes 2:5, which is the smaller out of 2

$A:B = 3:8$

$3k : 8k$

$$\frac{3k+5}{8k+5} = \frac{2}{5}$$

$15k+25 = 16k+10$

$k = 15$

for smaller value

$3k = 45$

11) find A:B:C:D when A:B = 2:3, B:C = 7:9, C:D = 5:7

$\frac{2}{3} \times \frac{7}{9} \times \frac{5}{7}$

for first number multiply all numerator

$2 \times 7 \times 5 = \underline{70}$ — (A)

for last number multiply all Denominal.

$3 \times 9 \times 7 = 189$ — (B)

for B follow that path

$3 \times 7 \times 5 = 105$

for C follow path

$3 \times 9 \times 5 = 135$

A:B = a:b B:C = c:d C:D = e:f

A:B:C:D = acd : bce : bde : bdf

12) Price of each article of type P, Q, R is ₹ 300, Rs. 180 and ₹ 120 respectively. Sunil buys each type in ratio 3:2:3 in Rs 6400. How many articles did he purchase

₹ 300 = 3k ₹ 120 = 3k

₹ 180 = 2k

So total cost

$30ck \times 3k = 90ck$ — (1) 360k — (2) 360k — (3)

$90ck + 360k + 360k = 6480$

$k = 4$

$3k = 6$

13) Ajay & Raj together have Rs 1050. or I take Rs 150 from Ajay, Ajay will have say amount as what Raj had earlier. Find the ratio of amounts of them initially.

$A+R = 1050$ — (1)

$A-150 = R$

$A-R = 150$ — (2)

Adding both

$A+A-R = 1050+150$

$2A = 1200$

$A = 600$

$R = 450$.

$A:R = 600:450$

$4:3$

14) If $x:y = 3:4$ then $(7x+3y):(7x-3y)$

Short cut

$x = 3$ use it three

$y = 4$

$\frac{7(3)+3(4)}{7(3)-3(4)} = \frac{33}{9} = \frac{11}{3}$

(or)

$\frac{7x}{3y} = \frac{21}{4}$ — (1)

$\frac{7x}{3y} = \frac{21}{21}$ — (2)

$\frac{7x+3y}{7x-3y} = \frac{33}{9}$

15. If $a:b = 5:7$ and $c:d = 2a:3b$ a:b d

$\frac{a}{b} = \frac{5}{7}$ $\frac{c}{d} = \frac{2a}{3b}$

$\frac{a}{b} \times \frac{c}{d}$ $\frac{5}{7} \times \frac{2a}{3b}$

$\frac{10a}{21b} = \frac{ac}{bd} = \frac{10 \times 5}{21 \times 7} = \frac{50}{147}$

16. The three numbers are in the ratio $\frac{1}{2} : \frac{2}{3} : \frac{3}{4}$ the difference between greatest & smallest is 36. find numbers

$\frac{1}{2} : \frac{2}{3} : \frac{3}{4}$ small g

$\frac{K}{2} : \frac{2K}{3} : \frac{3K}{4} = 0.5K : 0.6K : 0.7K$

$\frac{3K}{4} - \frac{K}{2} = 36$ $= K = 36 \times 4$

Now substitute

$\frac{K}{2} = \frac{36 \times 4}{2} = 72$ $\frac{2K}{3} = 96$ $\frac{3K}{4} = 108$

17) The ratio of market price of wheat & paddy 2:3 and the ratio of quantities is 5:4 find ratio on expenditure

W:P = 2:3

2K:3K

Consumption = 5A:4A

rate x consumption = Expenditure

$$\frac{2K \times 5A}{3K \times 4A} = \frac{5}{6}$$

18) RS 8400 is divided among A, B, C and D in such a way shares are A and B, B and C, C and D of ratios 2:3, 4:5 & 6:7 respectively

A:B = 2:3 B:C = 4:5 C:D = 6:7

That ratio method

A	:	B	:	C	:	D	LCM(multiple)
48		72		90		105	

Num (numerator) Share of A

$$\frac{48}{48+72+90+105} \times 8400 = 1280$$

19)

19) In a library, the ratio of number of story book to that of non story was 4:3 and total number was 1248 when some more story books were bought ratio became 5:3 find the number of story books bought.

$$\frac{S}{NS} = \frac{4}{3}$$

$$\frac{1248}{NS} = \frac{4}{3}$$

$N_S = 936$

M - books were added

$$\frac{1248+M}{936} = \frac{4}{3}$$

$M = 312$