

Bank Probationary Officer

Quantitative Aptitude

RATIO & PROPORTION

Ratio: The number of times one quantity contains another quantity of the same kind is called ratio of the two quantities. The ratio of a to b is written as

$$a : b = \frac{a}{b} = a \div b$$

In the ratio $a : b$, a and b are called the terms of ratio, ' a ' is the **antecedent** and ' b ' is the **consequent**.

Points to remember:

- The order of the terms in a ratio is very important
- The quantities of a ratio must be expressed in the same units.
- The ratio is unaltered if each term is multiplied or divided by the same number.
- When a certain quantity ' q ' is divided in a given ratio $a:b$, the two parts are

$$\frac{aq}{a+b} \text{ and } \frac{bq}{a+b}$$

- If $a : b$ and $c : d$ are two ratios, then $ac : bd$ is called the compounded ratio of the given ratios.

Proportion: The equality of the two ratios is called proportion. Suppose the two ratios $a:b$ and $c:d$ are equal, i.e., $a:b = c:d$, then we write,

$$a:b : : c:d$$

Here, a and d are called as extremes and b , c are called means.

Rule:

- $ad = bc$ 'or'

Product of extremes = Product of means.

- In $a:b : : c:d$, d is the **fourth proportional** to a, b and c .

- If x is the **third proportional** to a and b then $a : b : : b : x$

- Mean proportional between a and b is

$$\sqrt{(ab)}.$$

Other properties

If $\frac{a}{b} = \frac{c}{d}$ 'or' $a : b : : c:d$.

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

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

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

- $\frac{a}{b} = \frac{c}{d} = \frac{a+c}{b+d} = \frac{ka+kc}{kb+kd}$

Solved examples:

- If $a : b = 4:5$ and $b:c = 6:7$, find the ratios $a:c$ and $a:b:c$

Given, $\frac{a}{b} = \frac{4}{5}; \frac{b}{c} = \frac{6}{7}$

$$\therefore \frac{a}{b} \times \frac{b}{c} = \frac{4}{5} \times \frac{6}{7} \text{ (ie) } \frac{a}{c} = \frac{24}{35}$$

$$\therefore a : c = 24 : 35$$

Here ' b ' term is common to both the equations and so their corresponding values should be made equal.

$$\text{(ie) } a:b = 24 : 30$$

$$b:c = 30 : 35$$

$$\therefore a:b:c = 24 : 30 : 35$$

2. Divide Rs. 54 in the ratio 4 : 5

$$\text{Sum of ratios} = 4+5 = 9$$

$$\therefore \text{First part} = 54 \times \frac{4}{9} = \text{Rs. } 24$$

$$\text{Second part} = 54 \times \frac{5}{9} = \text{Rs. } 30$$

3. In a ratio, which is equal to 7 : 8 , if the antecedent is 35, what is the consequent?

Let the consequent be x

$$\Rightarrow 7x = 8 \times 35; x = \frac{8 \times 35}{7} = 40$$

4. The sides of a triangle are in the ratio of $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$. If the perimeter is 104 cms, find the length of the smallest side.

$$\text{Given ratio is } \frac{1}{2} : \frac{1}{3} : \frac{1}{4} = 6:4:3$$

(Multiplying with the L.C.M. of 2,3, & 4)

$$\text{Sum of ratio} = 6+4+3= 13$$

$$\therefore \text{Smallest side} = \frac{3}{13} \times 104 = 24 \text{ cms.}$$

5. The incomes of A and B are in the ratio 2:3 and their expenditure are in the ratio 1:2, If each saves Rs. 2,400, find A's income.

Let the income of A and B be 2x and 3x

Since, Income - Savings = Expenditure,

$$(2x - 2400) : (3x - 2400) = 1:2$$

$$\Rightarrow 2(2x - 2400) = 3x - 2400$$

$$x = 2400$$

$$\therefore \text{As income } 2x = 2 \times 2400$$

$$= \text{Rs. } 4800.$$

6. In 40 litres mixture of milk and water, the ratio of milk and water is 3:1. How much water should be added in the mixture so that the ratio of milk to water becomes 2:1?

In 40 litres of mixture, quantity of milk

$$= \frac{3}{4} \times 40 = 30 \text{ litres}$$

Quantity of water = 40-30=10 litres

Suppose x litres of water be added in 40 litres of mixture.

$$\therefore \frac{30}{10+x} = \frac{2}{1} \Rightarrow 2(10+x) = 30 \Rightarrow x = 5 \text{ litres}$$

7. Two numbers are such that the ratio between them is 3:5 but if each is increased by 10, the ratio between them becomes 5:7. Find the numbers.

Let the numbers be 3x and 5x

$$\text{Then } \frac{3x+10}{5x+10} = \frac{5}{7}$$

$$\Rightarrow 7(3x+10) = 5(5x+10) \Rightarrow x = 5$$

\therefore The numbers are 15 and 25

8. A bag contains rupees, fifty paise, and twenty five paise coins in the proportion 5:6:8. If the total amount is Rs. 210. Find the number of coins of each kind.

Ans: Let there be 5 rupee coins, 6 fifty paise coins, and 8 twenty five paise coins the value of 6 fifty paise coins

$$= \text{Rs. } 3$$

The value of 8 twenty five paise coins

$$= \text{Rs. } 2$$

The number of rupee coins

$$= \frac{5 \times 210}{10} = 105$$

The number of 50 paise coins

$$= \frac{6 \times 210}{10} = 126$$

The number of 25 paise coins

$$= \frac{8 \times 210}{10} = 168$$

PRACTICE TEST

- If $A:B = 3:2$ $B:C = 4:3$ then $A:B:C = ?$
 - 6:4:3
 - 3:2:3
 - 3:4:3
 - 3:2:1
- Ratio between two numbers is 3:2 and their difference is 225, then the smaller number is:
 - 90
 - 675
 - 135
 - 450
- If $2x + 3y = 4z$, then $x : y : z$ is
 - 4:3:2
 - 6:3:4
 - 3:4:2
 - 6:4:3
- The mean proportion between 9 and 36 is
 - 22.5
 - 18
 - 6
 - 36
- The fourth proportion to 3,6,15 is
 - 15
 - 30
 - 5
 - 18
- Two numbers are in the ratio 7:9. If 12 is subtracted from each of them, the ratio becomes 3:5. The product of the numbers is:
 - 432
 - 567
 - 1575
 - 1263
- What must be added to each term of the ratio 7:13 so that the ratio becomes 2:3?
 - 1
 - 2
 - 3
 - 5
- A total amount of Rs. 1800 is to be divided among A,B and C in such a way that half of A's part, one third of B's part and one-fourth of C's part is equal. The A's part is
 - Rs. 400
 - Rs. 600
 - Rs. 800
 - Rs. 900
- A sum of Rs. 53 is divided among A,B,C in such a way that A gets Rs. 7 more than B and B gets Rs. 8 more than C. Then the ratio of their shares is
 - 10:18:25
 - 18:25:10
 - 25:18:10
 - 15:18:20
- The ratio of number of boys and girls in a school of 720 students is 7:5. How many more girls should be admitted to make the ratio 1:1?
 - 90
 - 120
 - 220
 - 240
- The ratio of the number of boys and girls at a party was 1:2 but when 2 boys and 2 girls left, the ratio became 1:3. then the number of persons initially in the party was
 - 24
 - 36
 - 12
 - 15
- A sum of Rs. 3400 has been divided among A,B and C in such a way that A gets $\frac{2}{3}$ of what B gets and B gets $\frac{1}{4}$ of what C gets. Then, B's share is
 - Rs. 600
 - Rs. 340
 - Rs. 400
 - Rs. 500
- Two numbers are in the ratio 3:5, If 8 is subtracted from each, then they are in the ratio 1:3. Then, the second number is
 - 15
 - 20
 - 4
 - 12
- The proportion of copper and zinc in brass is 13:7. How much zinc will be there in 100 kg of brass?
 - 20 kg
 - 35 kg
 - 45 kg
 - 50kg
- The ratio of the father's age to son's age is 4:1. The product of their ages is 196. The ratio of their ages after 5 years will be:
 - 3:1
 - 10:3
 - 11:4
 - 14:5
- The ages of Manoj and Amit are in the ratio 2:3. After 12 years, their ages will be in the ratio 11:15. The age of Amit is:
 - 32 years
 - 40 years
 - 48 years
 - 56 years
- Rs. 780 is divided among 2 men, 6 women and 8 boys so that the share of a man, a woman and a boy are in the ratio 3:2:1. Then, how much does a boy get?
 - Rs. 130
 - Rs. 60
 - Rs. 240
 - Rs. 40

18. The ratio between the annual incomes of A and B is 5:4 and between their expenditures is 4:3. If at the end of the year, A and B respectively save Rs. 400 and Rs. 500, then the income of A is:

- 1) Rs. 4,000 2) Rs. 3,200
3) Rs. 3,700 4) Rs. 4,800

19. A bag contains one rupee, 50 paise and 25 paise coins in the ratio 5:7:9. If the total amount in the bag is Rs. 430, find the number of coins of 25 paise.

- 1) 200 2) 280
3) 360 4) 300

20. A mixture contains milk and water in the ratio 3:2. If 4 litres of water is added to the mixture, milk and water in the mixture becomes equal. The quantity of milk in the mixture in litre is.

- 1) 18 2) 4
3) 6 4) 12

21. Two equal glasses are $\frac{1}{2}$ and $\frac{2}{3}$ full of milk respectively. The two are completely filled up with water. The contents of the two glasses are then mixed in another vessel. The ratio of milk and water in the vessel is

- 1) 5:7 2) 7:5
3) 1:1 4) 2:3

22. An amount is to be distributed among A, B and C in the ratio 3:7:5 respectively. If the difference in the shares of A and B is Rs. 7,600/- what will be the share of C?

- 1) Rs. 5,700 2) Rs. 19,000
3) Rs. 9,500 4) Rs. 10,000

23. Two varieties of oil are mixed in the ratio 4:3 to produce first quality and if they are mixed in the ratio 2:3 second quality is obtained. How many kg. of the first quality be mixed with 10kg of the second quality so that a third quality having the two varieties in the ratio 5 : 4 may be produced?

- 1) 48 kg 2) 42 kg
3) 88 kg 4) 98 kg

24. The ratio of the number of gents to ladies in a party was 2:3. When 20 more gents joined the group, the ratio was reversed. The number of ladies in the party was

- 1) 16 2) 24 3) 30 4) 36

25. The HCF of three numbers is 12. If they are in the ratio of 1:2:3, the numbers are

- 1) 12,24,36 2) 10,20,30
3) 5,10,15 4) 4,8,12

26. If the ratio of the areas of two squares is 1:4, the ratio of their perimeters is

- 1) 1:2 2) 1:4
3) 1:6 4) 1:8

27. Two numbers are such that their difference, their sum and their product are in the ratio of 1:7:24. The product of the numbers is

- 1) 6 2) 12 3) 24 4) 48

28. The incomes of A, B and C are in the ratio 7:9:12 and their spending are in the ratio 8:9:15. If A saves $\frac{1}{4}$ th of his income, then the savings of A, B and C are in the ratio of

- 1) 56:99:69 2) 99:56:69
3) 69:56:99 4) 99:69:56

29. Rs. 180 contained in a box is made up of one rupee, 50 paise, and 25 paise coins in the proportion of 2:3:4. What is the number of 50 paise coins?

- 1) 150 2) 180
3) 240 4) 120

30. 81 is divided into three parts, such that half of the first part, one-third of the second part and one-fourth of the third part are equal. The third part is more than the first by

- 1) 9 2) 18
3) 27 4) 36

31. 94 is divided into two parts in such a way that the fifth part of the first and eight parts

of the second are in the ratio 3:4. The first part is.

- 1) 2 2) 30 3) 36 4) 48

32. If a carton containing a dozen mirrors is dropped, which of the following cannot be the ratio of broken mirrors to unbroken mirrors?

- 1) 2:1 2) 3:1
3) 3:2 3) 7:5

33. Two-third of Reya's money is equal to one-fifth of Sobha's money. What is the ratio between their share of money?

- 1) 2:5 2) 3:10
3) 4:5 4) 10:3

34. The ratio of number of boys and girls in a school is 3:2. If 20% of the boys and 30% of the girls are scholarship holders, the percentage of students who do not get scholarship is

- 1) 50 2) 72
3) 75 4) 76

35. 20 litres of a mixture contains milk and water in the ratio of 5:3. If 4 litres of this mixture is replaced by 4 litres of milk, the ratio of milk to water in the new mixture will be

- 1) 2:1 2) 5:3
3) 7:3 4) 7:4

36. A sum of Rs. 427 is to be divided among A, B and C in such a way that 3 times A's share, 4 times B's share and 7 times C's share are all equal. The share of C is

- 1) Rs. 84 2) Rs. 147
3) Rs. 196 4) Rs. 240

37. An employer reduces the number of his employees in the ratio of 9:8 and increases their wages in the ratio 14:15. In what ratio

the wages bill is increased or decreased.

- 1) 21:20 2) 20:21
3) 25:26 4) 26:25

38. A and B are two alloys of gold and copper prepared by mixing metals in the ratio 7:2 and 7:11 respectively. If equal quantities of alloys are melted to form a third alloy C. Find the ratio of gold and copper in C.

- 1) 5:7 2) 7:5
3) 6:5 4) 5:6

39. A shopkeeper mixes two kinds of flour, one costing Rs. 3.50 per kg and the other Rs. 2.25 per kg. so that the price of the mixture is Rs. 2.75 per kg. The ratio of first kind of flour to that of the second must be

- 1) 3:4 2) 4:3
3) 3:2 4) 2:3

40. In what ratio must 25% alcohol be mixed with 60% alcohol to get a mixture of 40% alcohol strength?

- 1) 1:2 2) 2:1
3) 4:3 4) 3:2

41. In what proportion must water be mixed with spirit to gain $16\frac{2}{3}\%$ by selling it at cost price?

- 1) 6:1 2) 2:1
3) 1:2 4) 1:6

42. 15 litres of a mixture contains 20% alcohol and the rest water. If 3 litres of water be mixed in it, the percentage of alcohol in the new mixture will be

- 1) $17\frac{1}{2}$ 2) $16\frac{2}{3}$
3) $18\frac{1}{2}$ 4) 15

ANSWERS TO PRACTICE TEST

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|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (1) | 2. (4) | 3. (4) | 4. (2) | 5. (2) | 6. (2) | 7. (4) | 8. (1) |
| 9. (3) | 10. (2) | 11. (3) | 12. (1) | 13. (2) | 14. (2) | 15. (3) | 16. (3) |
| 17. (2) | 18. (1) | 19. (3) | 20. (4) | 21. (2) | 22. (3) | 23. (4) | 24. (2) |
| 25. (1) | 26. (1) | 27. (4) | 28. (1) | 29. (4) | 30. (2) | 31. (2) | 32. (3) |
| 33. (2) | 34. (4) | 35. (3) | 36. (1) | 37. (1) | 38. (2) | 39. (4) | 40. (3) |
| 41. (4) | 42. (2) | | | | | | |