

## Ratio proportions and partnership

**Ratio** is the comparison of two more quantities of same unit. When a fraction is represented in the form of  $a : b$ , then it is a ratio whereas a **proportion** states that two ratios are equal. Here,  $a$  and  $b$  are any two integers. It develops fast problem-solving and foundational math skills, applicable in business and finance. Commonly asked in Accenture, TCS, DXC, IBM, Cognizant, HCL, Infosys, Microsoft, Deloitte, Amazon, Cisco, Walmart, VISA, etc.

### Types of proportions

1. **Direct proportions** – When one quantity of a ratio increases, the other also increases by same multiplier. Ex – If the cost of 1 pen is Rs. 5, then the cost of 2 pens will Rs. 10 and of 3 pens is Rs. 15 and so on.
2. **Inverse proportions** – The increase in one quantity of a ratio leads to decrease in other quantity. Ex- If 20 men can finish a work in 10 days. Then 40 men can finish the same work in 5 days, here number of men gets double, and number of days become half.
3. **Continued proportions**- In a continued proportion, the consequent of each ratio is the antecedent of the next. Ex –  $4 : 8 = 8 : 16 = 16 : 32$  etc.

### Types of problems and methods to solve

1. **When ratio and their sum is given.**

**Question:** The ratio of the two numbers is 4:5 and their sum are 45. Find the numbers?

**Solution:** Let the two numbers are  $4x$  and  $5x$  respectively

$$\text{The } 4x + 5x = 45$$

$$x = 45/9 = 5$$

$$\text{So the numbers are } 4x = 4 \times 5 = 20 \text{ and } 5x = 5 \times 5 = 25$$

2. **When ratio and the difference are given.**

**Question:** The ratio of two numbers A and B is 13:7 and the difference between them is 24. Find the numbers?

**Solution:** Let the two numbers A and B are  $13x$  and  $7x$  respectively

$$\text{So, } 13x - 7x = 24, \quad \text{Then } 6x = 24 \quad \text{and } x = 24/6 = 4$$

$$\text{Therefore, } A = 13x = 13 \times 4 = 52$$

$$B = 7x = 7 \times 4 = 28$$

### 3. When the ratio and the value of one unit is given.

**Question:** The ratio of two numbers A and B is 9:17 and value of B is 102. Find the value of A?

**Solution:** Let the two numbers A and B are  $9x$  and  $17x$  respectively

Value of B is 102 which is equal to  $17x$

Then  $x = 102/17 = 6$

Therefore  $A = 9x = 9 \times 6 = 54$

### 4. When the ratio and their product is given.

**Question:** The ratio of two numbers A and B is 7 : 3, Their product is 756. Find the numbers?

**Solution:** Let the two numbers A and B are  $7x$  and  $3x$  respectively

$$7x \times 3x = 756, \quad 21x^2 = 756$$

$$x^2 = 756/21 = 36$$

$$x = \pm 6$$

$$\text{Therefore } A = 7x = 7 \times 6 = \pm 42, \quad B = 3x = 3 \times 6 = \pm 18$$

### 5. Ratio merge

**Question:** A father distributed a sum of money among his three sons. If A gets  $2/3$  of B and B gets  $4/5$  of C and the total wealth is Rs.70 crores. Find the share of A?

**Solution:** The ratio of A and B is 2:3 and the ratio of B and C is 4:5,

We will have to merge the ratio to make B the same number in both ratios, it can be done by taking LCM of both value of B, 3 and 4 which is 12.

If B becomes 12 A will become 8 since there is a multiplier of 4 on both sides similarly C will be equal to 15 since there is a common multiplier 3 on both side B and C.

Now 3 numbers A, B and C can be  $8x$ ,  $12x$  and  $15x$  respectively.

$$\text{So, } 8x + 12x + 15x = 70 \text{ crores}$$

$$35x = 70 \text{ crores,} \quad x = 2 \text{ crores}$$

$$\text{Share of A} = 8x = 8 \times 2 = 16 \text{ crores.}$$

**Question:** If  $2A = 3B = 4C$ . Find the ratio of A, B and C?

**Solution:** We can do it by the method ratio merge by finding ratio of A:B and B : C. but to solve this question we can use a trick,

We can take the common multiple of 2, 3 and 4 and will make all the values equal to 12.

So, if  $2A = 12$      $A = 6$

$3B = 12$      $B = 4$

$4C = 12$      $C = 3$

Therefore the ratio of A, B and C is 6 : 4 : 3.

## Partnership

**Partnership for the same period:** When two or more people enter a business and invest a certain amount of money for the same period, then profit must be divided into the ratio of their investment.

Ex – A invested a sum of Rs. 5000 and B a sum of Rs. 10000 for 1 year. At the end of the year the profit will be divided into the ratio of 1 : 2, since the ratio of investment is 1 : 2.

**Partnership for different periods of time:** When two or more people enter a business and invest a certain amount of money for different periods, then profit must be divided as per the time duration they are investing for.

Ex – A started a business investing Rs. 5000, after 6 months B entered the same business investing Rs. 8000. Find the ratio of their profit out of the business?

To answer this question, we will multiply the investment with the time they are investing for:

Formula = Investment x time : investment x time

For A = Rs. 5000 x 12 months      for B = Rs. 8000 x 6 months

So, A : B = 60000 : 48000 = 5 : 4.

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