

## **RATIO AND PROPORTION**

### **Ratio**

The ratio of two quantities a and b is the fraction  $\frac{a}{b}$  and we write it as a: b.

In the ratio a: b, we call a as the first term or antecedent and b, the second term or consequent i.e., ratio 5: 9 represents  $\frac{5}{9}$  with antecedent = 5, consequent = 9.

**Q1. If A: B = 2: 3 and B: C = 5: 7 then what is the ratio A: B: C?**

**Solution.**

$$A: B = 2: 3$$

$$B: C = 5: 7$$

Multiply by  $\frac{3}{5}$  so as to make the ratio term of B Common,

$$B: C = 5 \times \frac{3}{5}: 7 \times \frac{3}{5}$$

$$\Rightarrow B: C = 3: \frac{21}{5}$$

$$= 2 \times 5: 3 \times 5: \frac{21}{5} \times 5$$

$$\text{Hence, } A: B: C = 10: 15: 21$$

### **Compounded Ratio**

If two or more ratios are given and the antecedent of one is multiplied with antecedent of others and consequents are multiplied with consequents of others, then the ratio obtained is called compound ratio.

The **compounded ratio** of the ratios (a: b), (c: d), (e: f) will be **(ace: bdf)**

**Q2. What is the equivalent compound ratio of 17: 23 :: 115: 153 :: 18: 25?**

**Solution.**

We know, compound ratio of the ratios (a: b), (c: d), (e: f) will be (ace: bdf) Thus, the compound ratio of (17: 23), (115: 153), (18: 25)

$$= (17 \times 115 \times 18) / (23 \times 153 \times 25) = 2: 5$$

### **Proportion**

The equality of two ratios is called proportion.

If a: b = c: d, we write, a: b :: c: d and we say that a, b, c, d is in proportion. Here, a and d are called extremes, while b and c are called mean terms.

Product of means = Product of extremes Thus, a: b :: c: d  $\Leftrightarrow (b \times c) = (a \times d)$

## Types of Proportion

### Third Proportion

If  $a : b = b : c$ , then  $c$  is called the third proportion to  $a$  and  $b$ .

### Fourth Proportion

If  $a : b = c : d$ , then  $d$  is called the fourth proportion to  $a, b, c$ .

### Mean Proportion

Mean proportion of  $a$  and  $b$  will be  $\sqrt{\frac{a}{b}}$

**Q3. If  $3 : 27 :: 5 : ?$**

**Solution.**

If  $3 : 27 :: 5 : ?$

$$\frac{3}{27} = \frac{5}{?}$$

$$? = 5 \times \frac{27}{3}$$

$$? = 45$$

**Q4. What is the third proportion to 17.9 and 16.8?**

**Solution.**

When  $c$  is the third proportion to  $a$  and  $b$ , relation between  $a$  and  $b$  is:  $b^2 = ac$

Let third proportion to 17.9 and 16.8 be  $x$ , then, 17.9:

$$16.8 :: 16.8 : x$$

$$\Rightarrow 17.9x = 16.8^2$$

$$x = \frac{16.8 \times 16.8}{17.9} = 15.76$$

$\therefore$  Third proportion to 17.9 and 16.8 is 15.76.

**Q5. Find the mean proportional between 14 & 15?**

**Solution.**

As we know that, mean proportional =  $\sqrt{ab}$

$$\Rightarrow \sqrt{14 \times 15}$$

$$\Rightarrow 14.5$$

So, the mean proportional of 14 and 15 = 14.5

**Q6. Mean proportional of 4 and 36 is a and third proportional of 18 and a is b. Find the fourth proportional of b, 12, 14.**

**Solution.**

Given,

Mean proportional of 4 and 36 = a

$$\Rightarrow a^2 = 4 \times 36$$

$$\Rightarrow a = 12$$

Third proportional of 18 and 12 = b

$$\Rightarrow 12^2 = 18 \times b$$

$$\Rightarrow b = 8$$

Fourth proportional of 8, 12 and 14

$$\Rightarrow 8/12 = 14/?$$

$$\Rightarrow ? = 21$$

### Some Important Questions

**Q7. A bag has coins of Rs. 1, 50 Paise and 25 Paise in ratio of 5: 9: 4. What is the worth of the bag if the total number of coins in the bags is 72?**

**Solution.**

$$\Rightarrow \text{Number of Rs. 1 Coins} = 5/18 \times 72 = 20$$

$$\Rightarrow \text{Number of 50 Paise coins} = 9/18 \times 72 = 36$$

$$\Rightarrow \text{Number of 25 Paise coins} = 4/18 \times 72 = 16$$

$$\Rightarrow \text{Total worth of the bag} = (20 \times 1) + (0.5 \times 36) + (0.25 \times 16) = 20 + 18 + 4 = \text{Rs. 42}$$

**Q8. If 18: 13.5: 16: x and (x + y): y: 18: 10, then what is the value of y?**

**Solution.**

$$18: 13.5: 16: x$$

$$x = (16 \times 13.5)/18$$

$$x = 12$$

Now,

$$(x + y): y: 18: 10$$

$$(12 + y): y: 9: 5$$

$$5(12 + y) = 9y$$

$$60 + 5y = 9y$$

$$4y = 60$$

$$y = 15$$

**Q9. Mr. Raj divides Rs. 1573 such that 4 times the 1st share, thrice the 2nd share and twice the third share amount to the same. Then the value of the 2nd share is:**

**Solution.**

Given:

Total amount = Rs. 1573.

**Calculation:**

Let the share of A, B and C is 4A: 3B: 2C. A: B: C

=  $\frac{1}{4}$ :  $\frac{1}{3}$ :  $\frac{1}{2}$  = 3: 4: 6

The value of the 2nd share =  $(\frac{4}{13}) \times 1573 = \text{Rs. } 484$