

# RATIOS

Ratios & Proportions

- ① Duplicate Ratio → Square
- ② Sub-duplicate Ratio → Square root ( $\sqrt{\quad}$ )
- ③ Triplicate → Cube
- ④ Sub-Triplicate → Cube root ( $\sqrt[3]{\quad}$ )

Duplicate Ratio of  $9 : 16 = 9^2 : 16^2 = 81 : 256$   
Sub duplicate Ratio of  $9 : 16 = \sqrt{9} : \sqrt{16} = 3 : 4$   
Triplicate Ratio of  $8 : 9 = 8^3 : 9^3 = 512 : 729$   
Sub-triplicate Ratio of  $8 : 125 = \sqrt[3]{8} : \sqrt[3]{125} = 2 : 5$

Find the Compound Ratio of  $2 : 5, 10 : 7, 14 : 9$  ?

$$\frac{2}{\cancel{5}} \times \frac{\cancel{10}^2}{\cancel{7}} \times \frac{\cancel{14}^2}{9} = \frac{8}{9} \Rightarrow \boxed{8 : 9}$$

## Ratios & Proportions

Inverse Ratio of  $5:7 \Rightarrow 7:5$   $\left[ \because \frac{1}{5} \times \frac{1}{7} = \frac{1}{35} \Rightarrow 7:5 \right]$

Inverse Ratio of  $3:4:6 \neq 6:4:3$

$$\frac{1}{3} : \frac{1}{4} : \frac{1}{6}$$

Method 1 =  $4:3:2$   
12

Method 2 :  $A : B : C$   
 $3 : 4 : 6$

Inv Rat  $2/3 : 1/4 : 1/6$   
 $4:3:2$

Least Common Multiple

$$\begin{array}{r} 2 \overline{) 3, 4, 6} \\ 3 \overline{) 3, 2, 3} \\ 1, 2, 1 \end{array}$$

$$\Rightarrow 2 \times 3 \times 2 = 12$$

Find the 4<sup>th</sup> Proportion of  $A, B, C$  ? (D ?)

$A : B = C : D$   
? - Fourth Proportion

$A \quad B \quad C \quad D$   
 $20 : 21 = 40 : 42$

$$D = \frac{BC}{A} = \frac{21 \times 40}{20} = 42$$

3<sup>rd</sup> Proportion of  $A, B, C$  ? (C ?)

$A : B = B : C$

$72 : 24 = 24 : ?$   
 $\Rightarrow C = \frac{B^2}{A} = \frac{24 \times 24}{72} = 8$

4<sup>th</sup> P  $\rightarrow \frac{BC}{A} = D$   
3<sup>rd</sup> P  $\rightarrow \frac{B^2}{A} = C$

### Ratios & Proportions

Find the Mean Proportion of  $\frac{A}{8}$  &  $\frac{C}{18}$ ? ( $B = ?$ )

$$\begin{aligned} A : B &= B : C \\ 8 : ? &= ? : 18 \end{aligned}$$

$$\begin{aligned} B &= \sqrt{AC} \\ &= \sqrt{8 \times 18} \\ &= \sqrt{144} \\ \mathbf{B} &= \mathbf{12} \end{aligned}$$

$$\sqrt{AC} = B$$

∴

$$\begin{aligned} 4^{th} P &\rightarrow \frac{BC}{A} = D \\ 2^{nd} P &= \frac{B^2}{A} = C \end{aligned}$$

$$\begin{aligned} A : B &= B : C \\ 8 : 12 &= 12 : 18 \\ \mathbf{2 : 3} &= \mathbf{2 : 3} \end{aligned}$$

### Ratios & Proportions

In a college, the ratio of Boys & Girls is 5:8. If there are 160 girls, find the no. of boys.

$$\begin{aligned} B : G \\ 5 : 8 \\ G - 8 \xrightarrow{\times 2} 160 \\ B - 5 \xrightarrow{\times 2} \mathbf{100} \end{aligned}$$

### Ratios & Proportions

The C.P of Mobile & Tablet are in the ratio 4:7.  
If the tablet C.P is Rs 15000 more than the Mobile C.P,  
then what is the C.P of the Tablet?

$$\begin{array}{|c|c|} \hline M & T \\ \hline 4 & 7 \\ \hline \end{array}$$

$$\begin{aligned} \text{Dif} &\rightarrow 3 \xrightarrow{\times 5} 15000 \\ T &\rightarrow 7 \xrightarrow{\times 5} \mathbf{35000} \end{aligned}$$

### Ratios & Proportions

Abhi's monthly income is two-seventh of Rak's monthly income.  
Rak's Annual Income is 4.2 lakh. What is Abhi's Annual Income?

$$A = \frac{2}{7} R$$

$$\frac{A}{R} = \frac{2}{7}$$

M.I.  $\boxed{A : R}$   
 $\boxed{2 : 7}$

A.I.  $\begin{array}{r} A : R \\ 2 : 7 \\ \times 12 \quad \times 12 \\ \hline 24 : 84 \\ \div 12 : \div 12 \\ \hline \boxed{2 : 7} \end{array}$

	A	R	
	2	7	
R	7	$\times 6$	4.2 lakh
A	2	$\times 6$	<u>1.2 lakh</u>

	A	R
	2	7
	$\times 12$	$\times 12$
	24	84
	$\div 12$	$\div 12$
	2	7

### Ratios & Proportions

The Ratio of Sita's, Riya's & Kunal's monthly income is 84:76:89.  
If Riya's Annual Income is Rs 4,56,000, what is the sum of Sita's & Kunal's annual income?

$$S : R : K$$

M.I.  $84 : 76 : 89$   
 $\times 12 \quad \times 12 \quad \times 12$

A.I.  $84 : 76 : 89$

$S + K = 173$

(R)	$\times 6$	
76	$\rightarrow$	4,56,000
173	$\times 6$	
(S+K)	$\rightarrow$	10,38,000

- Q Two numbers are in the ratio  $7:12$ . If 15 is subtracted from both the numbers, then the ratio becomes  $16:31$ . Find the largest number.  $108$

$$\begin{array}{rcl}
 \text{SN} & : & \text{LN} \\
 (7 - 15) & : & (12 - 15) \\
 16 & : & 31
 \end{array} \times 3$$
  

SN	:	LN
21	:	36
(-15)	:	
16	:	31

  

$$\begin{array}{r}
 5 \times 3 = 15 \\
 36 \times 3 = 108
 \end{array}$$

### Ratios & Proportions

- Q The incomes of A & B are in the ratio  $4:5$  & their expenses are in the ratio  $5:7$ . If each of them saves Rs 1500, then what is the income of B? Rs 5000

	A	B
I	4	5
- E	5	7
S	1500	1500

  

$$\begin{array}{r}
 3 \times 5 = 1500 \\
 10 \times 5 = 5000
 \end{array}$$
  

	A	B
Inc	8	10
- Exp	5	7
Sav	3	3

### Ratios & Proportions

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 ⑧ The ratio of milk and water in a vessel containing 60 litres of mixture is 3:2. Find the quantity of water to be added to make the ratio 2:3.

$$\begin{array}{l} \text{Milk} \rightarrow 2 \xrightarrow{\times 18} 36 \\ \text{Water} \rightarrow 3 \xrightarrow{\times 18} 54 \end{array}$$

60  
 M      W  
 3      2

36      24

2      3

36      54

Milk

$$\begin{array}{l} 5 \xrightarrow{\times 12} 60 \\ M \rightarrow 3 \xrightarrow{\times 12} 36 \\ W \rightarrow 2 \xrightarrow{\times 12} 24 \end{array}$$

+30 litres

Three equal capacity vessels contain liquor & water in the ratio 1:2, 2:1, 3:1 respectively. If all are mixed into a big vessel, find the ratio of liquor & water in the big vessel.

A (1 : 2)  $\times 4$   
 B (2 : 1)  $\times 4$   
 C (3 : 1)  $\times 3$

L      W  
 4      8  
 + 8      4  
 + 9      3  


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 21      15  
7 : 5

### Ratios & Proportions

If A:B is 2:3, B:C = 4:3, then find A:B:C?

$$\begin{array}{l} A : B : C \\ 2 : 3 : 3 \\ \times 4 : \times 4 : \times 3 \\ \hline 8 : 12 : 9 \end{array}$$

$$\begin{array}{l} A : B : C \\ 2 : 3 : 3 \\ \times 4 : \times 4 : \times 3 \\ \hline 8 : 12 : 9 \end{array}$$

### Ratios & Proportions

If  $A:B = 2:3$ ,  $B:C = 4:3$ ,  $C:D = 2:3$ , then find  $A:B:C:D$

$$\begin{array}{cccc} A & : & B & : & C & : & D \\ 2 & : & 3 & & & & \\ & & 4 & : & 3 & & \\ & & & & 2 & : & 3 \\ \hline 16 & : & 24 & : & 18 & : & 27 \end{array}$$

$$\begin{array}{cccc} A & : & B & : & C & : & D \\ 2 & : & 3 & : & 3 & : & 3 \\ 4 & : & 4 & : & 3 & : & 3 \\ \downarrow & & 2 & : & 2 & : & 2 & : & 3 \\ \hline 16 & : & 24 & : & 18 & : & 27 \end{array}$$

### Ratios & Proportions

If  $A:B = 3:4$ ,  $B:C = 8:10$ ,  $C:D = 15:17$ , then find  $A:D$ ?

$$\begin{array}{cccc} A & : & B & : & C & : & D \\ 3 & : & 4 & : & 4 & : & 4 \\ 8 & : & 8 & : & 10 & : & 10 \\ 15 & : & 15 & : & 15 & : & 17 \\ \hline 36 & & & & & & 68 \\ \hline 9 & : & & & & & 17 \end{array}$$

### Ratios & Proportions

If  $3A = 4B = 5C$ , then find  $A:B:C$

$$\begin{array}{ccc} A & : & B & : & C \\ 20 & : & 15 & : & 12 \end{array}$$