7. Ratio and Proportion

Ratio, Proportion and Variation is a base topic for understanding few other topics like time and work, time and distance etc . The basic fundamentals of this lecture are extensively used in solving many questions in chapters like Work & Time, Time, Speed & Distance etc.

Ratio

The comparison between two quantities of the same kind of units is the ratio of one quantity to another. Two quantities of different kinds cannot be compared. Thus, there is no relation between height and cost. The ratio of a and b is usually written as a: b or $\frac{a}{b}$

Note

The ratio of two numbers a and b, written as a: b is the fraction $\frac{a}{b}$ provided b ≠ 0. Thus a: b = $\frac{a}{b}$, b ≠ 0. If a = b ≠ 0, the ratio 1:1 or 1/1 = 1.

The ratio of 4 to 6 = 4:6 $\frac{4}{6} = \frac{2}{3}$

Commensurable Ratio

It is the ratio of two fractions or any two quantities which can be expressed exactly by the ratio of 2 integers. For example, the ratio of 10m to 40m is 10:40 or 1:4 , which is the ratio of two integers, so these are Commensurable quantities.

Other types of Ratios

Compounded Ratio

When two or more ratios are multiplied term wise, the ratio thus obtained is called their compounded ratio. For the ratios a:b and c:d, the compounded ratio is ac:bd.

Example: What is the compounded ratio, for 2:3 and 4:5?

Sol: The compounded ratio is 2 x 4:3 x 5 or 8:15.

Reciprocal Ratio

For the ratio a:b, a, b ≠ 0 the ratio $\frac{1}{a} : \frac{1}{b}$ which is same as b:a is called its reciprocal ratio.

Comparing Ratios

To compare two ratios, we express them as fractions and then compare

Example: Which is greater 3:4 or 4:5?

Sol: 3:4 = $\frac{3}{4}$ and 4:5 = $\frac{4}{5}$

➔ $\frac{3}{4} = \frac{3 \times 5}{4 \times 5} = \frac{15}{520}$

➔ $\frac{4}{5} = \frac{4 \times 4}{5 \times 4} = \frac{16}{20}$

Since, $\frac{16}{20} > \frac{15}{20}$ or, $\frac{4}{5} > \frac{3}{4}$, so, 4:5 > 3:4.

- When certain amount S is distributed in the ratio of a:b that means first whole amount is divided in to a + b parts then distributes as "a" parts and "b" parts.

Example: Divide 2400 in the ratio 3:5.

Sol: The first part is 3 units and the second part is 5 units. The total of both the parts,

= 3 units + 5 units = 8 units. Here, 8 units = 2400, So, 1 unit = 2400/8 = 300

The first part = 3 units = 3 x 300 = 900. The second part = 5 units

= 5 x 300 = 1500.

Example: A sum of money is divided between Vinod and Lokesh in theratio of 3:7. Vinod gets Rs. 240. What does Lokesh get?

Sol. Vinod gets 3 units = Rs. 240.

So, 1 unit = 240/3 = 80

Therefore, 7 units = 7 x 80 = 560

<u>**Note:**</u>

- a:b = ka : kb where k is a constant
- a:b = a/k : b/k
- a:b t ≠ a + k : b + k, where a ≠ b
- a:b ≠ a^2 : b^2, where a ≠ b
- a:b : c = x : y : z is equivalent to $\frac{a}{X} = \frac{b}{Y} = \frac{c}{Z}$
- a:b > x : y if ay >bx
- a:b < x : y if ay < bx
- If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f}$ = k, then $\frac{a+c+e+\cdots}{b+d+f+\ldots} = k$

Problems leading to the application of ratios

Example: The ratio of the number of boys to the number of girls in aschool of 1638 is 5:2. If the number ofgirls increased by60, then what must be the decrease in the number of boysto make the new ratio of boys to girls as 4:3?

Sol:

Number of boys = $\frac{5}{7} \times 1638 = 1170$

Number of girls = $\frac{2}{7} \times 1638 = 468$

Number of girls increase = 468 + 60 = 528

Total number of boys to be decreased = 11470 – 704 = 468.

The number of boys to be decreased = 1170 - 704 = 466.

Example: A bag contains an equal number of one rupee, 50 paise and 25 paise coins respectively. If the total value is Rs. 35, thenhow many coins of each type are there?

Sol. Here number of each type of coin is the same. Hence, wemay write,

The ratios of $x : y : z$ from the equations

Number of each type of coin = $\frac{\text{total amount}}{\text{sum of value of each coin}}$

Number of each type of coin = $\frac{35}{1 + 0.5 + 0.25}$ = 20 coins of each type.

Example: The sum of the squares of three numbers is 532 and theratio of the first to the second as also of the second to thethird is 3:2. What is the second number?

Sol: $\frac{\text{first number}}{\text{second number}} = \frac{3}{2} \text{ x } \frac{3}{3} = \frac{9}{6}$

[Make the second number same in both the ratios, i.e. 6]

and $\frac{\text{Second number}}{\text{third number}} = \frac{3}{2} \text{ x } \frac{2}{2} = \frac{6}{4}$

First: Second: Third = 9:6:4

$(9x)^2 + (6x)^2 + (4x)^2 = 532$

➔ $133x^2 = 532$

➔ $x = \pm 2$.

Second number is $6x = \pm 12$

Example: Abag contains one rupee, fifty paise, and twenty five paiseand ten paise coins in theproportion 1:3:5:7. If the totalamount is Rs. 22.25, then find the number of coins of eachkind.

Sol. Let the number of coins of one rupee, fifty paise, twenty five paise and ten paise be x, $3x$, $5x$, $7x$ respectively.

Now,

value of one 50 paise coin in rupee = $\frac{1}{2}$

Value of one 25 paise coin in rupee = $\frac{1}{4}$

Value of one 10 paise cpin in rupee = $\frac{1}{10}$

Number of coins x Value of coin in rupees

= Amount $[(x \times 1) + (3x \times \frac{1}{2}) + (5x \times \frac{1}{4}) + (7x \times \frac{1}{10})] = 22.25$

$\frac{89x}{20} = 22.25$ ➔ $x = 5$

Number of 1 rupee coins = 5 x 1 = 5

Number of 50 paise coins = $3x$ = 15

Number of 25 paise coins = $5x$ = 25

Number of 10 paise coins = $7x$ = 35

Example: If a:b = 3:4 and b:c = 6:13, then find a:b:c.

Sol: The best way to solve such questions is to make b common in the two ratios.

Thus, we can write a:b = 9:12, and b:c = 12:26.

Now that b is equal in both the ratios, we can write the same as a b c

9 12

12 26

Thus, we can write a:b:c = 9:12:26. Using formula directly, we can get ??????

Proportion

A statement expressing the equality of two ratios is called a proportion, i.e., if a:b = c:d or $\frac{a}{b} = \frac{c}{d}$ then a, b, c & d are said to be in proportion. Here a and d are called the extremes and b and c are called the means. Also d is called the fourth proportional to a, band c. Thus, we can write a:b = c:d,

- a is the **first proportional**
- b is the **second proportional**
- c is the **third proportional**
- d is the **fourth proportional**

For example, 5:10 = 22:44 is in proportion. Each quantity in a proportion is called a term. The first and thelast terms are, known as the extremes while the second and thethird term are called the means. For the four quantities to be inproportion,

Product of means = Product of extremes

Continued Proportion

Three or more quantities are said to be in continued proportion, when the ratio of the first and the second is equal to ratio of the second and the third and so on. Thus a, b, c are in continued proportion if

a:b::b:c i.e., $\frac{a}{b} = \frac{b}{c}$

Similarly, a, b, c. d. ... are in continued proportion if,a:b::b:c::c:d ... , i.e., $\frac{a}{b} = \frac{b}{c} = \frac{c}{d}$...,

Proportions are equations and can be transformed usingprocedures for equations. Some of the transformed equationsare used frequently and are called the laws of proportion.

If a : b = c : d, then

- ad = bc {Product of extremes = Product of means}
- $\frac{b}{a} = \frac{d}{c}$ (Invertendo)
- $\frac{a}{c} = \frac{b}{d}$ (Alternendo)
- $\frac{a+b}{b} = \frac{c+d}{d}$ (Componendo)
- $\frac{a-b}{b} = \frac{c-d}{d}$ (Dividendo)
- $\frac{a+b}{a-b} = \frac{c+d}{c-d}$ (Componendo & Dividendo)

In the proportion a : b = b : c, c is called the third proportional to a and b, and b is called a mean proportional between a and c. Thus, b^2 = ac. This is known as continued proportion.

Example: Find the fourth proportional to $12a^2$, $9a^2b$ and $6ab^2$

Sol: Let x be the fourth proportional, then $\frac{12\,a^2}{9a^2b} = \frac{6\,ab^2}{x} \Rightarrow x = \frac{6ab^2.9a^2b}{12a^2} = \frac{9}{12}ab^3$

Variation

If change in one quantity causes change in another quantity they are in variation.
The three general type of variation functions are direct variation, inverse variation and joint variation

Direct Variation

If x & y are related such that any increase or decrease in' x ' or vice versa, then the two quantities are said to be in direct proportion.

x is directly proportional to y is written as $x \alpha y$ or x = Ky. In other words x: y = x/y = K. Here K is a constant whose valuefor a particular variation is same.
Consider $x_1 = Ky_1$ and $x_2 = Ky_2$ dividing the two we get $\frac{x_1}{x_2} = \frac{y_1}{y_2}$

Thus, the chances of your success in the test are directly proportional to the number of hours of sincere work devoted every day.

Example: If $x \propto y$ and x = 9 when y = 30, then find the relationbetween x and y. Find x when y = $7\frac{1}{2}$ and y when x = 6.

Sol: Let x = ky, then 9 = k(30) k = $\frac{3}{10}$, i.e., $x = \frac{3}{10}y$

When $y = 7\frac{1}{2}$ $x = \frac{3}{10}(7\frac{1}{2}) = 2\frac{1}{4}$

When x = 6, $x = \frac{3}{10}y \Rightarrow y = 20$.

Inverse Variation

Here two quantities x & y are related such that, any increase in x would lead to a decrease in y or any decrease in x would lead to an increase in y. Thus the quantities x & y are said to be inversely related and x is inversely proportional to y is written as

$x \propto 1/y$ or $x = k/y$ or $xy = k$ (constant) Therefore $x_1y_1 = x_2y_2$

Or the product of two quantities remains constant.

Example: If y varies inversely as x, and $y = 3$ when $x = 2$, then find x when $y = 21$.

Sol: $y \propto \frac{1}{x}$ or $y = \frac{k}{x}$ is (where k is a constant)

Then $3 = \frac{k}{2}$, k = 6 i.e. $y = \frac{6}{x}$.

➔ When $y = 21$, $21 = \frac{6}{x}$, $x = \frac{2}{7}$

Example: If a person can travel with speed of 90kmph from A to B in 5 hrs, then in how many hours he can return to starting point with a speed of 50 kmph?

Sol: As we know when we travel with high speed we take less time to travel the same distance. So speed and time are inversely proportional.

So $V_1T_1 = V_2T_2$

➔ $90 \times 5 = 50 \times T_2$

➔ $T_2 = 9$ hrs

Joint Variation

- A varies jointly as B and C and is denoted by $A \propto BC$ Or $A = kBC$ (where k is a constant).
- A varies directly as B and inversely as C and is denoted by
  $A \propto \frac{B}{C}$ or $A = \frac{kB}{C}$ (where k is a constant).
- If A varies as B when C is constant, and if A varies as C when B is constant then A varies as BC when B and C both ➔ $A \propto BC$ Or $A = kBC$ (where k is a constant).

<u>Note</u>

- If $A \propto$ Band $B \propto C$, then $A \propto C$
- If $A \propto C$ and $B \propto C$, then $(A \pm B) \propto C$ and $\sqrt{(AB)} \propto C$
- If $A \propto BC$, then $A/C \propto$ Band $A/B \propto C$
- If $A \propto$ Band $C \propto D$, then $AC \propto BD$
- If $A \propto B$ then $A^n \propto B^n$

- If A ∝ B and A ∝ C then A ∝ (B - C) and A ∝ (B + C)
- If A ∝ B, then AP ∝ BP where P is any quantity, constant or variable

Partnership

- In case of the partnership business (where more than one person is involved in the business), if the period of investment is the same for each partner, then the profit or loss is divided in the ratio of their investments.

  If x and y are partners in a business, then

  $$\frac{\text{investment of x}}{\text{Investment of y}} = \frac{\text{profit of x}}{\text{Profit of y}} \text{ or } \frac{\text{investment of x}}{\text{Investment of y}} = \frac{\text{Loss of x}}{\text{Loss of y}}$$

Example: A and B together invested Rs. 12000 in a business. At the end of the year, out of a total profit of Rs. 1800, A's share was Rs. 750. What was the investment of A?

Sol: Since profits are shared in the ratio of their investments

$\frac{\text{A's investment}}{\text{B's investment}} = \frac{\text{profit share of A}}{\text{profit share of B}}$ (money invested by A and B for the same period)

$= \frac{750}{1800-750} = \frac{750}{1050} = \frac{5}{7}$

Investment of A = $\frac{5}{5+7}$ x 12000 = Rs. 5000

Example: A and B together started a business by investing Rs. 5000 and Rs. 7000 respectively. At the end of the year, the total loss was Rs. 1800. What is the share of A and B in loss?

Sol. Ratio of investment of A and B is 5000:7000 = 5:7.

Share of A in loss = 1800 x $\frac{5}{5+7}$ = Rs. 750 and,

The share of B in loss = 1800 x $\frac{7}{5+7}$ = Rs. 1050

Example: In a business A, B, and C invested Rs. 380, Rs. 400 and Rs. 420 respectively. Divide a net profit of Rs. 180 among the partners.

Sol.

A's profit: B's profit: C's profit

A's investment: B's investment: C's investment

80:400:420 = 19:20:21.

Profit share of A = $\frac{19}{60}$ x 180 = Rs. 57

Profit share of B = $\frac{20}{60}$ x 180 = Rs. 60

Profit share of C = $\frac{21}{60}$ x 188 = Rs. 63

Example: A started business with a capital of Rs. 10000 Four months later B joined him with a capital of Rs, 5000, What is the share of A in a total profit of Rs. 2000 at the end of the year?

Sol. $\frac{\text{Profit of A}}{\text{profit of B}} = \frac{\text{Amount} \times \text{No.of months}}{\text{Amount} \times \text{No.of months}} = \frac{10000 \times 12}{5000 \times 81}$

Profit share of A = $\frac{3}{3+1}$ x 2000 = Rs. 1500

If more than two persons invest money in a business, then MEI of A: MEI of B: MEI of C = Profit for A: Profit for B: Profit for C.

Example: A, Band C enter into a partnership. A contributes Rs. 320 for 4 months, B contributes Rs. 510 for 3 months and C contributes Rs. 270 for 5 months. If the total profit is Rs. 208, what will be the share of A?

Sol. A's profit: B's profit: C's profit

= 320 × 4:510 × 3:270 × 5 ➔ 1280:1530:1350 ➔ 128:153:135

Profit of A = $\frac{128}{128+153+135} \times 208$ ➔ $\frac{128}{416} \times 208$ = Rs. 64

Profit of B = $\frac{153}{128+153+135} \times 208$ ➔ $\frac{153}{416}$ x 208 = Rs. 76.50

Profit of C = $\frac{135}{128+153+135} \times 208$ ➔ $\frac{135}{416} \times 208$ = Rs. 67.50

Mixtures (Allegation)

The problems on this topic generally involve the theory of ratio & proportion and at times basics of percentages and profit & loss.

Types of Mixture

There are two types of mixtures they are, Simple and compound:

Simple Mixture: When two different ingredients are mixed together, it is known as a simple mixture.

Compound Mixture: When two or more simple mixtures are mixed together to form another mixture, it is known as a compound mixture.

Allegation Rule

This rule enables us to find the proportion in which two or more ingredients at the given price must be mixed to produce a mixture at a given price.

Statement: The rule states that when different quantities of different costs are mixed together to produce a mixture of mean cost, the ratio of the quantities are inversely proportional to the differences in their costs from the mean cost (value or strength).

The CP of the item that is cheaper is given by $\text{CP}_{\text{cheaper}}$. The CP ofthe item that is costlier (dearer) is given by CP (dearer). The CP of unit quantity of the final mixture is called the MEAN PRICE and is given by$CP_{mean\ price}$. The ratio in which cheaper item needs to be mixed with dearer item to get desired Mean price is,

$$= \frac{CP_{dearer} - CP_{mean\ price}}{CP_{mean\ price} - CP_{cheaper}}$$

Applications of the Rule

- The Alligation Rule is used to find the mean value of a mixture when the prices of two or more ingredients, which are mixed together and the proportion in which they are mixed are given.
- It is also used to find the proportion in which the ingredients at given prices must be mixed to produce a mixture at agiven price.

Example: In what ratio should tea at Rs. 35 per kg be mixed with tea at Rs. 27 per kg so that mixture may cost Rs. 30 per kg?

Sol: $\frac{\text{Quantity of cheaper}}{\text{quantity of dearer}} = \frac{35 - 30}{30 - 27} = \frac{5}{3}$

Hence the two should be mixed in the ratio 3:5. The above ratio calculated is 3:5 and not 5:3, i.e., tea @ 35 per kg to have 3 parts and tea @ 27 per kg to have 5 parts. This may be checked mentally by the following simple rule: "If meanprice is closer to cheaper CP, then quantity of cheaperwill be more and vice versa."

Example: In what ratio should two different types of mixtures containing milk and water in the ratio of 5:1 and 2:1 respectively mixed to obtain a final mixture containing milk and water in the ratio of 3:1?

Sol:

- Strength of milk in mixture 1 = 5/6 (because there are 5parts of milk for every 1 part of water. Hence there are 5 parts of milk for a total of 6 parts of the mixture
- Strength of milk in mixture 2 = 2/3 (because there are 2 parts of milk for every 1 part of water. Hence there are 2 parts of milk for a total of 3 parts of the mixture)
- Strength of milk in the final mixture required = 3/4 (becausethere are 3 parts of milk for every 1 part of water. Hence there are 3 parts of milk for a total of 4 parts of the mixture),

As we can see, the mixture 1 is stronger in milk as comparedto mixture 2, hence we will refer to mixture 1 as the dearermixture, mixture 2 as the cheaper mixture and the finalmixture as the mean mixture.

$$\frac{\text{Quantity of cheaper}}{\text{quantity of dearer}} = \frac{\frac{5}{6}-\frac{3}{4}}{\frac{3}{4}-\frac{2}{3}}$$

Hence, both the types of mixtures will have to be mixed inthe ratio of 1:1.

Two mixtures of same ingredients mixed (Compound mixture)

Mixture 1 has ingredients (A and B) in a: b. ➔ $\frac{\text{quantityofingredientA}}{\text{quantityofingredientB}} = \frac{a}{b}$

Mixture 2 has same ingredients (A and B) in $x{:}y$ ➔ $\frac{\text{quantityofingredientA}}{\text{quantityofingredientB}} = \frac{x}{Y}$

Case I. When q_A and q_B are to be found out when 1 and 2 are mixed in the ration of M:N then by alligation rule in the resultant mixture,

$$\frac{\text{quantity of ingredient A}}{\text{quantity of ingredient B}} = \frac{q_A}{q_B} = \frac{M \times \left(\frac{a}{a+b}\right) + N \times (\frac{X}{X+Y})}{M \times \left(\frac{b}{a+b}\right) + N \times (\frac{Y}{X+Y})}$$

Then, amount of ingredient A in the resultant mixture $\frac{q_A}{q_A + q_B} \times (M + N)$

Amount of ingredient A in the resultant mixture $\frac{q_B}{q_A + q_B} \times (M + N)$

Example: In two alloys, the ratio of zinc to tin is 5:2 and 3:4. If 7 kgof the first alloy and 21 kg of the second alloy are mixedtogether to form a new alloy, then what will be the ratio ofzinc and tin in the new alloy?

Sol.

Quantity of x = Quantity of Zinc

Quantity of y = Quantity of Tin

M = 7 kg N = 21 kg

a = 5 b = 2

x = 3 y = 4

Putting these values in the formula, we get

$$\frac{\text{quantity of Zin c}}{\text{Quantity of Tin}} = \frac{7 \times \left(\frac{5}{5+2}\right) + 21 \times \left(\frac{3}{3+4}\right)}{7 \times \left(\frac{2}{5+2}\right) + 21 \times \left(\frac{4}{3+4}\right)} = \frac{14}{14} = 1{:}1$$

Removal and Replacement by Equal Quantity

If a vessel contains "a" litres of petrol, and if "b" litres be withdrawn and replaced by kerosene, then if "b" litres of the mixture be withdrawn and replaced by kerosene, and the operation repeated 'n' times in all, then

$$\frac{\text{Petrol left in vessel after nth operation}}{\text{initial quantity of Petrol in vessel}} = \left(\frac{a-b}{a}\right)^n$$

Note that in the denominator the term "Initial quantity of Petrolin vessel" is equal to the "Volume of mixture in the vessel afterthe nth operation.

Example: A tea merchant buys two kinds of tea, the price of the firstkind being twice that of the second. He sells the mixture at Rs. 14/kg there by making a profit of 40%. If the ratio of the first to second kind of tea in the mixture is 2:3, then findthe cost price of each kind of tea.

Sol. The cost of mixture = Rs. 14 × $\frac{100}{140}$ = Rs. 10/kg

Ratio in which the cheaper and dearer is mixed = 3:2

Let the price of cheaper tea be Rs. x/kg and dearer tea be Rs. 2 x/kg

Applying the alligation rule, we get $\frac{3}{2} = \frac{2x-10}{10-x}$

30 - 3x = 4x - 20

➔ 7x = 50 $x = 7\frac{1}{7}$

Cost of cheaper tea = Rs. $7\frac{1}{7}$ and cost of dearer tea = Rs. $14\frac{2}{7}$

Practice Exercise

DIRECTIONS: For the following questions, four options are given.Choose the best option,

1. 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. How many persons were there initially in the party?
   1) 18 2) 30 3) 12 4) 15

2. What least number should be subtracted from each of the numbers 12, 17, 22, 32 so that the remainders may be in proportion?
   1) 2 2) 1 3) 3 4) 4

3. A sum of Rs. 3400 has been divided among A, B, C in such way that A gets 2/3 of what B gets and B gets C gets. What is the share of B?
   1) Rs. 600 2) Rs. 800 3) Rs. 500 4) Rs. 1000

4. If a: b = 5:6 and b:c = 8:5, then find the value of $\frac{a+b+c}{2a-b-c}$

1) 43 2) 59 3) 63 4) 39

5. The integer which when subtracted from both the numeratorand the denominator of 60/70 will give a ratio equal to 16/21 is

1) 25 2) 20 3) 26 4) 28

6. The least integer which when added to both terms of theratio 5:9 will make a ratio greater than 7:10 is

1) 3 2) 4 3) 6 4) 5

7. A's age is $\frac{5}{4}$ of B's, and B's age is $\frac{4}{3}$of C's, while M's ageis equal to the sum of the ages of A, Band C. If C is 15years old, then how old is M?

1) 55 years 2) 65 years 3) 70 years 4) 60 years

8. Rs. 375 is divided among A, B & C so that if Rs. 4, Rs. 5, Rs. 6 be subtracted from theirrespective shares, the remaindersn the ratio 3:4:5. Then, the shares (in Rs.) are respectively

1) 175, 125, 75 2) 120, 125, 130 3) 94, 125, 156 4) 90, 125, 160

9. four years ago the ratio of ages of A and B was 13:9 and eight years hence, the ratio will be 4:3 the difference of their present ages is

1) 56 years 2) 40 years 3) 16 years 4) 24 years

10. Rs. 730 were divided among A, B, C in such a way that if Agets Rs. 3, then B gets Rs. 4 and if B gets Rs. 3.50, then Cgets Rs. 3, The share of B exceeds that of C by

1) Rs. 30 2) RS. 40 3) Rs. 70 4) Rs. 210

11. If three numbers in the ratio 3:2:5 are such that the sum of their squares is 1862, then the middle number will be

1) 7 2) 14 3) 21 4) 35

12. A sum of RS. 53 is divided among A, B, C in such a way thatA gets RS. 7 more than B and B gets Rs. 8 more than C. Theratio of their shares is?

1) 10 :18:25 2) 18:25:10 3) 25:18:10 4) 15:18:20

13. Two numbers are in the ratio 3:5. If 8 be subtracted fromeach, then they are in the ratio 1:3. The second number is

1) 15 2) 20 3) 4 4) 12

14. A sum of money is divided so that the sum of the shares of A and B, B and C and C and A are respectively Rs. 12, Rs. 14.and Rs. 16. What is B's share (in Rs.)?

1) 5 2) 7 3) 9 4) 21

15. The ratio of the number of boys and girls in a college of 441 students is 5:4. How many girls should join the college sothat the ratio becomes 1:1?

1) 50 2) 49 3) 320 4) 94

16. A can contains a mixture of two liquids A and B in the ratio 7:5. When 9 litres of mixture are drawn off and the can isfilled with B, the ratio of A and B becomes 7:9. How manylitres of liquid A was contained by the can initially?

1) 25 2) 21 3) 20 4) 10

17. Two vessels A and B contain milk and water mixed in theratio 4:3 and 2:3. In what ratio must these mixtures bemixed to form a new mixture containing half milk and halfwater?

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

18. 729 ml of mixture contains milk and water in the ratio 7:2. How much more water is to be added to get a new mixturecontaining milk and water in the ratio 7:3?

1) 79 ml 2) 81 ml 3) 72 ml 4) 91 ml

19. An alloy of Zinc and tin contains 35% of Zinc by weight. Ifthe final percentage of zinc is to be 66.66, then the weightof zinc which must be added to 400 lb of this alloy is

1) 400 lb 2) 350 lb 3) 280 lb 4) 380 lb

20. A mixture of 40 litres of milk & water contains 10% water. How much water should be added to this so that water must be 20% in the new mixture?

1) 5 Litres 2) 4 Litres 3) 6.5 Litres 4) 7.5 Litres

Answers:

1. 3	**2.** 1	**3.** 1	**4.** 3	**5.** 4
6. 4	**7.** 4	**8.** 3	**9.** 3	**10.** 2
11. 2	**12.** 3	**13.** 2	**14.** 1	**15.** 2
16. 2	**17.** 1	**18.** 2	**19.** 4	**20.** 1