

Average or Arithmetic Mean means equal distribution. It lies between highest and lowest value.

$$\text{Average} = \frac{\text{Total sum of all observation}}{\text{Number of observation}}$$

### Deviation Concept

Deviation is calculated by taking the difference between each score and the mean score.

The sum of the deviation (net deviation) of a given set of data about their mean is always zero.

It means Sum of +ve deviation = Sum of -ve deviation

$$\sum_{i=1}^n (x_i - \bar{x}) = 0$$

Example: Average of 47, 54, 63, 45, 56, 69, 65

$$= \frac{399}{7} = 57$$

Deviation with respect to 57

|               |              |
|---------------|--------------|
| 47 - 57 = -10 | 63 - 57 = 6  |
| 54 - 57 = -3  | 69 - 57 = 12 |
| 45 - 57 = -12 | 65 - 57 = 8  |
| 56 - 57 = -1  | +26          |
| -26           |              |

Net deviation = 26 - 26 = 0

- If each number is decreased by a certain quantity 'k', then the average decreases by the same quantity.
- If each number is increased by a certain quantity 'k', then the average also increases by the same quantity.
- If each number is multiplied by a certain quantity 'k', then the mean also gets multiplied by same quantity.
- If each number is divided by a certain quantity 'k', then the mean also gets divided by same quantity.

### AP Average

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

Where,  $S_n$  Sum of 'n' numbers in a AP series, a = First term, n = number of term, d = common difference

$$S_n = \frac{n}{2} [a + a + (n-1)d]$$

$$\text{Last term} = l = t_n = a + (n-1)d$$

$$S_n = \frac{n}{2} (a + l)$$

$$\text{Avg. } \frac{S_n}{n} = \frac{a+l}{2}$$

$$\text{Avg.} = \frac{\text{First term} + \text{Last term}}{2}$$

**Example:** What is the average of all the numbers between 100 and 200 which are divisible by 13?

**Solution:** 1<sup>st</sup> term =  $13 \times 8 = 104$

Last term =  $13 \times 15 = 195$

$$\text{Average} = \frac{104+195}{2} = 149.4$$

- Sum = Average  $\times$  number of terms
- If the number of terms is odd, the average is the middle term.
- If the number of terms is even, the average is the mean of the two middle terms.
- Average of n consecutive number with common difference is A. If we add 'm' numbers in next or previous, then the average of (n + m) numbers = A +  $\frac{d}{2} \times m$

### Some Important Result

1. Average of 1<sup>st</sup> 'n' whole numbers =  $\frac{n-1}{2}$
2. Average of 1<sup>st</sup> 'n' natural numbers =  $\frac{n+1}{2}$
3. Average of 1<sup>st</sup> 'n' odd numbers = n
4. Average of 1<sup>st</sup> 'n' even numbers = n + 1
5. Average of square of 1<sup>st</sup> 'n' natural numbers =  $\frac{(n+1)(2n+1)}{6}$
6. Average of square of 1<sup>st</sup> 'n' odd numbers =  $\frac{(2n+1)(2n-1)}{3}$
7. Average of square of 1<sup>st</sup> 'n' even numbers =  $\frac{2(n+1)(2n-1)}{3}$
8. Average of cubes of 1<sup>st</sup> 'n' natural numbers =  $n \left( \frac{n+1}{2} \right)^2$
9. Average of cubes of 1<sup>st</sup> 'n' odd numbers =  $n(2n^2 - 1)$
10. Average of cubes of 1<sup>st</sup> 'n' even numbers =  $2n(n+1)^2$
11. Average of 'n' multiples of any number = Given number  $\times \frac{(n+1)}{2}$

### Concept

➤ **When new value is added**

New Average

$$= \text{Old Average} + \frac{\text{Added value} - \text{old average}}{n+1}$$

**Example:** The mean of 9 observation is 16. One more observation is included and new mean becomes 17. The 10<sup>th</sup> observation is:

**Solution:**  $17 = 16 + \frac{x-16}{9+1}$   
 $x = 26$

➤ **When value is removed**

New Average

$$= \text{Old Average} + \frac{\text{old average} - \text{Removed value}}{n-1}$$

**Example:** The average of 5 numbers is 27. If one number is excluded, the average becomes 25. The excluded number is:

**Solution:**  $25 = 27 + \frac{27-x}{5-1}$   
 $x = 35$

➤ **When value is replaced**

$$\text{New Average} = \text{Old Average} + \frac{\text{New value} - \text{Old value}}{n}$$

**Example:** Out of 10 teachers of a school, one teacher retires and in place of him a new teacher 25 years old join. As a result, average age of teachers reduces by 3 years. Age of the retired teacher is:

**Solution:**  $A - 3 = A + \frac{25-x}{10}$   
 $x = 55$

➤ If the average of  $n_1$  observation is  $a_1$ , the average of  $n_2$  observation is  $a_2$  and so on,

Then Average of all the observation =

$$\frac{n_1 a_1 + n_2 a_2 + n_3 a_3 + \dots}{n_1 + n_2 + n_3 + \dots}$$

**Example:** The average marks of 32 boys of section A of class X is 60 whereas the average marks of 40 boys of Section B of class X is 33. The average marks for both the sections combined together is:

**Solution:**  $\frac{32 \times 60 + 40 \times 33}{32 + 40} = \frac{1920 + 1320}{72} = 45$

Or  $60 + \frac{(33-60) \times 40}{32+40} = 60 - 15 = 45$

## EXERCISE

1. If the average of three consecutive even numbers is 258, find the largest of these numbers.

- (a) 260 (b) 265 (c) 275 (d) 270

(OSSC CGL 2021)

2. Average of 3rd and 5th number in 5 consecutive numbers is 124. Find the sum of 5 numbers.

- (a) 625 (b) 635 (c) 605 (d) 615

(OSSC CGL 2021)

3. A sequence of seven consecutive integers is given. The average of the first five given integers is 37. Find the average of all the seven integers.

- (a) 35 (b) 38 (c) 40 (d) 41

(OSSC CGL SPL 2023)

4. What is the average of first 37 natural numbers?  
 (a) 19 (b) 21 (c) 23 (d) 27

(OSSC CHSL 2024)

5. The average of 10 numbers is 1123. If each number is increased by 9, what will the new average be?

- (a) 1232 (b) 1132 (c) 1332 (d) 1032

(OSSC CGL 2021)

6. Jaffar obtained 73, 68, 46, 79 and 58 marks (out of 100) in English, Mathematics, Physics, Chemistry and Biology. What is his average marks?

- (a) 65 (b) 64.4 (c) 64.6 (d) 64.8

(OSSC Investigator 2022)

7. Ramesh is on a 9 day trip with his college mates. He had decided to keep his average expense for 9 days at Rs. 227. However, at the end of eight days, he realized that his expenses on first eight days were Rs. 191, Rs. 197, Rs. 221, Rs. 223, Rs. 183, Rs. 207, Rs. 211 and Rs. 209 respectively. How much should he spend on the 9th day to ensure that he meets his targeted average expense? (in Rs.)

- (a) 403 (b) 405 (c) 401 (d) 407

(OSSC CGL 2021)

8. A grocer has a sale of Rs. 6635, Rs. 7127, Rs. 7055, Rs. 7430 and Rs. 6462 for 5 consecutive months. How much sale must he have in the sixth month so that he gets an average sale of Rs. 6700? (in Rs.)

- (a) 5391 (b) 5191 (c) 5291 (d) 5491

(OSSC CGL 2021)

9. The average weight of 36 students in a class is 54.25 kg and that of remaining 20 students is 51 kg. Find the average weight of all the students in the class. (approximately)

- (a) 47 (b) 51 (c) 49 (d) 53

(OSSC CGL 2021)

10. If the average marks of three classes of 65, 70 and 75 students are 65, 70 and 75 respectively, find the average marks of all the students. (approximately)  
(a) 70.23 (b) 70.03 (c) 72.23 (d) 74.23  
(OSSC CGL 2021)
11. The average weight of 24 students in a class is 51.25 kg, and that of remaining 8 students is 46.5 kg. Find the average weight of all the students in the class. (approximately)  
(a) 50.062 (b) 52.063 (c) 56.063 (d) 54.063  
(OSSC CGL 2021)
12. A car owner buys petrol at Rs. 7.50, Rs. 8 and Rs. 8.50 per litre for three consecutive years. What approximately is the average cost per litre of petrol if he spends Rs. 4000 each year?  
(a) Rs. 7.98 (b) Rs. 8  
(c) Rs. 8.50 (d) Rs. 9  
(OSSC CHSL SPL 2022)
13. For three consecutive years, the costs of a product were Rs. 118 per litre, Rs. 236 per litre and Rs. 295 per litre respectively. If a common man spends an average of Rs. 12980 per year on that product, then what is the average cost of that product per litre for the three years? (in Rs.)  
(a) 176.31 (b) 186.31  
(c) 206.31 (d) 196.31  
(OSSC CGL 2021)
14. The average height of 31 telecom towers which are arranged in an ascending order is 288 m. If the average height of first 15 telecom is 288 m and that of last 15 telecom tower is 288 m, then what is the height of 16th telecom tower? (in m)  
(a) 268 (b) 298 (c) 278 (d) 288  
(OSSC CGL 2021)
15. The average of 11 numbers is 112.9. If the average of first six is 112.3 and that of the last six is 113.5, then the sixth number is:  
(a) 110.9 (b) 112.9 (c) 116.9 (d) 114.9  
(OSSC CGL 2021)
16. The average of 9 observations was 1119. The average of first of 4 is 1115 and that of the last 4 is 1123. What is the fifth observation?  
(a) 1119 (b) 1319 (c) 1419 (d) 1219  
(OSSC CGL 2021)
17. The average height of 35 telecom towers which are arranged in an ascending order is 284 m. If the average height of first 17 telecom is 284 and that of last 17 telecom tower is 286 m, then what is the height of 18th telecom tower? (in m)  
(a) 250 (b) 270 (c) 240 (d) 260  
(OSSC CGL 2021)
18. The average of 10 data is 57.5. In this the average of first 3 data is 52 and next 4 data is 62. If 8th data is 7 less than the 9th data and also 5 less than the 10th data, then find the eighth data.  
(a) 55 (b) 57 (c) 53 (d) 51  
(OSSC CGL 2021)
19. The average of Sohan's marks in 6 subjects is 74. If his average in 5 subjects excluding science is 70, then how many marks has he obtained in science?  
(a) 94 (b) 92 (c) 90 (d) 88  
(OSSC CHSL 2024)
20. The average weight of a Kabaddi team of 139 players is 89 kg. If the weight of the manager is included, then the average increases by 1 kg. Find the weight of the manager.  
(a) 219 (b) 239 (c) 229 (d) 249  
(OSSC CHSL 2024)
21. The average weight of all the 11 players of Real Madrid is 71 kg. If the average of first six light weight players of Real Madrid is 69 kg and that of the six heavy weight player of Real Madrid is 73 kg, find the weight of the player which lies in the sixth position in the list of players while all the 11 players of Real Madrid are arranged in the order of increasing or decreasing weights. (in kg)  
(a) 73 (b) 77 (c) 75 (d) 71  
(OSSC CHSL 2024)
22. The average weight of 269 fertilizer bags is 69 kg. If the weight of the box (in which the fertilizer bags are kept) is included, the calculated average weight per fertilizer bag will increase by 0.7 kg. What is the weight of the box? (in kg).  
(a) 208.3 (b) 198.3 (c) 178.3 (d) 188.3  
(OSSC CHSL 2024)
23. The average age of 24 students and the class teacher is 16 years. If the class teacher's age is

- excluded, the average reduces by one year. What is the age of the class teacher?  
 (a) 50 years (b) 45 years  
 (c) 40 years (d) Data inadequate  
**(OSSC CGL 2024)**
24. A batsman in his 12th innings makes a score of 65 and there by increases his average by 2 runs. What is his average after the 12th innings if he had never been 'not out'?  
 (a) 42 (b) 43 (c) 44 (d) 45  
**(OSSC CGL 2024)**
25. The average weight of 8 persons increases by 2.5 kg when a new person comes in place of one of them weighing 65 kg. What might be the weight of the new person?  
 (a) 76 kg (b) 76.5 kg  
 (c) 85 kg (d) Data inadequate  
**(OSSC CHSL 2023 & CGL SPL 2023)**
26. For 9 innings, Shane Watson had an average of 97 runs. In the 10th innings, he scores 122 runs, thus increasing his average. What is his new average?  
 (a) 97.5 (b) 99.5 (c) 98.5 (d) 96.5  
**(OSSC Investigator 2022)**
27. There are 35 students in a hostel. Due to the admission of 7 new students, the expenses of mess were increased by Rs. 42 per day while the average expenditure per head diminished by Rs. 1. What was the original expenditure of the mess?  
 (a) Rs. 400 (b) Rs. 420 (c) Rs. 445 (d) Rs. 465  
**(OSSC CGL 2024 and CGL Mains 2024-25)**
28. The average of 167 EB reading was 160 units. Later on it was found that a reading 171 was wrongly typed as 166. Find the correct average (approximately).  
 (a) 160.03 (b) 162.03 (c) 164.02 (d) 166.02  
**(OSSC CGL 2021)**
29. The average of 51 numbers is 279. If two numbers 274 and 284 are discarded, find the average of the remaining set of numbers.  
 (a) 289 (b) 269 (c) 259 (d) 279  
**(OSSC CGL 2021)**
30. The average age of A, B and C is 73. If the average age of A and B is 71 and that of B and C is 75, then find the age of B (in years).  
 (a) 77 (b) 73 (c) 71 (d) 75  
**(OSSC CGL 2021)**
31. The average age of three boys is 15 years. If the ratio of their ages is 3:5:7, then what is the age of the youngest boy?  
 (a) 21 years (b) 18 years  
 (c) 14 years (d) 9 years  
**(OSSC CTSRE 2024)**
32. In a class there are 25 girls and 20 boys. Total average weight of class is 38 kg. Total average weight of boys is 52 kg. Find the average weight of girls?  
 (a) 32 kg (b) 30 kg (c) 52 kg (d) 35 kg  
**(OSSC SSC CGL SPL 2023)**
33. The average age of Sumit's family consisting of 5 members, 3 years ago, was 35 years. One year ago, a new baby was born in the family. Three years hence, the average age of the family will be:  
 (a) 36 years (b)  $37\frac{5}{6}$  years  
 (c)  $35\frac{2}{5}$  years (d) None of these  
**(OSSC CGL 2022)**
34. A family consists of two grandparents, two parents and three grandchildren. The average age of the grandparents is 67 years, that of the parents is 35 years and that of the grandchildren is 6 years. What is the average age of the family?  
 (a)  $28\frac{4}{7}$  years (b)  $31\frac{5}{7}$  years  
 (c)  $32\frac{1}{7}$  years (d) None of these  
**(OSSC CHSL 2023)**
35. The captain of a cricket team of 11 members is 29 years old and the vice-captain is 2 years older. If the age of these two are excluded, the average age of the remaining players is two years less than the average age of the whole team. What is the average age of the team?  
 (a) 23 years (b) 22 years  
 (c) 24 years (d) None of these  
**(OSSC CTSRE 2023)**
36. 10 years ago, the average age of all the 25 teachers of a school was 45 years. 4 years ago, the principal had retired from her post at the age of 60 years. So, after one year, a new principal, whose age was 54 years, returned from outside. If

principal is also counted as a teacher, then the present average age of all the teachers is:

- (a)  $54\frac{18}{25}$  years (b)  $55\frac{19}{25}$  years  
(c)  $53\frac{8}{25}$  years (d) None of these

(OSSC CTSRE 2023)

37. In a class with certain number of students, if one student weighing 50 kg is added then average weight of the class increased by 1 kg. If one more student weighing 50 kg is added, then the average weight of the class increased by 1.5 over the original average. What is the original average weight of the class?

- (a) 2 kg (b) 15 kg (c) 47 kg (d) 55 kg

(OSSC CTSRE 2025)

38. The average weight of 8 persons increased by 1.5 kg. If a person weighing 65 kg is replaced by a new person, what could be the weight of the new person?

- (a) 76 kg (b) 77 kg  
(c) 76.5 kg (d) Data inadequate

(OSSC CPGL 2024)

39. The captain of a cricket team of 11 players is 25 years old and the wicket-keeper is 3 years older. If the age of these two players are replaced by that of another two players, the average age of the cricket team drops by 2 years. Find the average age of those two players.

- (a) 15 years (b) 15.5 years  
(c) 17 years (d) 16.5 years

(OSSC CPGL 2024)

40. 5 kg of superior quality of sugar is mixed with 25 kg of inferior quality of sugar. The price of superior quality and inferior quality sugar is Rs. 18 and Rs. 12 respectively. The average price per kg of mixture is.

- (a) Rs. 13 (b) Rs. 15 (c) Rs. 18 (d) Rs. 21

(OSSC CPGL 2024)

41. A library has an average of 260 visitors on Sundays and 140 on other days. The average number of visitors per day in a month of 30 days beginning with a Sunday is:

- (a) 180 (b) 176 (c) 160 (d) 215

(OSSC Accountant 2023)

42. 20 kg of coffee having a rate of Rs. 80 per kg is mixed with 12 kg of coffee having a rate of Rs. 60 per kg. What is the average rate of mixture?

- (a) Rs. 79.1 (b) 81.2 (c) 72.5 (d) Rs. 83.5

(OSSC Junior Clerk Mains 2022)

43. The average weight of X, Y and Z is 121 kg. If the average weight of X and Y is 116 kg and that of Y and Z is 126 kg, then find the weight of Y.

- (a) 123 (b) 125 (c) 121 (d) 127

(OSSC SCEW 2022)

44. The average weight of 40 bags in a godown is 170.5 kg and that of the remaining 20 bags is 35 kg. Find the average weight of all the bags in the godown. (rounding off to two decimals).

- (a) 115.34 (b) 125.34 (c) 125.34 (d) 105.34

(OSSC SCEW 2022)

45. The average weight of 22 box in a boat is 88 kg, it gets increased by 1 kg when a new box is added to the boat. Find the weight of the new box. (in Kg)

- (a) 111 (b) 113 (c) 107 (d) 109

(OSSC SCEW 2022)

46. If the average scores of three teams of 155, 165 and 175 members are 155, 165 and 175 respectively, then find the average score of all the members. (rounding off to two decimals)

- (a) 175.41 (b) 165.41 (c) 155.41 (d) 185.41

47. In the first 10 overs of a cricket game, the sum of run rate was only 3.2. What should be the run rate in the remaining 40 overs to reach the target of 282 runs?

- (a) 6.25 (b) 6.5 (c) 6.75 (d) 7

(OSSC Amin & CGL 2023)

48. The average monthly income of P and Q is Rs. 5,050. The average monthly income of Q and R is Rs. 6,250 and the average monthly income of P and R is Rs. 5,200. Then what is the monthly income of P?

- (a) Rs. 3,500 (b) Rs. 4,000  
(c) Rs. 4,050 (d) Rs. 5,000

(OSSC Statistical Asst 2024 & Stenographer 2024)

49. The average of first 61 natural numbers is:

- (a) 31 (b) 34 (c) 36 (d) 38

(OSSC Steno 2023)

50. Three numbers are in the ratio 4:5:6 and their average is 25. The largest number is:  
(a) 41 (b) 36 (c) 30 (d) 28  
(OSSC Steno 2025)
51. Average of 15 numbers is 53. A number is removed, the average of 14 numbers becomes 55. Which number is removed?  
(a) 23 (b) 24 (c) 25 (d) 26  
(OSSC Steno 2025)
52. The average weight of A, B and C is 45 kg. If the average weight of A, B is 40 and that of B, C is 43 kg, then the weight of B is:  
(a) 17 kg (b) 28 kg (c) 31 kg (d) 37 kg  
(OSSC CGL 2023)
53. The average age of 9 students and their teacher is 16 years. The average age of the first 4 students is 19 years and that of the last 5 students is 10 years. What is the age of the teacher?  
(a) 38 years (b) 35 years  
(c) 34 years (d) 32 years  
(OSSC CGL 2023)
54. The average of 5 terms is 250 and 1st term is  $\frac{1}{4}$  of the remaining terms. What will be the first term?  
(a) 260 (b) 270 (c) 240 (d) 250  
(OSSC Investigator 20222)
55. The average of 7 terms is 105. If the first 6 terms are 80, 112, 59, 54, 112 and 121, what will be the last term?  
(a) 187 (b) 167 (c) 177 (d) 197  
(OSSC Investigator 2022)
56. In a group of 10 girls, 5 of them have an average height of 5.2 feet. Rest of the 5 girls have an average height of 1.7 meters. What is the average height of the group in feet? (1 meter = 3.281 feet)  
(a) 5.48 (b) 5.38 (c) 5.27 (d) 5.19  
(OSSC ATO 2024)
57. If the average of three consecutive even numbers is 34, then what is the largest of these numbers?  
(a) 30 (b) 32 (c) 34 (d) 36  
(OSSC ATO 2024)
58. The average of the first 95 even natural numbers is \_\_\_\_\_.
- (a) 96 (b) 97 (c) 93 (d) 95  
(OSSC JEO & JA 2024)
59. The average price of three items of furniture is Rs. 16665. If their prices are in the ratio 3:5:7, the price of the costliest item (in Rs.) is:  
(a) 5555 (b) 23331 (c) 7777 (d) 9999  
(OSSC JEO & JA 2024)
60. The average temperature of City A in the first four days of May 2023 was  $52^{\circ}\text{C}$ . The average for the second, third, fourth and fifth days was  $55^{\circ}\text{C}$ . If the temperature on the first and fifth days were in the ratio 5:7, then what was the temperature of City A on 5 May 2023?  
(a)  $49^{\circ}$  (b)  $56^{\circ}$  (c)  $42^{\circ}$  (d)  $35^{\circ}$   
(OSSC JEO & JA 2024)
61. What is the difference between the average of prime numbers between 50 and 60 and the average of multiples of 4 between 30 and 70?  
(a) 2 (b) 16 (c) 6 (d) 4  
(OSSC JEO & JA 2024)
62. What is the difference between the average of prime numbers between 70 and 90 and the average of multiples of 5 between 10 and 20?  
(a) 64 (b) 65 (c) 67 (d) 63  
(OSSC JEO & JA 2024)
63. Chetan bought 52 books for Rs. 1125 from one shop and 47 books for Rs. 900 from another. What is the average price (in Rs.) he paid per book?  
(a) 1008.18 (b) 1018.18  
(c) 1028.18 (d) 1033.18  
(OSSC JEO & JA 2024)
64. The average age of 29 students in an academy is 15 years. After the admission of 6 new students, the average age becomes 14 years. The eldest of the six new students is 10 years old. The average age (in years) of the remaining 5 new students is:  
(a) 9 (b) 8 (c) 7.9 (d) 9.2  
(OSSC JEO & JA 2024)
65. The average salary of each trainee in a startup is Rs. 9,000. The average salary of 16 trainees is Rs. 8,500 and the average salary of the rest is Rs. 9,250. How many trainees does the startup have?  
(a) 46 (b) 44 (c) 42 (d) 48  
(OSSC JEO & JA 2024)

66. The average salary of 35 employees in a company is Rs. 56,000 per month. If the officer's salary is added, the average becomes Rs. 60,000 per month. The officer's annual salary (in Rs.) is:

(a) 24,00,000 (b) 7,20,000  
(c) 12,00,000 (d) 48,000

(OSSC JEO & JA 2024)

67. The average of 6.5, 10.7, 20.4 and 'a' is 13. The value of 'a' is:

(a) 16.4 (b) 15.4 (c) 14.4 (d) 13.4

(OSSC JEO & JA 2024)

### ANSWER KEY

01. (a) 02. (d) 03. (b) 04. (a) 05. (b) 06. (d)  
07. (c) 08. (d) 09. (d) 10. (a) 11. (a) 12. (a)  
13. (b) 14. (d) 15. (b) 16. (a) 17. (a) 18. (c)  
19. (a) 20. (c) 21. (d) 22. (d) 23. (c) 24. (b)  
25. (c) 26. (b) 27. (b) 28. (a) 29. (d) 30. (b)  
31. (d) 32. (c) 33. (d) 34. (b) 35. (d) 36. (a)  
37. (c) 38. (b) 39. (b) 40. (a) 41. (c) 42. (c)  
43. (c) 44. (c) 45. (a) 46. (b) 47. (a) 48. (b)  
49. (a) 50. (c) 51. (c) 52. (c) 53. (c) 54. (d)  
55. (d) 56. (b) 57. (d) 58. (a) 59. (b) 60. (c)  
61. (c) 62. (a) 63. (b) 64. (a) 65. (d) 66. (a)  
67. (c)

### SOLUTION

1. Let the three consecutive even numbers be  $x - 2$ ,  $x$  and  $x + 2$

$$\text{ATQ, } \frac{x-2+x+x+2}{3} = 258$$

$$x = 258$$

$$\text{Largest number} = x + 2 = 258 + 2 = 260$$

2. Let  $x - 2$ ,  $x - 1$ ,  $x$ ,  $x + 1$  and  $x + 2$  be the 5 consecutive numbers.

$$\text{ATQ, } \frac{x+x+2}{2} = 124$$

$$x + 1 = 124 \quad x = 123$$

$$\text{Sum of 5 members} = x - 2 + x - 1 + x + x + 1 + x + 2 = 5x = 5 \times 123 = 615$$

3. Let  $x - 2$ ,  $x - 1$ ,  $x$ ,  $x + 1$  and  $x + 2$  be the first five integers.

$$\text{ATQ, } \frac{x-2+x-1+x+x+1+x+2}{5} = 37$$

$$x = 37$$

$$\begin{aligned} \text{ATQ, } \frac{x-2+x-1+x+1+x+2+x+3+x+4}{7} \\ = \frac{7x+7}{7} = x + 1 = 37 + 1 = 38 \end{aligned}$$

4. Average of first 37 natural numbers =  $\frac{n+1}{2}$   
 $= \frac{37+1}{2} = 19$

5. If each number is increased by 9, then mean value will also be increased by 9.

$$\text{So new mean} = 1123 + 9 = 1132$$

6. Average marks =  $\frac{73+68+46+79+58}{5}$   
 $= \frac{324}{5} = 64.8$

7. Deviation with respect to 227

$$227 - 191 = 36 \quad 227 - 183 = 44$$

$$227 - 197 = 30 \quad 227 - 207 = 20$$

$$227 - 221 = 6 \quad 227 - 211 = 16$$

$$227 - 223 = 4 \quad 227 - 209 = 18$$

$$\text{Total Deviation} = 36 + 44 + 30 + 20 + 6 + 16 + 4 + 18 = 174$$

On the 9<sup>th</sup> day, he should spend Rs. 174 extra to meet his targeted average expensed 227.

$$\text{Required expenditure} = 227 + 174 = \text{Rs. } 401$$

8. Let the grocer has a sale of Rs.  $x$  in the 6<sup>th</sup> months.

$$\frac{6635+7127+7055+7430+6462+x}{6} = 6700$$

$$34,709 + x = 40,200$$

$$x = \text{Rs. } 5491$$

9.  $36 : 20 = 9 : 5$

Average weight of all students

$$= \frac{9 \times 54.28 + 5 \times 51}{9+5} = \frac{9(51+3.25) + 5 \times 51}{14}$$

$$= \frac{14 \times 51 + 9 \times 3.25}{14} = 51 + \frac{29.25}{14}$$

$$= 51 + 2.08 = 53 \text{ (approx)}$$

10.  $65 : 70 : 75 = 13 : 14 : 15$

Let the Average marks of all the students = 70

$$\begin{array}{cc} \text{Deficit} & \text{Surplus} \\ \boxed{65 - 70} & \boxed{70 - 75} \\ -5 \times 13 & + 5 \times 15 = +10 \end{array}$$

$$\text{Actual average} = 70 + \frac{10}{13+14+15} = 70.23$$

11.  $24 : 8 = 3 : 1$

Let the Average marks of all the students = 51.25

$$\text{Deficit: } (51.25 - 46.5) \times 1 = 4.75$$

$$\text{Actual average} = 51.25 - \frac{4.75}{3+1}$$

$$= 51.25 - 1.1875 = 50.0625$$

12. Average cost per litre

$$= \frac{3 \times 7.5 \times 8 \times 8.5}{7.5 \times 8 + 8 \times 8.5 \times 7.5} = 7.98 (\text{approx.})$$

13.

$$\begin{array}{ccc} & 12980 & \\ 110 & + & 55 + 44 = 209 \\ 118 & & 236 \quad 295 \text{ days} \end{array}$$

$$\text{Average cost per litre} = \frac{3 \times 12980}{209} = 186.31$$

14.

$$\begin{array}{cc} \boxed{1^{\text{st}} 15^{\text{th}}} & \boxed{\text{Last } 15^{\text{th}}} \\ 15(288 - 288) & 15(288 - 288) \\ 16^{\text{th}} \text{ tower} = 288 + 0 = 288 \end{array}$$

15.

$$\begin{array}{cc} \boxed{1^{\text{st}} \text{ six}} & \boxed{\text{Last six}} \\ 6(112.3 - 112.9) & 6(113.5 - 112.9) \\ - 6 \times 0.6 & + 6 \times 0.6 = 0 \\ 6^{\text{th}} \text{ number} = 112.9 + 0 = 112.9 \end{array}$$

16.

$$\begin{array}{cc} \boxed{4} & \boxed{4} \\ 4(1115 - 1119) & 4(1123 - 1119) \\ - 4 \times 4 & + 4 \times 4 = 0 \\ 5^{\text{th}} \text{ observation} = 1119 + 0 = 1119 \end{array}$$

17.

$$\begin{array}{cc} \boxed{1^{\text{st}} 17} & \boxed{\text{Last } 17} \\ 17(284 - 284) & 17(286 - 284) \\ 0 & + 17 \times 2 = 34 \\ \text{Height of } 18^{\text{th}} \text{ telecom tower} = 284 - 34 = 250 \end{array}$$

18.

$$\begin{array}{cc} \boxed{1^{\text{st}} 3} & \boxed{\text{Next } 4} \\ 3(52 - 57.5) & 4(62 - 57.5) \\ -3 \times 5.50 & + 4 \times 4.5 = 1.5 \end{array}$$

$$\begin{aligned} \text{Sum of last three data} &= 3 \times 57.5 - 1.5 \\ &= 171 \end{aligned}$$

$$8^{\text{th}} = , 9^{\text{th}} = x + 7, 10^{\text{th}} = x + 5$$

$$3x + 12 = 171 \quad 3x = 159 \quad x = 53$$

19. Marks obtained in science =  $74 + 5(74 - 70)$   
= 94

20. Average weight of Kabaddi team is increased by  
 $139 \times 1 = 139$  kg

$$\text{Weight of the manager} = (89+1) + 139 = 229$$

21.

$$\begin{array}{cc} \boxed{\text{Light six}} & \boxed{\text{Heavy six}} \\ 6(69 - 71) & 6(73 - 71) \\ - 6 \times 2 & + 6 \times 2 = 0 \\ \text{Sixth players' weight} = 71 + 0 = 71 \end{array}$$

22. Total weight of 269 bags is increased by  $0.7 \times 260 =$   
188.3 kg

$$\text{Weight of the box} = 188.3 \text{ kg}$$

23. Age of 24 student is reduced by  $24 \times 1 = 24$  years.  
Class teacher's age =  $16 + 24 = 40$  years

24. Let the average of 11 innings be  $x$ .

$$\text{ATQ, } \frac{11x+65}{12} = x + 2$$

$$11x + 65 = 12x + 24$$

$$x = 41$$

$$\text{Average after } 12^{\text{th}} \text{ innings} = 41 + 2 = 43$$

25. Total increase in weight of 8 person =  $2.5 \times 8 = 20$   
kg.

$$\text{Weight of new person} = 65 + 20 \text{ kg} = 85 \text{ kg.}$$

$$\begin{aligned} 26. \text{ New average} &= \frac{9 \times 97 + 122}{10} = \frac{9 \times 97 + 97 + 25}{10} \\ &= \frac{10 \times 97 + 25}{10} = 99.5 \end{aligned}$$

27. Let the average expenditure per head initially =  $x$ .

$$\text{ATQ, } \frac{35x+42}{42} = x - 1$$

$$353x + 42 = 42x - 42$$

$$7x = 84 \quad x = 12$$

$$\text{Original expenditure of the mess} = 35 \times 12 = \text{Rs. } 420$$

28. Correct average = Average of 160 units +  
(Difference of wrong and right reading)

$$= 160 + \frac{171-166}{160} = 160.03$$

29.  $274 - 279 = -5$   $284 - 279 = +5$

$$\text{Net deviation} = -5 + 5 = 0$$

Required average = 279

30.  $A + B + C = 73 \times 3 = 219$   
 $A + B = 71 \times 2 = 142$   
 $B + C = 75 \times 2 = 150$   
 $B = (A+B) + (B+C) - (A+B+C)$   
 $= 142 + 150 - 219 = 73$
31. Total age of 3 boys =  $3 + 5 + 7 = 15$  units  
 $= 15 \times 3 = 45$   
1 unit = 3  
Age of youngest boy = 3 units =  $3 \times 3 = 9$  years
32. ATQ,  $\frac{25x+20 \times 42}{45} = 52$   
 $\frac{5x+4 \times 52}{9} = 52$   
 $5x + 208 = 468$   
 $5x = 260 \quad x = 52$   
Alternatively,  $(52 - 52) \times 2 = 0$   
Average of 25 girls =  $52 + 0 = 52$
33. 3 years ago, average age of 5 members = 35.  
Present average age of 5 members =  $35 + 3 = 38$   
Sum of age including new baby =  $38 \times 5 + 1 = 191$   
Present average age of 6 members =  $\frac{191}{6}$   
 $= 31\frac{5}{6}$   
Three years hence, the average age of the family will be  $31\frac{5}{6} + 3 = 34\frac{5}{6}$
34. Average age of the family  
 $\frac{2 \times 67 + 2 \times 35 + 3 \times 6}{2+2+3} = \frac{222}{7} = 31\frac{5}{7}$
35. Let the average age of 11 members be  $x$ .  
ATQ,  $\frac{11x-29-31}{9} = (x-2)$   
 $11x - 60 = 9x - 18$   
 $2x = 42 \quad x = 21$
36. 10 years ago, average age of 25 teacher = 45 years.  
At present average age of 25 teachers =  $45 + 10 = 55$  years  
At the time of principal retired, the age of new principal =  $54 - 1 = 53$  years  
Present average =  $55 - \frac{(60-53)}{25} = 55 - \frac{7}{25} = 54\frac{18}{25}$
37. Let the number of students be  $x$ .  
The original average weight of the class be  $y$ .  
ATQ,  $\frac{xy+50}{x+1} = y+1$   
 $xy + 50 = xy + x + y + 1$   
 $3x + 3y = 147 \dots\dots\dots (1)$   
Again,  $\frac{xy+50+50}{x+2} = (y+1.5)$   
 $xy + 100 = xy + 1.5x + 2y + 3$   
 $3x + 4y = 194 \dots\dots\dots (2)$   
Equ<sup>n</sup> (2) – Equ<sup>n</sup> (1), we get  $y = 47$
38. Weight of 8 person increased by  $1.5 \times 8 = 12$  kg  
Weight of new person =  $65 + 12 = 77$  kg
39. Age of 11 players is decreased by  $11 \times 2 = 22$  years  
Sum of age of captain and wicket keeper – Sum of age of two new players = 22  
 $25 + 25 + 3 - 2x = 22$   
 $2x = 31 \quad x = 15.5$
40. Total price of mixture is  $5 \times 18 + 25 \times 12 = 90 + 300 = 390$   
Average price per kg =  $\frac{390}{5+25} = \text{Rs. } 13$
41. Total number of visitors =  $5 \times 260 + 25 \times 140 = 1300 + 3500 = 4800$   
The average number of visitors per day in a month =  $\frac{4800}{30} = 160$
42. Average rate of mixture =  $\frac{20 \times 80 + 12 \times 60}{20+12} = \frac{2320}{32} = 72.5$
43.  $X + Y + Z = 121 \times 3 = 363$   
 $X + Y = 116 \times 2 = 142$   
 $Y + Z = 126 \times 2 = 150$   
 $Y = (X+Y) + (Y+Z) - (X+Y+Z)$   
 $= 232 + 252 - 363 = 121$
44. Average weight of 60 bags =  $\frac{20(170.5 \times 2 + 35)}{20 \times 3} = \frac{341+35}{3} = 125.34$
45. The weight of the new box = average of 22 box + weight increased due to new box =  $88 + 23 \times 1 = 111$  kg
46.  $155 : 165 : 175 = 31 : 33 : 35$   
Let the average be 165  
Deviation w.r.t. 165  
 $31(155 - 165) = 31 \times (-10) = -310$   
 $35(175 - 165) = 35 \times 10 = 350$

Net deviation =  $-310 + 350 = 40$

Average =  $165 + \frac{40}{(31+33+35)} = 165.40$

47. Total run scored in first 10 overs =  $3.2 \times 10 = 32$

Required run in remaining 40 overs =  $282 - 32 = 250$

Required run rate =  $\frac{250}{40} = 6.25$

48.  $P + Q = 5050 \times 2 = 10100$   
 $Q + R = 6250 \times 2 = 12500$   
 $P + R = 5200 \times 2 = 10400$   
 $2(P + Q + R) = 10100 + 12500 + 10400 = 33000$   
 $(P + Q + R) = 33000 / 2 = 16500$   
 $P = P + Q + R - (Q + R) = 16500 - 12500 = 4000$

49. Average of first 61 natural numbers =  $\frac{61+1}{2} = 31$

50. Sum of three number =  $4 + 5 + 6 = 15$   
 15 units = 75  
 1 unit = 5  
 Largest number = 6 units =  $6 \times 5 = 30$

51. Number which is removed =  $15 \times 53 - 14 \times 55 = 15 \times 53 - 14(53 + 2) = 53 - 14 \times 2 = 25$

52.  $A + B + C = 45 \times 3 = 135$   
 $A + B = 40 \times 2 = 80$   
 $B + C = 43 \times 2 = 86$   
 $B = (A+B) + (B+C) - (A+B+C)$   
 $= 80 + 86 - 135 = 31$

53. Age of teacher =  $16 \times 10 - 19 \times 4 - 5 \times 10 = 34$  years

54. Sum of 5 terms =  $250 \times 5 = 1250$   
 ATQ,  $1^{\text{st}}$  term =  $\frac{1}{5} (2^{\text{nd}} + 3^{\text{rd}} + 4^{\text{th}} + 5^{\text{th}})$   
 $5 \times 1^{\text{st}}$  term =  $(1^{\text{st}} + 2^{\text{nd}} + 3^{\text{rd}} + 4^{\text{th}} + 5^{\text{th}})$   
 $1^{\text{st}}$  term =  $1250/5 = 250$

55. Deviation with respect to 105  
 $105 - 80 = 25$     $105 - 112 = -7$     $105 - 59 = 46$   
 $105 - 112 = -7$     $105 - 54 = 51$     $105 - 21 = -16$   
 Total Deviation =  $25 + 46 + 51 - 7 - 7 - 16 = 92$   
 Last term =  $105 + 92 = 197$

56. Let the average height of the group = 5.2.  
 Surplus:  $(5.57 - 5.2) \times 5 = 1.85$   
 Actual average =  $5.2 + 1.85/10 = 5.385$

57. Let the three consecutive even number be  $x - 2$ ,  $x$ ,  $x + 2$

Average = middle term =  $x = 34$

Largest number =  $x + 2 = 34 + 2 = 36$

58. Average of  $1^{\text{st}}$  95 even natural numbers =  $n + 1 = 95 + 1 = 96$ .

59. ATQ,  $\frac{3x+5x+7x}{3} = 16665$   
 $15x = 49,995$   
 $x = 3333$

Price of costliest item =  $7x = 7 \times 3333 = 23331$

60.  $1^{\text{st}} + 2^{\text{nd}} + 3^{\text{rd}} + 4^{\text{th}} = 52 \times 4 = 208 \dots (1)$

$2^{\text{nd}} + 3^{\text{rd}} + 4^{\text{th}} + 5^{\text{th}} = 55 \times 4 = 220 \dots (2)$

Equ<sup>n</sup>(2) - Equ<sup>n</sup>(1), we get

$5^{\text{th}} - 1^{\text{st}} = 7x - 5x = 12$                        $x = 6$

Temperature on  $5^{\text{th}}$  day =  $7x = 7 \times 6 = 42^{\circ}$

61. Average of prime number between 50 and 60 =  $(53 + 59)/2 = 56$

Average of multiples of 4 between 30 and 70 =  $(32+68)/2 = 50$

Required difference =  $56 - 50 = 6$

62. Average of prime number between 70 and 90 =  $(71 + 73 + 79 + 83 + 89)/5 = 79$

Average of multiples of 5 between 10 and 20 =  $(10 + 20)/2 = 15$

Required difference =  $79 - 15 = 64$

63. Average price =  $900 + \frac{(1125-900) \times 52}{52+47}$   
 $= 900 + 118.18 = 1018.18$

64. Total age of 6 new students =  $14 \times 35 - 15 \times 29 = 55$

Average age of remaining 5 students  
 $= \frac{55-10}{5} = 9$

65. 
$$\begin{array}{ccc} 8500 & & 9250 \\ & \searrow \quad \nearrow & \\ & 9000 & \\ & \nearrow \quad \searrow & \\ 250 & & 500 \\ 1 & : & 2 \end{array}$$

ATQ, 1 units = 16

3 units =  $3 \times 16 = 48$

66. The officers monthly salary =  $(60,000 - 56,000) \times 35 + 60,000 = 200000$

Annual salary =  $12 \times 200000 = 24,00,000$

67. Deviation with respect to 13

$6.5 - 13 = -6.5$     $10.7 - 13 = -2.3$     $20.4 - 13 = 7.4$

Total Deviation =  $7.4 - 6.5 - 2.3 = -1.4$

$a = 13 + 1.4 = 14.4$

**Ratio:-** Comparison between two quantities of same kind.

Ratio can be expressed as  $a : b$  ( $a$  is to  $b$ )

$a \rightarrow$  Antecedent       $b \rightarrow$  Consequent

Terms of ratio should be co-prime

$36 : 44$  ( $\times$ ) Since 36 & 44 are not co-prime number.

$9 : 11$  ( $\checkmark$ ) Since 9 & 11 are co-prime number.

### Properties of Ratio

1. The value of a ratio does not change, when both the numerator and denominator are multiplied by same number.

$$\frac{a}{b} = \frac{xa}{xb} = \frac{ya}{yb}$$

$$\text{eg. } \frac{5}{7} = \frac{10}{14} = \frac{15}{21}$$

2. The value of a ratio does not change, when both the numerator and denominator are divided by same number

$$\frac{a}{b} = \frac{\frac{a}{x}}{\frac{b}{x}} = \frac{\frac{a}{y}}{\frac{b}{y}}$$

$$\text{eg. } \frac{5}{7} = \frac{\frac{5}{5}}{\frac{7}{5}} = \frac{\frac{5}{7}}{\frac{7}{3}}$$

### Types of Ratio

- Duplicate Ratio :  $a^2 : b^2$   
Eg. Duplicate ratio of 3 : 4 is 9 : 16.
- Triplicate Ratio :  $a^3 : b^3$   
Eg. Triplicate ratio of 3 : 4 is 27 : 64.
- Sub-duplicate Ratio :  $\sqrt{a} : \sqrt{b}$   
Eg. Sub-duplicate ratio of 9 : 16 is 3 : 4.
- Sub-triplicate Ratio :  $\sqrt[3]{a} : \sqrt[3]{b}$   
Eg. Sub-triplicate ratio of 27 : 64 is 3 : 4.
- Inverse Ratio :  $b : a$   
Eg. Inverse ratio of 3 : 4 is 4 : 3.
- Compound Ratio :  $a : b, c : d, e : f = \frac{ace}{bdf}$   
Compound Ratio of 3 : 4, 5 : 7 is  $\frac{15}{28}$

**Proportion:-** When two ratios are equal, they are said to be in proportion.

If  $a : b = c : d$ , then  $a : b :: c : d$

1. If  $a, b, c, d$  are in proportion, then the product of the extremes = product of mean.

$$\frac{a}{b} = \frac{c}{d} \rightarrow ad = bc$$

2. If  $a, b, c$  are continued proportion, then  $a : b = b : c$

$$\frac{a}{b} = \frac{b}{c} \rightarrow b^2 = ac$$

### Properties of Proportion

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

- Invertendo  $\rightarrow \frac{b}{a} = \frac{d}{c}$
- Alternendo  $\rightarrow \frac{a}{c} = \frac{b}{d}$
- Componendo  $\rightarrow \frac{a+b}{b} = \frac{c+d}{d}$
- Dividendo  $\rightarrow \frac{a-b}{b} = \frac{c-d}{d}$
- Componendo and Dividendo  $\rightarrow \frac{a+b}{a-b} = \frac{c+d}{c-d}$

### Variation

1. Direct Proportion:  $A \propto B$   
A varies directly as B  
It means when A increases, B also increases.
2. Inverse Proportion:  $A \propto \frac{1}{B}$   
A varies inversely as B  
It means A increases, B decreases.

### Concept 1: Balancing Ratios

Balancing two ratios with a common term involves equalizing the shared quantity through proportional adjustment, enabling the ratios to be combined into a single, multi-term ratio.

e.g.  $a : b = 2 : 3$      $b : c = 4 : 5$

Here, the common term is **b**. Make the common terms equal

$$a : b = (2 : 3)_{\times 4} \quad b : c = (4 : 5)_{\times 3}$$

$$a : b : c = 8 : 12 : 15$$

**Example:** Divide Rs. 7,500 among A, B and C such that A's share to B's share is in the ratio 5 : 2 and B's to C's share is in the ratio 7 : 13. How much will B receive?

$$\text{Solution: } A : B = (5 : 2)_{\times 7} \quad B : C = (7 : 13)_{\times 2}$$

$$a : b : c = 35 : 14 : 26$$

$$\text{Sum of ratio terms} = 10 + 14 + 26 = 75 \text{ units}$$

$$75 \text{ units} = 7500$$

$$1 \text{ unit} = 7500 \div 75 = 100$$

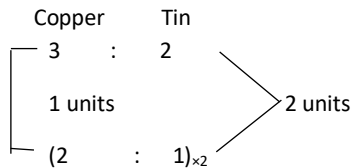
$$B's \text{ share} = 14 \text{ units} = 14 \times 100 = \text{Rs. } 1400$$

### Concept 2: Balancing of one terms of a ratio

When an additional amount is added to one quantities of a mixture or ratio, while the quantities of the other components remain unchanged.

**Example:** An alloy contains copper and tin in the ratio 3 : 2. If 250 gm of copper is added to this alloy then copper in it becomes double the quantity of tin in it. What is the amount (in gm) of tin in the alloy?

**Solution:** Since copper is added, quantity of tin is same.



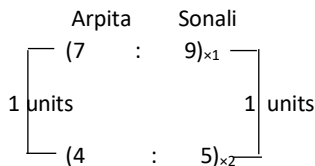
ATQ, 1 units = 250 gm

2 units =  $2 \times 250 = 500$  gm

### Concept 3: Balancing both terms of a ratio.

**Example:** Present ages of Arpita and Sonali are in the ratio of 7 : 9. Three years hence, the ratio of their ages becomes 4 : 5. What is Sonali's present age in years?

**Solution:**  $7 : 9 = 2$  units       $5 : 4 = 1$  unit



ATQ, 1 units = 3

Sonali's present age = 9 units =  $9 \times 3 = 27$  years

## EXERCISE

- If  $23a = 24b$  and  $31b = 23c$ , find  $a : b : c$ .  
(a) 24 : 23 : 31      (b) 23 : 24 : 31  
(c) 24 : 31 : 24      (d) 31 : 24 : 23  
(OSSC CGL 2021)
- If  $16a = 17b$  and  $17b = 16c$ , find  $a : b : c$ .  
(a) 15 : 16 : 17      (b) 16 : 17 : 16  
(c) 17 : 16 : 17      (d) 15 : 14 : 16  
(OSSC CGL 2021)
- The ratio of three numbers is 12 : 13 : 14 and their sum is 1872. Find the second number of the three numbers.  
(a) 624      (b) 604      (c) 594      (d) 614  
(OSSC CGL 2021 & SCEW 2021)
- Three numbers are in the ratio 26 : 27 : 28. The smallest number is 1924. Find the difference between the smallest and the largest number.  
(a) 118      (b) 138      (c) 148      (d) 128  
(OSSC CGL 2021)
- The salaries of A, B and C are in the ratio of 15 : 8 : 7. If their total salary is Rs. 4080, find the salary received by C.  
(a) 942      (b) 922      (c) 952      (d) 932  
(OSSC CGL 2021)
- The sum of three terms is 14380. The ratio between first term and second term is 15 : 16 and the ratio between second and third term is 17 : 18. Find the difference between first and last term.  
(a) 680      (b) 650      (c) 670      (d) 660  
(OSSC CGL 2021)
- Three numbers are in the ratio 13 : 15 : 17. If the difference between thrice the third number and sum of first and second number is 529, then find the difference between the first and third number.  
(a) 88      (b) 92      (c) 80      (d) 84  
(OSSC CGL 2021)
- The ratio between the number of males and females in a college is 24 : 25. If the number of males is increased by 30% and the number of females is increased by 40%, then what will be the new ratio of males and females in the college?  
(a) 146 : 175      (b) 175 : 146  
(c) 156 : 175      (d) 175 : 156  
(OSSC CGL 2021)
- Rs. 1092 is divided among 3 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 man get? (in Rs.)  
(a) 122      (b) 120      (c) 126      (d) 124  
(OSSC CGL 2021)
- A 595 litres of mixture contains milk and water in the ratio 17 : 18. How much milk must be added to the mixture so that it contains milk and water in the proportion of 3 : 2? (in litres)  
(a) 180      (b) 170      (c) 190      (d) 160  
(OSSC CGL 2021)

11. Milk and water are in the ratio of 3 : 2 in a mixture of 90 litres. How much water should be added so that the ratio of milk and water becomes 2 : 3? (in litres)  
(a) 51 (b) 49 (c) 45 (d) 47  
(OSSC CGL 2021)
12. A mixture contains milk and water in the ratio 8 : 7. If 20 litres of water is added to the mixture, milk and water in the mixture become equal. The quantity of milk in the mixture in litres is:  
(a) 165 (b) 170 (c) 160 (d) 175  
(OSSC CGL 2021)
13. Two vessels containing 39 litres and 51 litres quantity of solution, have milk and water in the ratio of 19 : 20 and 30 : 21 respectively. If the solutions are mixed with each other, then how many litres of water has to be added in the final solution to make the resulting solution in the ratio 1 : 1?  
(a) 12 (b) 8 (c) 6 (d) 10  
(OSSC CGL 2021)
14. Salaries of R and S are in the ratio 4 : 5. If the salary of each is increased by 4200, the new ratio becomes 13 : 15. What is the original salary of S?  
(a) 8400 (b) 8800 (c) 8600 (d) 8200  
(OSSC CGL 2021)
15. 44 male and 55 female from a group of social workers. During their membership drive, the equal number of males and females joined this group. How many female members does the group have now, if the ratio of males to females is 13 : 14?  
(a) 124 (b) 134 (c) 144 (d) 154  
(OSSC CGL 2021)
16. The income of A, B, C are in the ratio 12 : 9 : 7 and their spending are in the ratio 15 : 9 : 8. If A saved 25% of his income, then what is the ratio of savings A, B and C?  
(a) 11 : 13 : 18 (b) 15 : 18 : 11  
(c) 16 : 17 : 21 (d) 13 : 16 : 11  
(OSSC CGL 2022)
17. A bag contains Rs. 410 in the form of Rs. 5, Rs. 2 and Rs. 1 coins. If the number of coins is in the ratio 4 : 6 : 9 respectively, then what is the number of 2 rupees coins?  
(a) 40 (b) 50 (c) 60 (d) 70  
(OSSC CGL 2022)
18. A farmer has three children and 44 gold coins. He decided to give coins to his three children in the following ratio  $\frac{1}{3} : \frac{1}{6} : \frac{1}{9}$ . The one who got highest number of coins, got how many coins?  
(a) 20 (b) 27 (c) 24 (d) 18  
(OSSC CGL SPL 2022)
19. Three friends had dinner at a restaurant. When the bill was received, Amita paid  $\frac{2}{3}$  as much as Veena paid and Veena paid  $\frac{1}{2}$  as much as Tanya paid. What fraction on the bill did Veena pay?  
(a)  $\frac{1}{3}$  (b)  $\frac{3}{11}$  (c)  $\frac{12}{13}$  (d)  $\frac{5}{8}$   
(OSSC CGL SPL 2022)
20. Two numbers are in the ratio 3 : 5. If 9 is subtracted from each, the ratio becomes 12 : 23. Find the greater number.  
(a) 85 (b) 115 (c) 55 (d) 135  
(OSSC CGL SPL 2023)
21. The salaries of A, B, C are in the ratio 2 : 3 : 5. If increments of 15%, 10% and 20% respectively are allowed in their salaries, then what will be new ratio of their salaries?  
(a) 3 : 3 : 10 (b) 10 : 11 : 20  
(c) 23 : 33 : 60 (d) Can not be determined  
(OSSC CGL SPL 2023)
22. A man has Rs. 480 in the denominations of one-rupee notes, five-rupee notes and ten-rupee notes. The number of notes of each denomination is equal. What is the total number of notes that he has?  
(a) 45 (b) 60 (c) 75 (d) 90  
(OSSC CGL SPL 2023)
23. Ananya had a total of Rs. 320 in the denomination of 1-rupee coins, 5-rupee coins and 10-rupee coins. Given that the number of coins for all the denomination is same. What is the total number of coins that she has?  
(a) 45 (b) 60 (c) 75 (d) 90  
(OSSC CHSL 2022 & ESI 2023)
24. Seats of Mathematics, Physics and Biology in a school are in the ratio 5 : 7 : 8. There is a proposal to increase these seats by 40%, 50% and 75%

- respectively. What will be the ratio of increased seats?  
 (a) 2 : 3 : 4 (b) 6 : 7 : 8  
 (c) 6 : 8 : 9 (d) None of these  
**(OSSC CHSL 2022 & Statistical Asst. 2024)**
25. There are two examination rooms A and B. If 10 students are sent from A to B, then the number of students in each room is the same. If 20 candidates are sent from B to A, then the number of students in A is double the number of students in B. The number of students in room A is:  
 (a) 20 (b) 80 (c) 100 (d) 200  
**(OSSC CHSL 2022)**
26. A mixture contains milk and water in the ratio 5 : 9. When 5 liters of water is added, the ratio changes to 5 : 11. What is the quantity of milk in the initial mixture?  
 (a) 11 liters (b) 11.5 liters  
 (c) 12 liters (d) 12.5 liters  
**(OSSC CHSL 2023)**
27. Let  $x : y = 4 : 7$  and  $y : z = 9 : 7$ . If  $x = 72$ , then what is the value of  $z$ ?  
 (a) 98 (b) 77 (c) 63 (d) 49  
**(OSSC CHSL 2023)**
28. The ratio of income of A and B is 3 : 4. The ratio of their expenditure is 4 : 5. Find the ratio of their savings if the savings of A is one-fourth of his income.  
 (a) 11 : 18 (b) 12 : 19  
 (c) 14 : 19 (d) 11 : 19  
**(OSSC CHSL 2024)**
29. The difference between two positive numbers is 10 and the ratio between them is 5 : 3. What is the product of these two numbers?  
 (a) 375 (b) 250 (c) 175 (d) 125  
**(OSSC CTSRE 2023)**
30. A pond was dug by four men; Nishant, Priyanam, Aniruddha and Rahim. They were paid a total of Rs. 1500 and the money is to be shared in the ratio of 1 : 2 : 2 : 1 respectively. What is the share of Nishant and Rahim together?  
 (a) Rs. 1500 (b) Rs. 1000  
 (c) Rs. 500 (d) none of these  
**(OSSC CHSL 2024)**
31. In an alloy, the ratio of Aluminium and copper is 5 : 2. If 1.250 kg of copper is mixed in 17 kg 500 g of alloy, then the ratio of Aluminium and copper in the alloy will be:  
 (a) 1 : 2 (b) 2 : 1 (c) 2 : 3 (d) 3 : 2  
**(OSSC CTSRE 2024)**
32. If two numbers are in the ratio 3 : 4. If 29 is added to both of the numbers then the ratio becomes 4 : 5, then find the smallest number.  
 (a) 87 (b) 89 (c) 83 (d) 85  
**(OSSC BSSO 2022)**
33. The ratio of number of girls and boys in a school of 780 students is 6 : 7. How many more girls be admitted to make the ratio 1 : 1?  
 (a) 64 (b) 66 (c) 62 (d) 60  
**(OSSC BSSO 2022)**
34. If  $a : b = 3 : 5$  and  $b : c = 7 : 9$ , find  $a : b : c$ .  
 (a) 21 : 35 : 45 (b) 21 : 33 : 45  
 (c) 23 : 35 : 45 (d) 21 : 35 : 47  
**(OSSC BSSO 2022)**
35. Three numbers are in the ratio 32 : 33 : 34. The smallest number is 2176. Find the difference between the smallest and largest number.  
 (a) 136 (b) 116 (c) 126 (d) 106  
**(OSSC BSSO 2022)**
36. If three numbers are in the ratio 27 : 28 : 29 and the value of lowest number is 405, find the sum of all three numbers.  
 (a) 1260 (b) 1360 (c) 1060 (d) 1160  
**(OSSC Investigator 2022)**
37. If  $a : b = 5 : 6$  and  $b : c = 7 : 8$ , then find  $a : b : c$ .  
 (a) 35 : 42 : 48 (b) 35 : 41 : 48  
 (c) 35 : 42 : 47 (d) 33 : 42 : 48  
**(OSSC Investigator 2022)**
38. A sum is divided among Rakesh, Suresh and Mohan. If the difference between the shares of Rakesh and Mohan is Rs. 7000 and between those of Suresh and Mohan is Rs. 3500, what was the sum?  
 (a) Rs. 30,000 (b) Rs. 13,000  
 (c) Rs. 10,000 (d) cannot be determined  
**(OSSC CPGL 2024)**

39. The students in three classes are in the ratio 2 : 3 : 5. If 20 students are increased in each class, the ratio changes to 4 : 5 : 7. What was the total number of students in the three classes before the increase?  
(a) 96 (b) 100 (c) 104 (d) 110  
(OSSC CPGL 2023)
40. Rs. 425 is divided among 4 men, 5 women and 6 boys such that the share of a man, a woman and a boy may be in the ratio of 9 : 8 : 4. What is the share of a woman?  
(a) 31 (b) 34 (c) 36 (d) 38  
(OSSC CPGL 2023)
41. The sum of three numbers is 147. If the ratio of the first to second is 2 : 3 and that of the second to the third 5 : 8, then the second number is:  
(a) 45 (b) 30 (c) 48 (d) 58  
(OSSC Accountant 2023)
42. A tin of oil was  $\frac{4}{5}$  full. When 6 bottles of oil were taken out and four bottles of oil were poured into it, it was  $\frac{3}{4}$  full. How many bottles of oil can the tin contain?  
(a) 10 (b) 20 (c) 30 (d) 40  
(OSSC Jr. Clerk Main 2022)
43. A mixture contains petrol and water in the ratio 9 : 5. If 84 litres of water is added to the mixture, the quantity of petrol and water in the mixture becomes equal. What is the quantity of petrol?  
(a) 84 litres (b) 100 litres  
(c) 140 litres (d) 189 litres  
(OSSC Jr. Clerk Main 2022)
44. The ratio of three numbers is 12 : 13 : 14 and their sum is 1872. Find the second number of the three numbers.  
(a) 624 (b) 644 (c) 634 (d) 614  
(OSSC SCEW 2021)
45. If  $11a = 12b$  and  $7b = 11c$ , find  $a : b : c$ .  
(a) 14 : 11 : 7 (b) 12 : 11 : 7  
(c) 13 : 11 : 7 (d) 15 : 11 : 7  
(OSSC SCEW 2021)
46. The ratio of two numbers is 6 : 7 and their sum is 429. Find the greater of the two numbers.  
(a) 221 (b) 251 (c) 231 (d) 241  
(OSSC SCEW 2021)
47. The ratio 115 : 138 in its simplest form is:  
(a) 2 : 3 (b) 3 : 4 (c) 1 : 2 (d) 5 : 6  
(OSSC Amin 2023)
48. A passenger bus starts from Bermuda towards Cuttack. The number of women in the bus is half of the number of men. In Cuttack, 15 men leave the bus and 5 women enter. Now, number of men and women is equal. In the beginning, how many passengers entered the bus?  
(a) 75 (b) 60 (c) 57 (d) 45  
(OSSC ESI 2023)
49. The ratio of squares of two numbers is called as:  
(a) Duplicate Ratio (b) Sub-duplicate ratio (c) Triplicate ratio (d) Compound ratio  
(OSSC VSA 2023)
50. In the ratio  $a : b$ ,  $a$  is called as first term or \_\_\_\_\_.  
(a) consequent (b) Extreme  
(c) mean term (d) Antecedent  
(OSSC VSA 2023)
51. The length of a ribbon was originally 60 cm. It was reduced in the ratio 5 : 3. What is its length now?  
(a) 34 cm (b) 42 cm (c) 36 cm (d) 48 cm  
(OSSC VSA 2023)
52. The ratio of number of boys to girls in a school is 10 : 11. If the number of girls in the school is 8360, then find the total number of students in the school?  
(a) 18642 (b) 15960 (c) 16982 (d) 17048  
(OSSC VSA 2023)
53. Salaries of Rahim and Karim are in the ratio 2 : 3. If the salary of each is increased by Rs. 2000, the new ratio becomes 40 : 57. What is Karim's present salary?  
(a) Rs. 25800 (b) Rs. 17000  
(c) Rs. 14600 (d) Rs. 20000  
(OSSC Steno 2024)
54. An alloy contains copper and tin in the ratio 3 : 2. If 250 gram of copper is added to this alloy, then the quantity of copper in the new alloy becomes double the quantity of tin. What is the amount of tin in the alloy?  
(a) 200 gm (b) 250 gm (c) 500 gm (d) 750 gm  
(OSSC CGL Main 2023)

55. The ratio of water and milk in a 30 litres of mixture is 7 : 3. How many litres of water be added to the mixture so that the ratio of water and milk becomes 6 : 1?  
(a) 30 (b) 32 (c) 33 (d) 35  
(OSSC CGL Main 2023)
56. Seats for Mathematics, Physics and Biology in a school are in the ratio 5 : 7 : 8. There is a proposal to increase these seats by 40%, 50% and 75% respectively. What will be the ratio of increased seats?  
(a) 6 : 7 : 8 (b) 6 : 8 : 9  
(c) 2 : 3 : 4 (d) 1 : 5 : 8  
(OSSC Statistical Asst. 2024)
57. Mahesh's salary is Rs. 12,000 more than Sumit's salary. If the ratio of Mahesh's and Sumit's salary is 7 : 4, then what is the salary of Sumit?  
(a) 13,000 (b) 19,000  
(c) 16,000 (d) 23,000  
(OSSC VSA 2023)
58. Three students A, B and C play cricket. The runs scored by A and B respectively are in the ratio 3 : 2. B's runs to C's runs are also in the same ratio. Together they score 342 runs. Then the runs scored by B are:  
(a) 216 (b) 108 (c) 90 (d) 1172  
(OSSC LTR 2024)
59. 700 ml of a mixture contains water and milk in the ratio 2 : 8. How much water must be added to the mixture so that the ratio of water and milk becomes 3 : 8?  
(a) 75 ml (b) 70 ml (c) 65 ml (d) 60 ml  
(OSSC ATO 2024)
60. In a school having roll strength 286, the ratio of boys and girls is 8 : 5. If 22 more girls get admitted to the school, then what will be the ratio of boys and girls in the school?  
(a) 4 : 3 (b) 6 : 5 (c) 8 : 7 (d) 10 : 7  
(OSSC ATO 2024)
61. Which of the following ratio is smallest?  
(a) 15 : 36 (b) 10 : 51  
(c) 14 : 44 (d) 26 : 54  
(OSSC JEO & JA 2024)
62. There are 8610 students in a school and the ratio of boys to girls in the school is 17 : 24. Then find the number of boys in school.  
(a) 3570 (b) 3564 (c) 3586 (d) 3584  
(OSSC JEO & JA 2024)
63. If 343 apples were distributed among Sneha, Yash and Rohan in the ratio  $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$ , how many apples did the Rohan get?  
(a) 59 (b) 129 (c) 49 (d) 79  
(OSSC JEO & JA 2024)
64. Divide Rs. 2408 into three parts in such a way that half of the first part, one-fourth of the second part and one-eighth of the third part are equal. What is the difference between first and second part (in Rs.)?  
(a) 244 (b) 344 (c) 194 (d) 444  
(OSSC JEO & JA 2024)
65. Find the mean proportional of 11 and 704?  
(a) 87 (b) 89 (c) 88 (d) 91  
(OSSC JEO & JA 2024)
66. If 684 apples were distributed among Kavita, Rakesh, and Shalini in the ratio  $\frac{1}{4} : \frac{1}{9} : \frac{1}{6}$ . How many apples did the Shalini get?  
(a) 216 (b) 206 (c) 186 (d) 196  
(OSSC JEO & JA 2024)

### VARIATION

67. A printer can print 20 pages per minute. How much time will it take to print a document of 300 pages?  
(a) 10 minutes (b) 15 minutes  
(c) 20 minutes (d) 25 minutes  
(OSSC CHSL 2023)
68. Running at the same constant rate, 6 identical machines can produce a total of 270 bottles per minute. At this rate, how many bottles could 10 such machines produce in 4 minutes?  
(a) 648 (b) 1800 (c) 2700 (d) 10800  
(OSSC CHSL 2023)
69. If 100 cats kill 100 mice in 100 days, then 4 cats would kill 4 mice in how many days?

- (a) 1 day (b) 4 days (c) 40 days (d) 100 days  
(OSSC CTSRE 2023)
70. 31 people can cut 62 trees in 35 days. In how many days, 32 people cut 96 trees?  
(a) 52 (b) 54 (c) 56 (d) 58  
(OSSC CGL 2021)
71. 3 pumps, working 8 hours a day, can empty a tank in 2 days. How many hours a day must 4 pumps work to empty the tank in 1 day?  
(a) 9 (b) 10 (c) 11 (d) 12  
(OSSC CGL Pre 2022 & Statistical Asst. 2024)
72. Nine taps of same capacity can fill a water tank completely in 20 minutes. How many taps of the same capacity are required to fill up the same water tank in 15 minutes?  
(a) 10 (b) 11 (c) 14 (d) 12  
(OSSC CTSRE 2024)
73. In a family of 7 persons can live on Rs. 840 for 36 days, how long can a family of 9 persons live on Rs. 810?  
(a) 25 (b) 29 (c) 27 (d) 31  
(OSSC CPGL 2023)
74. On a given period, 9 persons can make 108 toys. How many persons are needed to make 48 toys in the same period?  
(a) 4 (b) 6 (c) 8 (d) 10  
(OSSC CPGL 2023)
75. 10 printers can print 10 question booklets in 10 minutes. How many printers will be needed to print 1000 question booklets in 10 hrs?  
(a) 1000 (b) 100 (c) 10 (d) 1  
(OSSC ESI 2023)
76. A car travels 432 km on 48 litres of petrol. How far would it travel on 20 litres of petrol?  
(a) 180 km (b) 160 km (c) 200 km (d) 140 km  
(OSSCL LTR 2024)
77. 20 buckets can fill a tank and the capacity of each bucket is 12 liters. How many buckets will be required to fill the tank, if the capacity of each bucket is 10 litres?  
(a) 22 (b) 24 (c) 27 (d) 30  
(OSSC ATO 2024)
78. Five men prepare 10 toys in 6 days working 6 hours a day. Then, in how many days can 12 men prepare 16 toys working 8 hours a day?  
(a) 3 days (b) 4 days (c) 5 days (d) 6 days  
(OSSC CGL SPL 2023)
79. If 6 men working 8 hours a day earn Rs. 1680 per week, then how much will 9 men working 6 hours a day earn per week?  
(a) Rs. 1740 (b) Rs. 1890  
(c) Rs. 2050 (d) Rs. 2230  
(OSSC CGL SPL 2023)

|                   |
|-------------------|
| <b>ANSWER KEY</b> |
|-------------------|

- |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|
| 01. (a) | 02. (c) | 03. (a) | 04. (c) | 05. (c) | 06. (d) |
| 07. (b) | 08. (c) | 09. (c) | 10. (b) | 11. (c) | 12. (c) |
| 13. (b) | 14. (a) | 15. (d) | 16. (b) | 17. (c) | 18. (c) |
| 19. (b) | 20. (c) | 21. (c) | 22. (d) | 23. (b) | 24. (a) |
| 25. (c) | 26. (d) | 27. (a) | 28. (b) | 29. (a) | 30. (c) |
| 31. (b) | 32. (a) | 33. (d) | 34. (a) | 35. (a) | 36. (a) |
| 37. (a) | 38. (d) | 39. (b) | 40. (b) | 41. (a) | 42. (d) |
| 43. (d) | 44. (a) | 45. (b) | 46. (a) | 47. (d) | 48. (b) |
| 49. (a) | 50. (d) | 51. (c) | 52. (b) | 53. (b) | 54. (c) |
| 55. (c) | 56. (c) | 57. (c) | 58. (b) | 59. (b) | 60. (a) |
| 61. (b) | 62. (a) | 63. (c) | 64. (b) | 65. (c) | 66. (a) |
| 67. (b) | 68. (b) | 69. (d) | 70. (b) | 71. (d) | 72. (d) |
| 73. (c) | 74. (a) | 75. (b) | 76. (a) | 77. (b) | 78. (a) |
| 79. (b) |         |         |         |         |         |

**SOLUTION**

- $(23a = 24b) \times 31$        $(31b = 23c) \times 24$   
 $23 \times 31a = 24 \times 31b = 23 \times 24c = 23 \times 31 \times 24$   
 $a : b : c = 24 : 23 : 31$
- $16a = 17b = 16c = 16 \times 17$   
 $a : b : c = 17 : 16 : 17$
- $\text{Sum} = 12 + 13 + 14 = 39 \text{ units}$   
 $\text{ATQ, } 39 \text{ units} = 1872$   
 $1 \text{ unit} = 48$   
 $\text{Second number} = 13 \text{ units} = 13 \times 48 = 624$
- $\text{Smallest number} = 26 \text{ units}$   
 $\text{Difference} = 28 - 26 = 2 \text{ units}$   
 $\text{ATQ, } 26 \text{ units} = 1924$   
 $1 \text{ unit} = 74$   
 $2 \text{ units} = 2 \times 74 = 148$
- $\text{Salary received by C} = \frac{7}{(15+8+7)} \times 4080$   
 $= \text{Rs. } 952$
- $1^{\text{st}} : 2^{\text{nd}} = (15 : 16) \times 17$   
 $2^{\text{nd}} : 3^{\text{rd}} = (17 : 18) \times 16$   
 $1^{\text{st}} : 2^{\text{nd}} : 3^{\text{rd}} = 15 \times 17 : 16 \times 17 : 18 \times 16$   
 $= 255 : 272 : 288$   
 $\text{ATQ, } 815 \text{ units} = 16300$   
 $1 \text{ unit} = 20$   
 $\text{Difference} = 288 - 255 = 33 \text{ units}$   
 $= 33 \times 20 = 660$
- $\text{ATQ, } 3 \times 17 - (13 + 15) = 23 \text{ units}$   
 $23 \text{ units} = 529$   
 $1 \text{ unit} = 23$   
 $\text{Difference} = 17 - 13 = 4 \text{ units} = 4 \times 23 = 92$
- | Males    | Females   |
|----------|-----------|
| 240      | 250       |
| +30% +72 | +40% +100 |
| 312      | 350       |
| 156      | 175       |
| :        |           |
- | Man        | Woman | Boy |
|------------|-------|-----|
| Share: 2×3 | 6×2   | 8×1 |
| 3          | 6     | 4   |
| :          | :     |     |

Men's share =  $\frac{3}{3+4+3} \times 1092 = \text{Rs. } 252$

Each man gets  $\frac{252}{2} = \text{Rs. } 126$

- | Milk     | Water  |
|----------|--------|
| 17       | 18     |
| 10 units |        |
| (3       | 2) × 9 |

18

Milk is added. So quantity of water remains same.

ATQ, 35 units = 595

1 unit = 17

10 units = 170

- | Milk | Water   |
|------|---------|
| (3   | 2) × 2  |
| 6    | 5 units |
| (2   | 3) × 3  |

Water is added. So quantity of water remains same.

ATQ, 10 units = 90 litres

5 units = 45 litres

- | Milk | Water  |
|------|--------|
| 8    | 7      |
| 8    | 1 unit |
| (1   | 1) × 8 |

Water is added. So quantity of water remains same.

ATQ, 1 units = 20 litres

Quantity of milk = 8 units =  $8 \times 20 = 160$  litres

- | Milk | Water | Total      |
|------|-------|------------|
| 19   | 20    | 39         |
| 30   | 21    | 51         |
|      |       |            |
| 49   | - 41  | = 8 litres |

8 litres of water be added.

- | R       | S       |
|---------|---------|
| (4      | 5) × 2  |
| 5 units | 5 units |
| 13      | 15      |

ATQ, 5 units = 4200

Salary of S = 10 units = 8400

- Let the number of members joined the group =  $x$

$$\text{ATQ, } \frac{44+x}{55+x} = \frac{13}{14}$$

$$\frac{11}{55+x} = \frac{1}{14}$$

Number of female =  $55 + x = 11 \times 14 = 154$

16. The incomes of A, B and C be  $12x$ ,  $9x$  and  $7x$  respectively.  
The expenditure of A, B and C be  $15y$ ,  $9y$  and  $8y$  respectively.

$$\text{ATQ, } \frac{\text{Saving}}{\text{Income}} = \frac{12x-15y}{12x} = \frac{1}{4}$$

$$3x = 12x - 15y$$

$$9x = 15y \quad x : y = 5 : 3$$

|          | A  | B  | C  |
|----------|----|----|----|
| Income:  | 60 | 45 | 35 |
| Expend:  | 45 | 27 | 24 |
| Savings: | 15 | 18 | 11 |

17. Denomination:  $5 : 2 : 1$

Number of coins:  $4 : 6 : 9$

$$\text{Values} \quad 5 \times 4 : 2 \times 6 : 1 \times 9$$

$$20 : 12 : 9 = 41$$

ATQ, 41 units = Rs. 410

Total value of Rs. 2 coins = 12 units = 120

Number of Rs. 2 coins =  $\text{Rs. } 120 / \text{Rs. } 2 = 60$

18.  $\left(\frac{1}{3} : \frac{1}{6} : \frac{1}{9}\right) \times 18 = 6 : 3 : 2$

ATQ, 11 units = 44

Required number of coins = 6 units = 24

19. Amit : Veena =  $2 : 3$

$$\text{Veena : Tanya} = (1 : 2) \times 3$$

$$\text{Amit : Veena : Tanya} = 2 : 3 : 6$$

$$\text{Required fraction} = \frac{3}{2+3+6} = \frac{3}{11}$$

- 20.

$$\left[ \begin{array}{l} (3 : 5) \times 11 \\ (12 : 23) \times 2 \end{array} \right] \begin{array}{l} 9 \text{ units} \\ 9 \text{ units} \end{array}$$

ATQ, 9 units = 9

Greatest number =  $5 \times 11 = 55$

21. 

|      |      |      |
|------|------|------|
| A    | B    | C    |
| 200  | 300  | 500  |
| +15% | +10% | +20% |
| +30  | +30  | +100 |
| 23   | 330  | 600  |

$$23 : 33 : 60$$

22. Let the number of notes each denomination be  $x$ .

$$\text{ATQ, } 1.x + 5.x + 10.x = 480$$

$$16x = 480 \quad x = 30$$

Total number of notes =  $3x = 3 \times 30 = 90$

23. Let the number of notes each denomination be  $x$ .

$$\text{ATQ, } 1.x + 5.x + 10.x = 320$$

$$16x = 320 \quad x = 20$$

Total number of notes =  $3x = 3 \times 20 = 60$

24. MATH PHY BIO

$$\begin{array}{ccc} 500 & 700 & 800 \\ \downarrow +40\% & \downarrow +50\% & \downarrow +75\% \\ 700 & 1050 & 1400 \\ 2 & 3 & 4 \end{array}$$

25. Let the number of students in room A and room B be  $X$  and  $Y$ .

$$\text{ATQ, } \frac{X-10}{Y+10} = \frac{1}{1}$$

$$X - Y = 20 \text{ -----(1)}$$

$$\text{Again, } \frac{X+20}{Y-20} = \frac{2}{1}$$

$$X - 2Y = -60 \text{ -----(2)}$$

Subtracting equ<sup>n</sup>(2) from equ<sup>n</sup>(1), we get

$$Y = 80$$

$$X = 80 + 20 = 100$$

26. 

|         |       |
|---------|-------|
| Milk    | Water |
| 5       | 9     |
| 2 units |       |
| 5       | 11    |

Water is added. So quantity of water remains same.

ATQ, 2 units = 5 litres

$$1 \text{ unit} = 2.5$$

$$5 \text{ units} = 5 \times 2.5 = 12.5 \text{ litres}$$

27.  $x : y = (4 : 7) \times 9$

$$y : z = (9 : 7) \times 7$$

$$x = 36 \text{ units} = 72$$

$$1 \text{ unit} = 2$$

$$Z = 49 \text{ units} = 49 \times 2 = 98$$

28. 

|              |    |    |
|--------------|----|----|
|              | A  | B  |
| Income:      | 3x | 4x |
| Expenditure: | 4y | 5y |

$$\text{ATQ, } 3x - 4y = \frac{1}{4} 3x$$

$$12x - 16y = 3x$$

$$9x = 16y \quad x : y = 16 : 9$$

$$\text{Ratio of savings} = (3 \times 16 - 4 \times 9) : (4 \times 16 - 5 \times 9) = 12 : 19$$

29. Difference =  $5 - 3 = 2$  units  
 ATQ, 2 units = 10    1 unit = 5  
 Product =  $5 \times 3 = 15 \text{ unit}^2 = 15 \times 5^2 = 375$

30. Share of Nishant and Rahim =  $\frac{1+1}{1+2+2+1} \times 1500 = 500$

31. Aluminium = 5x and Copper = 2x  
 ATQ,  $7x = 17.500 \quad x = 2.500$   
 Aluminium =  $5 \times 2.500 = 12.500$   
 Copper =  $2 \times 2.500 = 5.000$   
 Ratio of Aluminium and Copper in the new mixture =  $12.500 : (5.000 + 1.250) = 12.500 : 6.250 = 2 : 1$

32. 

|         |         |
|---------|---------|
| (3 : 4) | (4 : 5) |
| 1 units | 1 units |

$$\text{ATQ, 1 units} = 29$$

$$\text{Smallest number} = 3 \text{ units} = 3 \times 29 = 87$$

33. 

|         |         |   |      |
|---------|---------|---|------|
| (6 : 7) | (7 : 7) | } | same |
| 1 units | 1 units |   |      |

$$\text{ATQ, 13 units} = 780 \quad 1 \text{ unit} = 60$$

34.  $a : b = (3 : 5)_{\times 7}$   
 $b : c = (7 : 9)_{\times 5}$   
 $a : b : c = 21 : 35 : 45$

35. ATQ, 32 units = 2176  
 1 unit = 68  
 Difference =  $34 - 32 = 2 \text{ units} = 2 \times 68 = 136$

36. ATQ, 27 units = 405

1 unit = 15  
 Sum of three numbers =  $(27+28+29) = 84 \text{ units} = 84 \times 15 = 1260$

37.  $a : b = (5 : 6)_{\times 7}$   
 $b : c = (7 : 8)_{\times 6}$   
 $a : b : c = 35 : 42 : 48$

38. Rakesh – Mohan = Rs. 7000  
 Suresh – Mohan = Rs. 3000  
 Here are two equation with three variables. So the value cannot be determined.

39. Before: 

|         |         |         |
|---------|---------|---------|
| 2       | 3       | 5       |
| 2 units | 2 units | 2 units |

 After: 

|   |   |   |
|---|---|---|
| 4 | 5 | 7 |
|---|---|---|

$$2 \text{ units} = 20$$

Total number of students before increase =  $2 + 3 + 5 = 10 \text{ units} = 10 \times 10 = 100$

40. 

|              | Man          | Woman        | Boy          |
|--------------|--------------|--------------|--------------|
| Number:      | 4            | 5            | 6            |
| Each share:  | $\times 9$   | $\times 8$   | $\times 4$   |
| Total share: | $4 \times 9$ | $5 \times 8$ | $6 \times 4$ |
|              | 9            | 10           | 6            |

Total share of women =  $\frac{10}{9+10+16} \times 425 = 170$

Share of a woman =  $\frac{170}{5} = 34$

41.  $1^{\text{st}} : 2^{\text{nd}} = (2 : 3)_{\times 5}$   
 $2^{\text{nd}} : 3^{\text{rd}} = (5 : 8)_{\times 3}$   
 $1^{\text{st}} : 2^{\text{nd}} : 3^{\text{rd}} = 10 : 15 : 24$   
 $2^{\text{nd}} \text{ number} = \frac{15}{(10+15+24)} \times 147 = 45$

42. 

|    |    |    |         |
|----|----|----|---------|
| 20 | (5 | 4) | -1 unit |
|    | (4 | 3) |         |

$$\text{Capacity of tin remains same.}$$

$$1 \text{ unit} = 6 - 4 = 2 \text{ bottles}$$

$$\text{Capacity of tin} = 20 \times 2 = 40 \text{ bottles}$$

43.  $\begin{array}{ccc} & \text{Petrol} & \text{Water} \\ & 9 & : & 5 \\ 9 & \swarrow & & \searrow \\ & (1 & : & 1) \times 9 \end{array}$   
 4 unit  
 Water is added. So quantity of petrol remains same.

ATQ, 4 units = 84 litres

1 unit = 21

Quantity of petrol = 9 units =  $9 \times 21 = 189$  litres

44. Sum =  $12 + 13 + 14 = 39$  units

ATQ, 39 units = 1872

13 units =  $1872 / 3 = 624$

45.  $(11a = 12b) \times 7$

$(7b = 11c) \times 12$

$11 \times 7a = 12 \times 7b = 11 \times 12c = 11 \times 7 \times 12$

$a : b : c = 12 : 11 : 7$

46. Sum of two numbers =  $6 + 7 = 13$  units

13 units = 429    1 unit = 33

Greater number = 7 units =  $7 \times 33 = 231$

47.  $115 : 138 = 23 \times (5 : 6) = 5 : 6$

48. Let the number of men and women passenger in the bus be  $2x$  and  $x$  respectively.

ATQ,  $\frac{2x-15}{x+5} = \frac{1}{1}$

$2x - 15 = x + 15$

$x = 20$

In the beginning, number of passenger =  $2x + x =$

$3x = 3 \times 20 = 60$

49. Duplicate ratio: If  $a$  and  $b$  are two numbers then their duplicate ratio is  $a^2 : b^2$ .

50.  $a : b, a \rightarrow$  antecedent &  $b \rightarrow$  consequent

51. Original: 5 units = 60 cm

1 unit = 12 cm

Now the length of ribbon = 3 units =  $3 \times 12$

= 36 cm

52. Girls: 11 units = 8360

1 unit = 760

Total number of students =  $(10+11) = 21$  units = 21

$\times 760 = 15960$

53.  $\begin{array}{ccc} & (2 & : & 3) \times 17 \\ 6 & \swarrow & & \searrow \\ & \text{units} & & \text{units} \\ & 40 & : & 57 \end{array}$

ATQ, 6 units = 3400

Karim's salary = 3 units =  $\frac{1}{2} \times 34000 = 17,000$

54.  $\begin{array}{ccc} & \text{Copper} & \text{Tin} \\ & 3 & : & 2 \\ & \swarrow & & \searrow \\ & 1 \text{ unit} & & \text{same} \\ & (2 & : & 1) \times 2 \end{array}$

Copper is added. So quantity of tin remains same.

ATQ, 1 unit = 250 gram

Amount of tin = 2 units =  $2 \times 250 = 500$  gram

55.  $\begin{array}{ccc} & \text{Milk} & \text{Water} \\ & 3 & : & 7 \\ 9 & \swarrow & & \searrow \\ & 11 \text{ unit} \\ & (1 & : & 6) \times 3 \end{array}$

Water is added. So quantity of milk remains same.

ATQ, 10 units = 30 litres

11 units = 33 litres

56.  $\begin{array}{ccc} \text{Math} & \text{Phy} & \text{Chem} \\ 500 & 700 & 800 \\ \downarrow +40\% +200 & \downarrow +50\% +350 & \downarrow +75\% +600 \\ 700 & 1050 & 1400 \\ 2 & : & 3 & : & 4 \end{array}$

57. Difference between Mahesh and Sumit's salary = 7 - 4 = 3 units

3 units = 12,000    1 unit = 4,000

Salary of Sumit's 4 units =  $4 \times 4,000 = 16,000$

58.  $A : B = (3 : 2) \times 3$

$B : C = (3 : 2) \times 2$

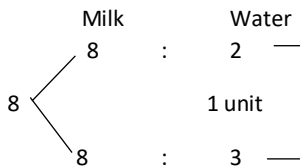
$A : B : C = 9 : 6 : 4$

ATQ, 19 units = 342

1 unit = 18

Total scored by B = 6 units =  $6 \times 18 = 108$

59.



Water is added. So quantity of milk remains same.

ATQ, 10 units = 700 ml

1 units = 70 ml

60. Boys + Girls = (8+5) = 13 units

ATQ, 13 units = 286

1 unit = 22

22 more girls i. e. 1 unit get admitted.

New ratio = 8 : (5 + 1) = 4 : 3

61. (a)  $15 \times 2.5 = 37.5$  (36)

(b)  $10 \times 5 = 50$  (51)

(c)  $14 \times 3 = 42$  (44)

(d)  $26 \times 2 = 52$  (54)

Option (b) is smallest. Denominator is approximately 5 times numerator.

62. Boys + Girls = (17+24) = 41 units

ATQ, 41 units = 8610

1 unit = 210

Number of boys = 17 units =  $17 \times 210 = 3570$

63. Sneha : Yash : Rohan =

$$\left(\frac{1}{2} : \frac{1}{1} : \frac{1}{4}\right) \times 4 = 2 : 4 : 1$$

$$\text{Rohan gets} = \frac{1}{2+4+1} \times 343 = 49$$

64. ATQ,  $\frac{1}{2}$  of 1<sup>st</sup> =  $\frac{1}{4}$  of 2<sup>nd</sup> =  $\frac{1}{8}$  of 3<sup>rd</sup> = k

$$1^{\text{st}} : 2^{\text{nd}} : 3^{\text{rd}} = 2k : 4k : 8k = 1 : 2 : 4$$

Again, 7 units = 2408

Difference = 2 - 1 = 1 units = 344

65. Mean Proportional =  $\sqrt{11 \times 704}$ 

$$= \sqrt{11 \times 11 \times 8 \times 8} = 88$$

66. Kavita : Rakesh : Shalini =

$$\left(\frac{1}{4} : \frac{1}{9} : \frac{1}{6}\right) \times 36 = 9 : 4 : 6$$

$$\text{Rohan gets} = \frac{6}{9+4+6} \times 684 = 216$$

67. 1 min ----- 20 pages

It will take  $\frac{300}{20} = 15$  minutes to print a document of 300 pages.

68. 6 Machines ----- 270 bottles per min

1 machine ----  $270/6 = 45$  bottles per min

10 machine ---- 450 bottles per min

1 min ----- 450 bottles

4 min -----  $450 \times 4 = 1800$  bottles

$$69. \frac{100 \text{ cats} \times 100 \text{ days}}{100 \text{ mice}} = \frac{4 \text{ cats} \times x \text{ days}}{4 \text{ mice}}$$

$$x = 100 \text{ days}$$

$$70. \frac{31 \text{ people} \times 36 \text{ days}}{62 \text{ tree}} = \frac{32 \text{ people} \times x \text{ days}}{96 \text{ tree}}$$

$$x = 54 \text{ days}$$

71. 3 pumps  $\times$  8 hours  $\times$  2 days = 4 pumps  $\times$  x hours  $\times$  1 days

$$x = 12 \text{ hours}$$

72. 9 taps  $\times$  20 mins = x taps  $\times$  15 mins

$$x = 12 \text{ taps}$$

$$73. \frac{7 \text{ persons} \times 36 \text{ days}}{\text{Rs.840}} = \frac{9 \text{ persons} \times x \text{ days}}{\text{Rs.810}}$$

$$x = 27 \text{ days}$$

$$74. \frac{9 \text{ person}}{108 \text{ toys}} = \frac{x \text{ person}}{48 \text{ toys}}$$

$$x = 4 \text{ person}$$

$$75. \frac{10 \text{ printer} \times 10 \text{ minutes}}{10 \text{ booklets}} = \frac{x \text{ printers} \times 10 \text{ hours}}{6000 \text{ booklets}}$$

$$x = 100 \text{ printers}$$

76. 48 L petrol ----- 432 km

1 L petrol -----  $432/48 = 9$  km

20 L petrol -----  $20 \times 9 = 180$  km

77. Capacity of tank = 20 bucket  $\times$  12 litres = x buckets  $\times$  10 litres

$$x = 24 \text{ buckets}$$

$$78. \frac{5 \text{ men} \times 6 \text{ days} \times 6 \text{ hrs}}{10 \text{ toys}} = \frac{12 \text{ men} \times x \text{ days} \times 8 \text{ hrs}}{16 \text{ toys}}$$

$$x = 3 \text{ days}$$

$$79. \frac{6 \text{ men} \times 8 \text{ hrs}}{1680} = \frac{9 \text{ men} \times 6 \text{ hrs}}{x}$$

$$x = 1890$$

1. When Rahul was born, his father was 32 years older than his brother and his mother was 25 years older than his sister. If Rahul's brother is 6 years older than him and his mother is 3 years younger than his father, how old was Rahul's sister when he was born?  
(a) 7 years (b) 10 years  
(c) 14 years (d) 19 years  
(OSSC CGL 2022)
2. The sum of the present age of mother and her son is 60 years. Six years ago, the age of the mother was five times the age of her son. What will be the age of her son after 6 years?  
(a) 23 years (b) 22 years  
(c) 21 years (d) 20 years  
(OSSC CGL 2023)
3. Today is Varun's birthday. One year from today, he will be twice as old as he was 12 years ago. How old is Varun today?  
(a) 20 years (b) 22 years  
(c) 25 years (d) 27 years  
(OSSC CGL SPL 2022)
4. Sum of A's and B's age 12 years ago was 176. A's age 36 years ago was equal to B's age 12 years ago. Find the present age of A?  
(a) 112 years (b) 128 years  
(c) 84 years (d) 104 years  
(OSSC CGL SPL 2023)
5. Jitendra says, "If you reverse the digits in my age, the number that you will obtain will be Dharmendra's age. Dharmendra is older than me and the difference of ages of me and Dharmendra will be one-eleventh of the sum of our ages". The age of Jitendra is:  
(a) 23 years (b) 34 years  
(c) 45 years (d) None of these  
(OSSC CHSL 2022 & Accountant 2023)
6. The sum of the ages of 3 people A, B and C is 90 years. What would be the total of their ages 4 years back?  
(a) 74 years (b) 78 years  
(c) 86 years (d) 80 years  
(OSSC CHSL 2022)
7. If the total ages of Iqbal and Shikhar is 12 years more than the total age of Shikhar and Charu, then Charu is how many years younger than Iqbal?  
(a) 11 years (b) 12 years  
(c) 14 years (d) 15 years  
(OSSC CHSL 2023)
8. Father is aged 3 times more than the age of his son Rohit. After 8 years, he would be  $2\frac{1}{2}$  times of Rohit's age. After further 8 years, how many times would he (father) be of Rohit's age?  
(a) 2 times (b)  $2\frac{1}{4}$  times  
(c)  $2\frac{3}{4}$  times (d) 3 times  
(OSSC CHSL 2024)
9. Samrat is as much younger than Ritesh as he is older than Tamanna. If the sum of the ages of Ritesh and Tamanna is 50 years, what is definitely the difference between Ritesh and Samrat's age?  
(a) 1 year (b) 2 years  
(c) 25 years (d) Data inadequate  
(OSSC CTSRE 2022)
10. Rohan is as much younger than Ajay as he is older than Meena. If the sum of ages of Ajay and Meena is 108 years, then how old is Rohan?  
(a) 32 years (b) 36 years  
(c) 54 years (d) 64 years  
(OSSC CTSRE 2023)
11. The ratio of the present age of father to that of son is 7:2. After 10 years, their ages will be in the ratio of 9:4. What is the present age of the father?  
(a) 35 years (b) 40 years  
(c) 43 years (d) 45 years  
(OSSC CTSRE 2023)
12. Six years ago, the respective ratio between the age of Riddhi and her father at that time was 1:7. The difference between the age of Riddhi's father and Riddhi is 36 years. What will be Riddhi's age 5 years from now?  
(a) 13 years (b) 17 years  
(c) 19 years (d) 21 years  
(OSSC CTSRE 2024)
13. A is two years older than B who is twice as old as C. If the total of the ages of A, B and C is 62, then how old is C (in years)?

- (a) 13 (b) 12 (c) 14 (d) 11  
(OSSC BSSO 2022)
14. Twenty-two years ago, A was two-third of B in age. If the ratio of their present age is 4:5, what will be the total of their present ages?  
(a) 69 (b) 99 (c) 79 (d) 89  
(OSSC BSSO 2022)
15. At present, the ratio between the ages of A and B is 5:4. After 7 years, A's age will be 32 years. What is the present age of B? (in years)  
(a) 22 (b) 24 (c) 28 (d) 20  
(OSSC BSSO 2022)
16. The ratio of present age of Sachin to that of Dravid is 3:5 and after five years the sum of their age will be 90 years. Find the difference between present age of Sachin and Dravid?  
(a) 14 years (b) 20 years  
(c) 18 years (d) 30 years  
(OSSC CPGL 2024)
17. Samir's age is one-fourth of his father's age and two-third of his sister Reema's age. What is the ratio of the age of Samir, Reema and their father respectively?  
(a) 3:2:8 (b) 3:4:8 (c) 2:3:8 (d) 4:3:8  
(OSSC CPGL 2024)
18. Prachi's father was 28 years of age when she was born while her mother was 26 years old when her brother four years younger to her was born. What is the difference between the age of her parents?  
(a) 2 years (b) 4 years  
(c) 6 years (d) 8 years  
(OSSC Accountant 2023)
19. A man is thrice as old as his son. Three years ago the man was 4 times as old as his son. Find their present age.  
(a) 27, 9 (b) 30, 10 (c) 24, 6 (d) 33, 11  
(OSSC Amin 2023)
20. Rishab asked his grandfather how old he was. Rather than giving him a straight answer, he replied. "I have 6 children, and there are 4 years between each one and the next. I had my first child (your uncle Ravi) when I was 29. Now the youngest one (your Auntie Ramita) is 29 herself. That's all I am telling you!" How old is Rishab's grandfather?  
(a) 76 (b) 78 (c) 82 (d) 86  
(OSSC Amin 2023)
21. The sum of age of 4 children born at the interval of 3 years each is 50 years. What is the age of the eldest child?  
(a) 8 (b) 11 (c) 14 (d) 17  
(OSSC VSA 2023)
22. The sum of the ages of son and father is 56 years. After 4 years, the age of the father will be three times that of the son. What is the age of son?  
(a) 11 (b) 12 (c) 15 (d) 18  
(OSSC Steno 2022)
23. A is 3 years older to B and 3 years younger to C, while B and D are twin. How many years older is C compared to D?  
(a) 2 (b) 3 (c) 6 (d) 12  
(OSSC Steno 2024)
24. Three years ago X's age was double of Y's. Seven years hence, the sum of their united ages will be 83 years. The age of X today is:  
(a) 47 years (b) 35 years  
(c) 45 years (d) 24 years  
(OSSC LTR 2024)
25. The ratio of the age of Seeta and Geeta is 2:7. After 6 years, the ratio of their age will be 1:2. What is the difference in their present age?  
(a) 8 years (b) 9 years  
(c) 10 years (d) 11 years  
(OSSC ATO 2024)
26. The sum of the age of A and 4 times the age of B is 40 years. Also 4 times the age of A is added to 7 times the age of B, the result is 91 years. The sum of the ages (in years) of A and B is:  
(a) 16 (b) 13 (c) 17 (d) 22
27. The ratio of the present ages of A and B is 8:15. Eight years ago, the ratio of their ages was 6:13. What will be the ratio of ages of A and B after 8 years from now?  
(a) 10:17 (b) 9:14 (c) 8:5 (d) 9:5  
(OSSC VSA 2023)

28. Aditya was born two years after his father's marriage. His mother is five years younger than his father but 20 years older than Aditya who is 10 years old now. At what age did his father get married?
- (a) 23 years (b) 25 years  
(c) 33 years (d) 35 years

(OSSC ESI 2023)

29. 10 years ago, the average age of a family of 4 members was 24 years. Since then, two children having been born, still the average age of the family is the same today. If the two children differ in age by 2 years, find the present age of the younger child.
- (a) 2 years (b) 3 years  
(c) 1 year (d) 4 years

(OSSC CGL Mains 2024-25)

**ANSWER KEY**

01. (b) 02. (c) 03. (c) 04. (a) 05. (d) 06. (b)  
07. (b) 08. (a) 09. (d) 10. (c) 11. (a) 12. (b)  
13. (b) 14. (b) 15. (d) 16. (b) 17. (b) 18. (c)  
19. (a) 20. (b) 21. (d) 22. (b) 23. (b) 24. (c)  
25. (c) 26. (c) 27. (a) 28. (a) 29. (b)

**SOLUTION**

1. Let the age of Rahul =  $x$   
The age of Rahul's brother =  $x + 6$   
The age of Rahul's father =  $x + 6 + 32 = x + 38$   
The age of Rahul's brother =  $x + 38 - 3 = x + 35$   
The age of Rahul's sister =  $x + 35 - 25 = x + 10$   
The age of Rahul's sister when he was born =  $x + 10 - x = 10$  years
2. Present: Mother + Son = 60 years  
Six years ago: Mother + Son =  $60 - 6 = 54$  years  
Mother : Son = 5 : 1  
ATQ, 6 units = 54 years  
Son's age before six years = 1 unit = 9 years  
Son's age after 6 years =  $9 + 2 \times 6 = 21$

3. Let one year ago, the age of Varun =  $x$ .

$$\text{ATQ, } \frac{x}{x-12} = \frac{2}{1}$$

$$x = 2x - 24 \quad x = 24$$

$$\text{Varun's present age} = 24 + 1 = 25 \text{ years}$$

4. 12 years ago:  $A + B = 176$

Present age:

$$A + B = 176 + 2 \times 12 = 200 \dots (1)$$

$$\text{Again, } (A-36) = (B-12)$$

$$A - B = 24 \dots (2)$$

Adding equ<sup>n</sup> (1) & (2), we get

$$2A = 224 \quad A = 112$$

5. My age =  $10x + y$

$$\text{ATQ, } (10y + x - 10x - y) = \frac{1}{11} (10x + y + 10y + x)$$

$$9(y - x) = \frac{1}{11} \times 11(x + y)$$

$$10x = 8y$$

$$\frac{x}{y} = \frac{4}{5}$$

$$\text{Dharmendra's age} = 10 \times 5 + 4 = 54 \text{ years}$$

6. Present age:  $A + B + C = 90$  years

$$4 \text{ years back: } A + B + C = 90 - 4 \times 3 = 78 \text{ years}$$

7. (Iqbal + Shikhar) - (Shikhar + Charu) = 12 years  
(Iqbal - Charu) = 12 years

8. Father Rohit

$$\begin{array}{ccc} 4 & : & 1 \\ \left[ \begin{array}{c} 1 \text{ units} \\ 5 \end{array} \right] & = & \left[ \begin{array}{c} +8 \\ 2 \end{array} \right] \text{ years} \end{array}$$

After 8 years, Father's age = 5 units =  $5 \times 8 = 40$  years and Rohit's age = 2 units =  $2 \times 8 = 16$  years

After further 8 years father would be  $\frac{(40+8)}{(16+8)} = 2$  times of Rohit's age.

9. Ritesh Samrat Tamanna

$$x + a \quad x \quad x + a$$

$$\text{ATQ, } x + a + x - a = 50 \text{ years}$$

$$x = 25 \text{ years}$$

Difference between Ritesh and Samrat's age =

$$x + a - x = a$$

The given data is inadequate.

10. Ajay Rohan Meena

$$x + a \quad x \quad x + a$$

ATQ,  $x + a + x - a = 108$  years

$x = 54$  years

11. Present: 7 : 2 2 units  
 After 10 years: 9 : 4

2 units = 10 years

1 years = 5 years

Present age of father = 7 years = 7 units =  $7 \times 5 = 35$  years

12. 

|                | Ridhi   | her Father |
|----------------|---------|------------|
| Six years ago: | $x$     | $7x$       |
| Present:       | $x + 6$ | $7x + 6$   |

ATQ,  $7x + 6 - x - 6 = 36$   
 $x = 6$  years  
 Ridhi's present age =  $6 + 6 = 12$  years  
 Ridhi's age after 5 years =  $12 + 5 = 17$  years

13. 

| A        | B    | C   |
|----------|------|-----|
| $2x + 2$ | $2x$ | $x$ |

$A + B + C = 62$   
 $5x + 2 = 62 \quad x = 12$  years

14. 

|               | A | B |
|---------------|---|---|
| 22 years ago: | 2 | 3 |

2 units

Present: 4 : 5

2 units = 22    1 unit = 11  
 Total of their present age =  $4 + 5 = 9$  units =  $9 \times 11 = 99$  years

15. After 7 years, A's age =  $5x + 7 = 32$   
 $x = 5$  years  
 Present age of B =  $4x = 4 \times 5 = 20$  years

16. 

|                | Sachin   | David    |
|----------------|----------|----------|
| Present:       | $3x$     | $5x$     |
| After 5 years: | $3x + 5$ | $5x + 5$ |

ATQ,  $3x + 5 + 5x + 5 = 90$   
 $x = 10$  years  
 Difference between present age =  $5x - 3x = 2x = 2 \times 10 = 20$  years

17. Samir's age =  $\frac{1}{4}$  of father's age =  $\frac{2}{3}$  of Reema's age =  $2k$   
 Samir : Reema : Father =  $2k : 3k : 8k$

=  $2 : 3 : 8$

18. When Prachi was born, father's age = 28 years  
 When her brother was born, mother's age = 26 years  
 Her brother 4 years younger to Prachi  
 When Prachi was born, Mother's age =  $26 - 4 = 22$  years  
 Difference between the age of her parent =  $28 - 22 = 6$  years

19. 

|              | Man                  | Son     |
|--------------|----------------------|---------|
| Present:     | $(3 : 1)_{\times 3}$ |         |
|              |                      | 1 units |
| 3 years ago: | $(4 : 1)_{\times 2}$ |         |

ATQ, 1 unit = 3 years  
 Present age of father = 9 units  
 $= 9 \times 3 = 27$  years  
 Present age of Son = 3 units  
 $= 3 \times 3 = 9$  years

20. Grandfather's age when 1<sup>st</sup> child was born = 29  
 Grandfather's age when last child was born =  $29 + (6 - 1) \times 9 = 49$   
 Present age of Grandfather =  $49 + 29 = 78$  years.

21.  $x + x + 3 + x + 6 + x + 9 = 50$   
 $4x = 32 \quad x = 8$   
 Eldest child's age =  $x + 9 = 8 + 9 = 17$  years

22. Present: Father + Son = 56 years  
 After 4 years: Mother + Son =  $56 + 2 \times 4 = 64$  years  
 Father : Son =  $3 : 1$   
 ATQ, 4 units = 64 years  
 1 unit = 16 years  
 Son's present age = 3 unit = 12 years

23. 

| A   | B       | C       | D   |
|-----|---------|---------|-----|
| $x$ | $x - 3$ | $x + 3$ | $x$ |

ATQ,  $C - D = x + 3 - x = 3$  years

24. 

|              | X        | Y       |
|--------------|----------|---------|
| 3 years ago: | $2x$     | $1x$    |
| Present:     | $2x + 3$ | $x + 3$ |

7 years hence:  $2x + 10 \quad x + 10$   
 ATQ,  $2x + 10 + x + 10 = 83$   
 $3x = 63 \quad x = 21$  years

$$\begin{aligned}\text{Present age of X} &= 2x + 3 \\ &= 2 \times 21 + 3 = 45 \text{ years}\end{aligned}$$

25. Seeta Geeta

$$\begin{array}{rcll}\text{Present:} & 2 & : & 7 \\ & & & \text{3 units} \\ \text{After 6 years:} & (1 & : & 2) \times 5\end{array}$$

$$\begin{aligned}3 \text{ units} &= 6 \text{ years} \quad 1 \text{ unit} = 2 \text{ years} \\ \text{Difference between their present age} \\ &= (7 - 2) = 5 \text{ units} = 5 \times 2 = 10 \text{ years}\end{aligned}$$

26.  $A + 4B = 40$  ..... (1)  
 $4A + 7B = 91$  ..... (2)  
 $\text{Equ}^n (1) \times 4 - \text{Equ}^n (2)$ , we get  
 $9B = 69 \quad B = 23/3$   
 $A + 4 \times \frac{23}{3} = 40$   
 $A = 40 - \frac{92}{3} \quad A = \frac{28}{3}$   
 $A + B = \frac{28}{3} + \frac{23}{3} = 17 \text{ years}$

27.  $A \quad B$   
8 years ago:  $6 \quad : \quad 13$   
 $+ 8 \text{ years} \quad +2 \text{ units}$   
Present:  $8 \quad : \quad 15$   
 $+ 8 \text{ years} \quad +2 \text{ units}$   
8 years hence:  $10 \quad : \quad 17$

28. Let the age of Aditya's father at the time of Marriage =  $x$   
Present Age of Aditya's father =  $x + 2 + 10$   
 $= x + 12$   
Present Age of Aditya's mother =  $x + 12 - 5$   
 $= x + 7$   
Again,  $x + 7 - 10 = 20$   
 $x = 23 \text{ years}$
29. 10 years ago, the average age of a family of 4 members was 24 years  
Present average age of a family of 4 members  
 $= 34 \times 4 = 136$

Since then, two children having been born, still the average age of the family is the same today.

$$\begin{aligned}\text{Present average age of a family of 6 members} \\ &= 24 \times 6 = 144\end{aligned}$$

$$\text{Total age of two children} = 144 - 136 = 8 \text{ years}$$

$$\text{Difference of age of two children} = 2 \text{ years}$$

$$\text{Age of younger child} = \frac{8-2}{2} = 3 \text{ years}$$

**Concept:** A container contains  $x$  units of liquid A. If  $y$  units are taken out and replaced by liquid B and this process is repeated 'n' times.

$$\frac{\text{Liquid A left after } n\text{th operation}}{\text{Initial quantity of liquid A}} = \left(1 - \frac{y}{x}\right)^n$$

**Example:** A drum contains 80 litres of ethanol. 20 litres of this liquid is removed and replaced with water. 20 litres of this mixture is again removed and replaced with water. How much water (in litres) is present in this drum now?

**Solution:** Final quantity of ethanol =  $80 \left(1 - \frac{20}{80}\right)^2$

$$= 80 \times \frac{3}{4} \times \frac{3}{4} = 45 \text{ litres}$$

$$\text{Water} = 80 - 45 = 35$$

### EXERCISE

- 27 litres are drawn from a cask full of wine and is then filled with water. This operation is performed once more. The ratio of the quantity of wine now left in cask to that of the water is 49:15. How much wine did the cask hold originally? (in litres)  
(a) 246 (b) 216 (c) 236 (d) 226  
(OSSC CGL 2021)
- A bucket contains liquid A and B in the ratio 14:15. 116 litres of the mixture is taken out and filled with 116 litres of B, now the ratio changes to 7:8. Find the quantity of liquid B initially. (in litres)  
(a) 1800 (b) 1700 (c) 1600 (d) 1900  
(OSSC CGL 2021)
- A 20 litres of mixture contains 30% alcohol and 70% water. If 5 litres of water is added to the mixture, then what will be the percentage of alcohol in the new mixture?  
(a) 22% (b) 23% (c) 24% (d) 25%  
(OSSC CHSL 2023)
- A milkman's vessel is filled with liquid, 4 parts of which are water and 5 parts milk. How much of the mixture must be drawn off and replaced with water so that the mixture may be half water and half milk?  
(a) 1/3 (b) 1/4 (c) 1/5 (d) 1/10  
(OSSC CTSRE 2022)
- In 2 gallons mixture of spirit and water, the percentage of water is 12%. In another 3 gallons mixture of spirit and water, the percentage of water is 5%. These two mixtures are poured into a pot and 1/2 gallon of water is added to it. What is the percentage of water in this new mixture?  
(a)  $17\frac{1}{11}\%$  (b)  $17\frac{3}{11}\%$  (c)  $16\frac{2}{11}\%$  (d)  $6\frac{13}{27}\%$   
(OSSC Jr Clerk Mains 2022)
- Two bottles contain 6 and 10 liters of mixtures of alcohol and water. The smaller bottle contains 75% of water and the other contains 75% of alcohol. The contents of these two bottles are emptied into a 18-litre bottle which then filled up with water. What is the percentage of water in the third bottle?  
(a) 60% (b) 40% (c) 50% (d) None of the options  
(OSSC Jr Clerk Mains 2022)
- A, B and C are 3 vessels having mixtures of wine and water. A contains 30% wine, B contains 40% wine and C contains 45% wine. If 4 litres from A, 3 litres from B, and 5 litres from C are mixed, find the concentration of wine in the final mixture?  
(a)  $35\frac{5}{12}\%$  (b)  $38\frac{3}{4}\%$  (c)  $39\frac{7}{12}\%$  (d) 40 %  
(OSSC Jr Clerk Mains 2022)
- 20 litres of a mixture contains milk and water in the ratio of 5:3. If four litres of this mixture is replaced by four litres of milk, then find the ratio of the milk to that of the water in the new mixture.  
(a) 2:3 (b) 4:3 (c) 5:3 (d) 7:3  
(OSSC LTR 2024)
- A container contains a mixture of water and alcohol in the ratio 7:5. When 18 litres of mixture are drawn off and the container is filled with alcohol, the new ratio becomes 7:9. How many litres of water was in the container initially?  
(a) 50 litres (b) 42 litres (c) 46 litres (d) 40 litres  
(OSSC CGL Mains 2022)
- A mixture contains lemon juice and sugar syrup in equal proportion. If a new mixture is prepared by adding this mixture and sugar syrup in the ratio 1:3, then the ratio of lemon juice and sugar syrup in the new mixture is:  
(a) 6:1 (b) 7:1 (c) 1:7 (d) 1:6  
(OSSC CGL Mains 2022)

## ANSWER KEY

01. (b) 02. (\*) 03. (c) 04. (d) 05. (c)  
 06. (c) 07. (b) 08. (d) 09. (b) 10. (c)

## SOLUTION

1.  $\frac{\text{Final quantity of wine}}{\text{Initial quantity of wine}} = \left(1 - \frac{27}{x}\right)^2$   
 $= \frac{49}{15+19} = \frac{49}{64} = \left(\frac{7}{8}\right)^2$   
 $1 - \frac{27}{x} = \frac{7}{8}$   
 $\frac{27}{x} = \frac{1}{8}$   
 $x = 27 \times 8 = 216$
2. 116 litres of the mixture is taken out. and Ratio will also be 14 : 15. Liquid B is poured by same liters  
 Now the ratio becomes 7 : 8.

|            |    |   |               |
|------------|----|---|---------------|
|            | A  |   | B             |
| Initially: | 14 | : | 15            |
|            |    |   | 1 unit        |
| After:     | (7 | : | 8) $\times 2$ |

Liquid B is added not A. So make quantity of A equal.

1 unit = 116 litres

Quantity of liquid of B initially = 15 units  
 $= 15 \times 116 = 1740$

3. Alcohol : Water = 3 : 7    Alcohol =  $\frac{3}{10} \times 20 = 6$  litres  
 Percentage of alcohol in the new mixture

$$= \frac{6}{25} \times 100 = 24\%$$

4. 

|            |      |       |               |              |
|------------|------|-------|---------------|--------------|
|            | Milk | Water |               | Total        |
| Initially: | 5    | :     | 4             | 9            |
|            |      |       | 1 unit        |              |
| After:     | (1   | :     | 1) $\times 5$ | 2 $\times 5$ |

1 unit taken out from 10 unit of total mixture.  
 Required fraction =  $\frac{1}{10}$

5. In 2 gallons mixture, the quantity of water = 12% of  
 2 gallons =  $\frac{6}{25}$  gallons

In 3 gallons mixture, the quantity of water = 5% of  
 3 gallons =  $\frac{3}{20}$  gallons

Percentage of water in the new mixture

$$= \frac{\left(\frac{6}{25} + \frac{3}{20} + \frac{1}{2}\right)}{\left(\frac{5}{2} + \frac{1}{2}\right)} \times 100 = \frac{89}{100} \times \frac{2}{11} \times 100 = 16\frac{2}{11}\%$$

6. Percentage of water in 6 litres of mixture = 75% of  
 6 = 4.5 litres

Percentage of water in 10 litres of mixture = 25% of 10 = 2.5 litres

Percentage of water in the new mixture

$$= \frac{4.5+2.5+2}{18} \times 100 = 50\%$$

7. Vessel A: Quantity of wine = 30% of 4 litres = 1.2 litres

Vessel B: Quantity of wine = 40% of 3 = 1.2 litres

Vessel C: Quantity of wine = 45% of 5 = 2.25 litres

Percentage of wine in the final mixture

$$= \frac{1.2+1.2+2.25}{12} \times 100 = 38\frac{3}{4}\%$$

8. Ratio of milk : water =

$$\left(\frac{5}{8} \times 20 - \frac{5}{8} \times 4 + 4\right) : \left(\frac{3}{8} \times 20 - \frac{3}{8} \times 4\right)$$

$$= 14 : 6 = 7 : 3$$

9. 

|            |       |   |            |
|------------|-------|---|------------|
|            | Water |   | Alcohol    |
| Initially: | 7     | : | 5          |
|            |       |   | -18 litres |
|            | 7     | : | 5          |
|            |       |   | + 4 units  |

Final: 7 : 9

Alcohol is added. So make quantity of water equal.

4 unit = 18 litres

1 unit = 4.5 litre

Quantity of mixture = 16 units  
 $= 16 \times 4.5 = 72$  litres

$$\text{Quantity of water} = \frac{7}{7+5} \times 72 = 42 \text{ litres}$$

10. Lemon Juice : Sugar Syrup = 1 : 1

|              |       |       |               |
|--------------|-------|-------|---------------|
|              | Lemon | Sugar | Total         |
| New mixture: | 1     | :     | 1             |
|              | (0    | :     | 2) $\times 3$ |
|              | 1     | :     | 7             |

To find the ratio in which two ingredients must be mixed to produce a desired mixture.

Let average of 'x' number = a & average of 'y' = b

$$\text{Combined average} = \frac{ax+by}{x+y} = m$$

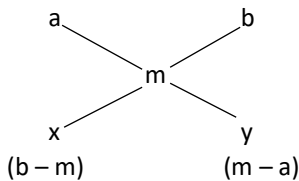
$$mx + my = ax + by$$

$$mx - ax = by - my$$

$$x(m - a) = y(b - m)$$

$$\frac{x}{y} = \frac{b-m}{m-a}$$

If  $b > m > a$ ,

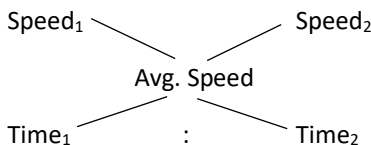


$$m = a + \frac{(b-a)}{x+y} \times y \text{ or } b - \frac{(b-a)}{x+y} \times x$$

$$a = m + \frac{(b-m)y}{x} \quad \& \quad b = m - \frac{(m-a)x}{y}$$

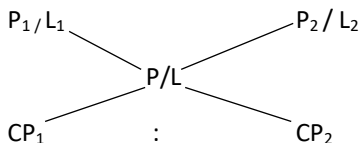
➤  $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$

When average speeds are alligated with overall average speed, we get ratio of time.



➤  $\text{Profit / Loss\%} = \frac{P/L}{CP} \times 100$

When profit or loss percentage are alligated with overall profit percentage, then we get ratio of cost price.



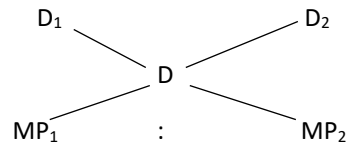
➤  $\text{Price} = \frac{\text{Rs.}}{\text{Kg}}$

When unit prices of the ingredients are alligated with overall price, we get ratio of quantities.



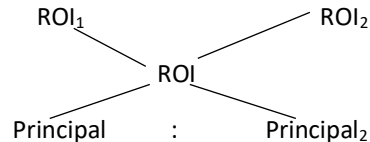
➤  $D\% = \frac{D}{MP} \times 100$

When two discount % are alligated with overall discount%, we get ratio of mark price.

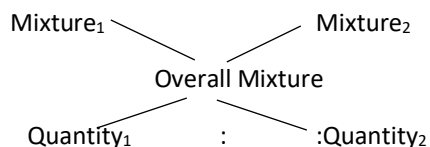


➤  $\text{ROI\%} = \frac{\text{SI for 1 year}}{\text{Principal}} \times 100$

A person invest some capital at a certain rate of interest and rest part at other rate of interest. If rate of interest are alligated, we get ratio of principal.

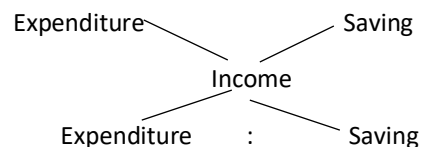


➤ When two mixtures are alligated we get ratio of quantity in which mixture are mixed.



➤  $\text{Income} = \text{Expenditure} + \text{Saving}$

When percentage increase or decrease in expenditure and saving are alligated, then we get ratio of expenditure to saving.



### EXERCISE

1. A can contains 84 litres of rose milk at Rs. 16.50 per litre. How much water which is free of cost be added to this can so that the cost of rose milk reduces to Rs. 14 per litre? (in litres)  
(a) 19 (b) 17 (c) 21 (d) 15  
(OSSC CGL 2021)
2. In what ratio must a grocer mix two varieties of pulses costing Rs. 66 and Rs. 88 per kg respectively so as to get a mixture worth Rs. 76 per kg?  
(a) 4:5 (b) 5:6 (c) 6:5 (d) 3:4  
(OSSC CGL 2021)
3. Rice worth Rs. 230 per kg and Rs. 238 per kg are mixed with a third variety in the ratio 1:3:2. If the mixture is worth Rs. 281 per kg, find the price of the third variety per kg. (in Rs.)  
(a) 361 (b) 351 (c) 371 (d) 341  
(OSSC CGL 2021)
4. Pure milk costs Rs. 3.60 per litre. A milkman adds water to 25 litres of pure milk and sells the mixture at Rs. 3 per litre. How many litres of water does he add?  
(a) 2 litres (b) 5 litres  
(c) 7 litres (d) 11 litres  
(OSSC CGL 2024)
5. A mixture containing 50% of milk is mixed with another mixture containing x% of milk in equal proportions. If the mixture so formed contains 45% of milk, then what is the value of x?  
(a) 40 (b) 30 (c) 20 (d) 10  
(OSSC CHSL 2023)
6. Milk and water in two vessels A and B are in the ratio 5:3 and 2:3 respectively. In what ratio should the liquids in both the vessels be mixed to obtain a new mixture in the vessel C containing half milk and half water?  
(a) 1:2 (b) 2:3 (c) 3:5 (d) 4:5  
(OSSC CHSL 2024)
7. In a pot, the ratio of water and alcohol is 4:3. In another pot, the ratio of water and alcohol is 2:1. In what ratio mixture should be taken from the given mixtures to make the final mixture so that in the final mixture the ratio of water and alcohol is 13:8.  
(a) 3:2 (b) 1:1 (c) 4:3 (d) 5:2  
(OSSC CPGL 2024)
8. A man has some hens and cows. If the number of heads be 50 and the number of feet equals 160, then the number of cows will be:  
(a) 22 (b) 21 (c) 20 (d) 30  
(OSSC Accountant 2023)
9. Find the ratio in which rice at Rs. 7.20 a kg be mixed with rice at Rs. 5.70 a kg to produce a mixture worth Rs. 6.30 a kg.  
(a) 1:3 (b) 2:3 (c) 3:4 (d) 4:5  
(OSSC Amin 2023)
10. There are some cats and parrots in a zoo. By counting heads they are 60. The number of their legs is 200. Then how many parrots are there?  
(a) 40 (b) 30 (c) 50 (d) 20  
(OSSC ESI 2023)
11. A man has some hens and cows. If the number of heads be 48 and the number of feet equals 140, then the number of hens will be:  
(a) 22 (b) 23 (c) 24 (d) 26  
(OSSC Steno 2023)
12. How much of coffee costing Rs. 36.60 per kg be mixed with 63 kg of coffee costing Rs. 17.10 per kg, so that the mixture may cost Rs. 24 per kg?  
(a) 30.5 kg (b) 33.5 kg  
(c) 34.5 kg (d) 39.5 kg  
(OSSC Steno 2024)
13. In an examination, a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. If he attempts in all 60 questions and secures 130 marks, then the number of questions he attempts correctly is:  
(a) 40 (b) 42 (c) 38 (d) 20  
(OSSC CGL Mains 2022)
14. In what ratio must a grocer mix two varieties of rice costing Rs. 265 and Rs. 194 per kg, respectively, to get a mixture of rice worth Rs. 215 per kg?  
(a) 50:21 (b) 48:42 (c) 60:26 (d) 52:22  
(OSSC JEO & JA 2024)

15. The contents of two vessels containing water and milk are in the ratio 1 : 2 and 2 : 5 are mixed in the ratio 1 : 4. The resulting mixture will have water and milk in the ratio:

(a) 21 : 74 (b) 31 : 74  
(c) 11 : 64 (d) 15 : 54

(OSSC CGL Mains 2024-25)

16. In an objective examination of 90 questions, 5 marks are allotted for every correct answer and 2 marks are deducted for every wrong answer. After attempting all the 90 questions a student got a total of 387 marks. Find the number of questions that he attempted wrong.

(a) 6 (b) 8 (c) 9 (d) 4

(OSSC CGL Mains 2024-25)

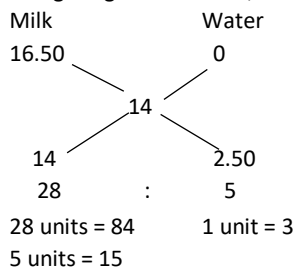
### ANSWER KEY

01. (d) 02. (c) 03. (c) 04. (b) 05. (a)  
06. (d) 07. (b) 08. (c) 09. (b) 10. (d)  
11. (d) 12. (c) 13. (c) 14. (a) 15. (i)

### SOLUTION

1. Let the price of water be Rs.0

Now using allegation method,



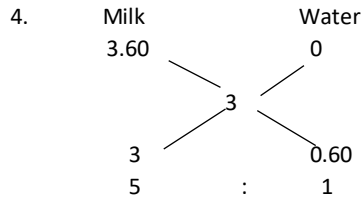
- 2.
- |    |   |    |
|----|---|----|
| 66 |   | 88 |
| 76 |   |    |
| 12 | : | 10 |
| 6  | : | 5  |

3. ATQ,  $\frac{1 \times 230 + 3 \times 238 + 2x}{(1+3+2)} = 281$

$$230 + 714 + 2x = 1686$$

$$2x = 1686 - 944 = 742$$

$$x = 371$$



ATQ, 5 units = 25 litres 1 unit = 5 litres

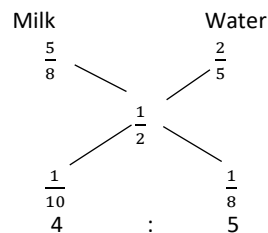
5.  $M_1 : M_2 = 1 : 1$

$$\text{ATQ, } \frac{50\% \text{ of } M_1 + x\% \text{ of } M_2}{M_1 + M_2} = 45\%$$

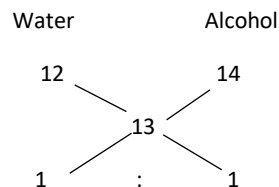
$$\frac{50+x}{2} = 45$$

$$x = 40$$

- 6.
- |             |       |         |
|-------------|-------|---------|
| Milk        | Water | Mixture |
| Vessel A: 5 | :     | 3       |
| Vessel B: 2 | :     | 3       |



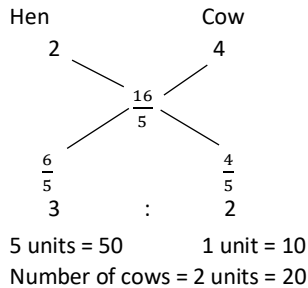
- 7.
- |              |         |              |
|--------------|---------|--------------|
| Water        | Alcohol | Mixture      |
| $4 \times 3$ | :       | $3 \times 3$ |
| $2 \times 7$ | :       | $1 \times 7$ |
| 13           | :       | 8            |
|              |         | 21           |



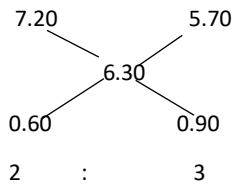
8. Total number of animals = 50

Total number of leg = 160

$$\text{Average number of legs per head} = \frac{160}{50} = \frac{16}{5}$$

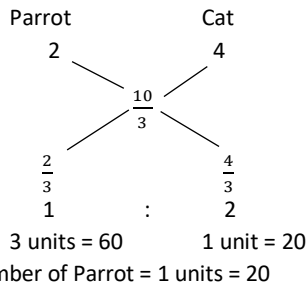


9.



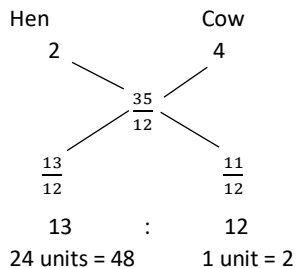
10. Total number of animals = 60

Total number of leg = 200

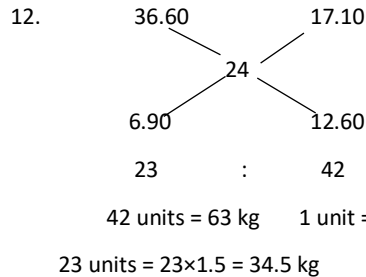
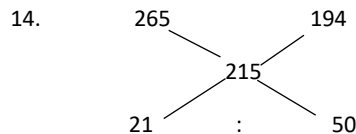
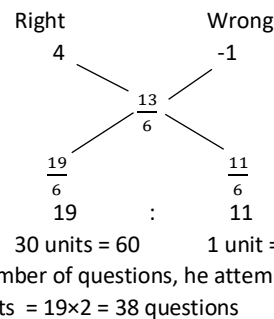
Average number of legs per head =  $\frac{200}{60} = \frac{10}{3}$ 

11. Total number of animals = 48

Total number of leg = 140

Average number of legs per head =  $\frac{140}{48} = \frac{35}{12}$ 

Number of hens = 13 units = 26

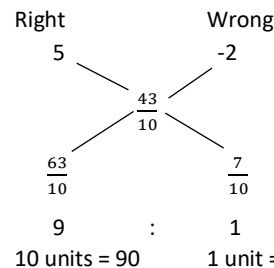
13. Average number per question =  $\frac{130}{60} = \frac{13}{6}$ 

15. Water                      Milk                      Mixture

$1 \times (1 \times 7)$  :  $2 \times 7$                        $3 \times 7$

$4 \times (2 \times 3)$  :  $5 \times 3$                        $7 \times 3$

Water : milk = (7 + 24) : (14 + 60) = 31 : 74

16. Average number per question =  $\frac{387}{90} = \frac{43}{10}$ 

Number of questions, he attempt wrongly is 1 unit = 9

**Concept:**Profit/Loss  $\propto$  Investment/CapitalProfit/Loss  $\propto$  Time periodProfit/Loss  $\propto$  Investment  $\times$  Time

Let A, B and C are three partners, invest  $C_1$ ,  $C_2$  and  $C_3$  for  $T_1$ ,  $T_2$  and  $T_3$  respectively.

Ratio of profit =  $C_1T_1 : C_2T_2 : C_3T_3$ **EXERCISE**

- 1 If  $2(\text{A's capital}) = 4(\text{B's capital}) = 3(\text{C's capital})$ , then find the ratio of their capitals.  
(a) 5:3:4 (b) 6:3:4 (c) 3:4:6 (d) 3:4:5  
(OSSC CGL 2021)
- 2 X and Y invested in a business. They earned some profit which they divided in the ratio of 5:4. If X invested Rs. 75,000, find the amount invested by Y (in Rs.).  
(a) 60,000 (b) 62,000  
(c) 61,000 (d) 63,000  
(OSSC CGL 2021)
- 3 P, Q and R started a business by investing Rs. 3005, Rs. 2404 and Rs. 4207 respectively. Find the share of Q out of the annual profit of Rs. 9616.  
(a) 2504 (b) 2404 (c) 2304 (d) 2604  
(OSSC CGL 2021)
- 4 Ashok, Bharat, and Chand enter into a partnership. Ashok contributes one-third of the whole capital while Bharat contributes as much as the contribution of Ashok and Chand together. If the profit at the end of the year is Rs. 96,000, how much would Chand receive? (in Rs.)  
(a) 16,000 (b) 42,000 (c) 14,000 (d) 28,000  
(OSSC CGL 2021)
- 5 Two persons A and B invested in a business with Rs. 1,54,000 and Rs. 1,10,000 respectively. They agreed that 40% of the profit should be divided equally among them and the rest should be divided between them according to their investment. If A got 2520 rupees more than B, then find the total profit (in Rs.).  
(a) 25205 (b) 25200 (c) 25225 (d) 25215  
(OSSC CGL 2021)
- 6 Three partners A, B and C invest a total sum of Rs. 30,000. At the end of the year, A gets 20,400 rupees, B gets 25,500 and C gets 30,600 rupees profit. How much amount is invested by A and C together? (in Rs.)  
(a) 22,000 (b) 21,000  
(c) 20,000 (d) 23,000  
(OSSC CGL 2021)
- 7 K, L, M together started a business. K invested Rs. 6700 for 3 months, L invested Rs. 4000 for 5 months and M invested Rs. 7900 for 4 months. If they get a total profit of Rs. 7170, find the share of K (in Rs.).  
(a) 2010 (b) 2210 (c) 2310 (d) 2110  
(OSSC CGL 2021)
- 8 Akash started a business with Rs. 21,000 and is joined afterwards by Bala with Rs. 36,000. After how many months did Bala join if the profits at the end of the year are divided equally?  
(a) 4 (b) 7 (c) 5 (d) 6  
(OSSC CGL 2021)
9. X and Y invest Rs. 5600 and Rs. 6600 respectively. If X doubles his capital after 6 months, in what ratio should X and Y divide that year's profit?  
(a) 14:13 (b) 13:14 (c) 14:11 (d) 11:14  
(OSSC CGL 2021)
10. Ajay and Bhaskar started a partnership business investing some amount in the ratio of 3:5. Chand joined them after six months with an amount equal to that of Bhaskar. In what proportion should the profit at the end of one year be distributed among Ajay, Bhaskar and Chand?  
(a) 3:7:5 (b) 15:10:6 (c) 6:10:5 (d) 6:7:5  
(OSSC CGL 2021 & Steno 2023)
11. Three friends A, B, C invested in a business in the ratio of 8:5:6. After 6 months, C withdrew half his capital. If the total profit earned for the year is Rs. 1,12,000, then find the profit earned by C (in Rs.).  
(a) 28,900 (b) 29,000 (c) 28,800 (d) 29,100  
(OSSC CGL 2021)
12. A and B entered into partnership with capitals in the ratio 4:5. After 3 months, A withdrew  $\frac{1}{4}$  of his capital and B withdrew  $\frac{1}{5}$  of his capital. The

- gain at the end of 10 months was Rs. 760. A's share in this profit is:  
(a) Rs. 330 (b) Rs. 360 (c) Rs. 380 (d) Rs. 430  
(OSSC CGL 2022)
13. X's and Y's shares in a business are in the ratio of 5:3. If X had invested Rs. 70,000 for 12 months, then for what period of time Y has invested Rs. 60,000?  
(a) 6.4 months (b) 7.4 months  
(c) 8.4 months (d) 9.4 months  
(OSSC CGL 2023)
14. X and Y put in Rs. 3,000 and Rs. 4,000 respectively into a business. X reinvests into the business his share of the first year's profit of Rs. 2,100 whereas Y does not reinvest. In what ratio should they share the second year's profit?  
(a) 39:40 (b) 3:4 (c) 3:7 (d) 40:79  
(OSSC CGL 2024)
15. A and B started a business in partnership investing Rs. 20,000 and Rs. 15,000 respectively. After six months, C joined them with Rs. 20,000. What will be B's share in total profit of Rs. 25,000 earned at the end of 2 years from the starting of the business?  
(a) Rs. 7500 (b) Rs. 9000  
(c) Rs. 9500 (d) Rs. 10,000  
(OSSC CGL SPL 2022)
16. A, B and C subscribe together Rs. 50,000 for a business. A subscribes Rs. 4,000 more than B and B Rs. 5,000 more than C. Out of a total profit of Rs. 35,000, A received:  
(a) Rs. 7300 (b) Rs. 14,700  
(c) Rs. 12,600 (d) Rs. 9250  
(OSSC CGL SPL 2023, CGL 2023 MAINS, CHSL 2023, CHSL 2025)
17. P and Q invest in a business in the ratio 3:2. If 5% of the total profit goes to charity and P's share is Rs. 855, then what is the total profit?  
(a) 500 (b) 1000 (c) 1500 (d) 2000  
(OSSC CHSL 2024 & CPGL 2023)
18. P, Q and R are partners. They have invested Rs. 35,000, Rs. 25,000 and Rs. 10,000 respectively for the same period. If the total profit is Rs. 18,000, then what is the profit share of P?  
(a) Rs. 9500 (b) Rs. 9000  
(c) Rs. 8,500 (d) Rs. 8000  
(OSSC CHSL 2024)
19. A, B and C entered into a partnership. A invested Rs. 2560 and B invested Rs. 2000. At the end of the year, they gained Rs. 1105, out of which A got 320. Find C's capital.  
(a) Rs. 2840 (b) Rs. 4028  
(c) Rs. 4280 (d) Rs. 4820  
(OSSC CHSL 2025)
20. Ajit, Sumit and Rashmi are three partners. They shared the profit in a business in the ratio 5:7:8. They had partnered for 14 months, 8 months and 7 months respectively. What was the ratio of their investments?  
(a) 5:7:8 (b) 20:49:64  
(c) 38:28:21 (d) None of these  
(OSSC CTSRE 2023 & Statistical Asst. 2024)
21. Ram started a business and Shyam joined him after 2 months. Ram spent Rs. 30,000 while Shyam spent Rs. 45,000. Their one year profit came out to be Rs. 54,000. What is the profit amount of Ram?  
(a) Rs. 20,000 (b) Rs. 24,000  
(c) Rs. 27,000 (d) Rs. 30,000  
(OSSC CTSRE 2024)
22. A and B enter into a partnership with their capitals in the ratio 7:9. At the end of 8 months, A withdraws his capital. If they receive the profits in the ratio 8:9, find how long B's capital was used?  
(a) 5 months (b) 7 months  
(c) 8 months (d) 9 months  
(OSSC CPGL 2023)
23. Three friends A, B and C started a business by investing a sum of money in the ratio of 5:7:6. After 6 months C withdraws half of his capital. If the sum invested by 'A' is Rs. 40,000 out of a total annual profit of Rs. 33,000, C's share will be:  
(a) Rs. 9000 (b) Rs. 12,000  
(c) Rs. 16,000 (d) Rs. 10,000  
(OSSC CPGL 2024)
24. A, B, C rent a grass lawn. A puts 10 goats for 7 months, B puts 12 goats for 5 months and C puts 15 goats for 3 months for grazing. If the total rent

of the pasture is Rs. 175, how much C pays of his share of rent?

- (a) Rs. 45 (b) Rs. 50 (c) Rs. 55 (d) Rs. 60

(OSSC Accountant 2023)

25. A, B and C enter into a partnership. A invests a sum of money at the beginning of the year and B invests double the amount after 6 months and C invests thrice the amount after 8 months. At the end of the year, they earn a profit of Rs. 12,000. What is the B's share of profit?

- (a) Rs. 3,500 (b) Rs. 3,800  
(c) Rs. 4,500 (d) Rs. 4,000

(OSSC Jr Clerk 2022 mains)

26. Hari and Ram enter into a partnership with capitals Rs. 15,000 and Rs. 12,000 respectively. If Hari had put his capital for 4 months and he received Rs. 5,000 from the total profit of Rs. 8,000, then for how many months had Ram put his capital?

- (a) 6 months (b) 3 months  
(c) 9 months (d) 12 months

(OSSC Jr Clerk Mains 2022)

27. In a partnership, A invests  $\frac{1}{6}$  of the capital for  $\frac{1}{6}$  of the time, B invests  $\frac{1}{3}$  of the capital for  $\frac{1}{3}$  of the time and C invests the rest of the capital for the whole time. What is A's share in the profit out of a total profit of Rs. 2,300?

- (a) Rs. 100 (b) Rs. 110 (c) Rs. 120 (d) Rs. 130

(OSSC Jr Clerk Mains 2022)

28. Mary and Mike enter into a partnership by investing Rs. 700 and Rs. 300 respectively. At the end of one year, they divided their profits such that a third of the profit is divided equally for the efforts they have put into the business and the remaining amount of profit is divided in the ratio of the investments they made in the business. If Mary received Rs. 800 more than Mike did, what was the profit made by their business in that year?

- (a) Rs. 4,000 (b) Rs. 3,000  
(c) Rs. 4,500 (d) Rs. 2,500

(OSSC Jr Clerk Mains 2022)

29. A, B and C invested Rs. 9150, Rs. 7320 and Rs. 5490 respectively in a partnership business. Find the share of A in a profit of Rs. 3000 after a year (in Rs.).

- (a) 1450 (b) 1250 (c) 1150 (d) 1350

(OSSC SCEW 2021)

30. X began business with Rs. 44,000 and was joined afterwards by Y with Rs. 33,000. Find after how many months did Y join, if the profits at the end of the year were divided in the ratio of 8:3.

- (a) 12 (b) 10 (c) 6 (d) 8

(OSSC SCERW 2021)

31. A, B, C together started a business. A invested Rs. 6100 for 5 months, B invested Rs. 7100 for 4 months and C Rs. 8100 for 3 months. If they get a total profit of Rs. 12480, find the share of A (in Rs.).

- (a) 4475 (b) 4775 (c) 4575 (d) 4675

(OSSC SCEW 2021)

32. A and B invest in a business in the ratio 3 : 2. If 10% of the total profit goes to charity and A's share is Rs. 1404, find the total profit (in Rs.).

- (a) 2700 (b) 2600 (c) 2800 (d) 2500

(OSSC SCEW 2021)

33. A and B invest in a business in the ratio 4 : 1. If 15% of the total profit goes to charity and A's share is Rs. 1836, find the total profit (in Rs.).

- (a) 2800 (b) 2900 (c) 2700 (d) 2600

(OSSC SCEW 2021)

34. A starts business with Rs. 3500 and after 5 months, B joins with A as his partner. After a year, the profit is divided in the ratio 2 : 3. What is B's contribution in the capital?

- (a) Rs. 7500 (b) Rs. 8000  
(c) Rs. 8500 (d) Rs. 9000

(OSSC Amin 2023)

35. Simran started a software business by investing Rs. 50,000. After six months, Nanda joined her with a capital of Rs. 80,000. After 3 years, they earned a profit of Rs. 24,500. What was Simran's share in the profit?

- (a) Rs. 9,423 (b) Rs. 10,250  
(c) Rs. 10,500 (d) Rs. 12,500

(OSSC Statistical Asst. 2024)

36. A and B invest in a business in the ratio 3 : 4. If 2% of the profit goes to CSR activity and A's share is 840, then the total profit is:

- (a) Rs. 1400 (b) Rs. 1500



- 7.
- |          | K             | L             | M             |
|----------|---------------|---------------|---------------|
|          | 6700          | 4000          | 7900          |
| Capital: | 67            | 40            | 79            |
| Time :   | 3             | 5             | 4             |
| Profit:  | $67 \times 3$ | $40 \times 5$ | $79 \times 4$ |
|          | 201           | 200           | 316           |
- K's share =  $\frac{201}{(201+200+316)} \times 7170 = \text{Rs. } 2010$

- 8.
- |          | Akash         | Bala           |
|----------|---------------|----------------|
| Capital: | 21000         | 36000          |
|          | 7             | 12             |
| Profit:  | 1             | 1              |
| Time:    | $\frac{1}{7}$ | $\frac{1}{12}$ |
|          | 12            | 7              |
- Then Bala would join the business after 12 - 7 = 5 months

- 9.
- |          | X                           | Y              |
|----------|-----------------------------|----------------|
| Capital: | 5600                        | 6600           |
|          | 28                          | 33             |
| Profit:  | $28 \times 6 + 56 \times 6$ | $33 \times 12$ |
|          | 14                          | 11             |

- 10.
- |          | Ajay | Bhaskar | Chand |
|----------|------|---------|-------|
| Capital: | 3    | 5       | 5     |
| Time :   | 12   | 12      | 6     |
| Profit:  | 36   | 60      | 30    |
|          | 6    | 10      | 5     |

- 11.
- |         | Ajay          | Bhaskar       | Chand                     |
|---------|---------------|---------------|---------------------------|
| Profit: | $8 \times 12$ | $5 \times 12$ | $6 \times 6 + 3 \times 6$ |
|         | 96            | 60            | 54                        |
|         | 16            | 10            | 9                         |
- Profit earned by C =  $\frac{9}{(16+10+9)} \times 112,000$   
 $= \frac{9}{35} \times 112,000 = 28800$

- 12.
- |         | A                         | B                         |
|---------|---------------------------|---------------------------|
| Profit: | $4 \times 3 + 3 \times 7$ | $5 \times 3 + 4 \times 7$ |
|         | 33                        | 43                        |
- A's share =  $\frac{33}{(33+43)} \times 760 = \text{Rs. } 330$

- 13.
- |          | X             | Y             |
|----------|---------------|---------------|
| Capital: | 70000         | 60000         |
|          | 7             | 6             |
| Profit:  | 5             | 3             |
| Time:    | $\frac{5}{7}$ | $\frac{3}{6}$ |
|          | 10            | 7             |

10 units = 12 months  
 1 unit = 1.2 months  
 7 units =  $7 \times 1.2 = 8.4$  months

- 14.
- |          | X    | Y    |
|----------|------|------|
| Capital: | 3000 | 4000 |
|          | 3    | 4    |
- First year's profit share of X =  $\frac{3}{3+4} \times 2100$   
 $= \text{Rs. } 900$

2<sup>nd</sup> year X' capital = 3000 + 900 = 3900  
 2<sup>nd</sup> year profit would be divided in the ratio of their investment.  
 Required ratio = 3900 : 4000 = 39 : 40

- 15.
- |          | A            | B            | C              |
|----------|--------------|--------------|----------------|
|          | 20000        | 15000        | 20000          |
| Capital: | 4            | 3            | 4              |
| Time :   | 2            | 2            | 1.5            |
| Profit:  | $4 \times 2$ | $3 \times 2$ | $4 \times 1.5$ |
|          | 4            | 3            | 3              |
- B's share =  $\frac{3}{(4+3+3)} \times 25000 = \text{Rs. } 7500$

16. ATQ,  $x + 9000 + x + 5000 + x = 50,000$   
 $3x + 14,000 = 50,000$   
 $x = 12,000$   
 $A = 12,000 + 9000 = 21000$   
 $B = 12,000 + 5000 = 17000$   
 $C = 12,000$

|          | A     | B     | C     |
|----------|-------|-------|-------|
| Capital: | 21000 | 17000 | 12000 |
|          | 21    | 17    | 12    |

A's share =  $\frac{21}{(21+17+12)} \times 35,000$   
 $= \text{Rs. } 14700$

17. Let the total profit = 100 units.  
 Remaining profit after donation =  $100 - 5\%$  of 100 = 95 units  
 Share of P =  $\frac{3}{3+2} \times 95 = 57$  units  
 ATQ, 57 units = 855  
 1 unit =  $\frac{855}{57} = 15$   
 Total profit = 100 units =  $15 \times 100 = 1500$

- 18.
- |          | P     | Q     | R     |
|----------|-------|-------|-------|
|          | 20000 | 15000 | 20000 |
| Capital: | 7     | 5     | 2     |

Profit would be divided in the ratio of their capitals.

$$\text{Share of P} = \frac{7}{7+5+2} \times 18,000 = \text{Rs. } 9000$$

19. Ratio of profit = Ratio of investment

$$\frac{\text{Share of A}}{\text{Total profit}} = \frac{2560}{2560+200+x} = \frac{320}{1105}$$

$$\frac{2560}{4560+x} = \frac{64}{221}$$

$$\frac{40}{4560+x} = \frac{1}{221}$$

$$x = 8840 - 4560 = 4280$$

|             |                |               |               |
|-------------|----------------|---------------|---------------|
| 20.         | Ajit           | Sumit         | Rashmi        |
| Profit:     | 5              | 7             | 8             |
| Time :      | 14             | 8             | 7             |
| Investment: | $\frac{5}{14}$ | $\frac{7}{8}$ | $\frac{8}{7}$ |
|             | 20             | 49            | 64            |

|                                                      |       |       |
|------------------------------------------------------|-------|-------|
| 21.                                                  | Ram   | Shyam |
| Capital:                                             | 30000 | 45000 |
|                                                      | 2     | 3     |
| Time:                                                | 12    | 10    |
| Profit:(C×T)                                         | 24    | 30    |
|                                                      | 4     | 5     |
| Profit amount of Ram = $\frac{4}{4+5} \times 54,000$ |       |       |
| = Rs. 24,000                                         |       |       |

|                                               |               |               |
|-----------------------------------------------|---------------|---------------|
| 22.                                           | A             | B             |
| Time = $\frac{\text{Profit}}{\text{Capital}}$ | $\frac{8}{7}$ | $\frac{9}{9}$ |
|                                               | 8             | 7             |
| B's capital was used for 7 months.            |               |               |

|                                                |      |      |          |
|------------------------------------------------|------|------|----------|
| 23.                                            | A    | B    | C        |
| Profit:                                        | 5×12 | 7×12 | 6×6+3×6  |
|                                                | 10   | 14   | 9        |
| Share of C = $\frac{9}{10+14+9} \times 33,000$ |      |      |          |
|                                                |      |      | Rs. 9000 |

|                                             |      |      |        |
|---------------------------------------------|------|------|--------|
| 24.                                         | A    | B    | C      |
| Profit:                                     | 10×7 | 12×5 | 15×3   |
|                                             | 14   | 12   | 9      |
| Share of C = $\frac{9}{14+12+9} \times 175$ |      |      |        |
|                                             |      |      | Rs. 45 |

|          |    |    |    |
|----------|----|----|----|
| 25.      | A  | B  | C  |
| Capital: | 1  | 2  | 3  |
| Time :   | 12 | 6  | 4  |
| Profit:  | 12 | 12 | 12 |
|          | 1  | 1  | 1  |

$$\text{B's share} = \frac{1}{(1+1+1)} \times 12000 = \text{Rs. } 4000$$

|          |               |               |
|----------|---------------|---------------|
| 26.      | Hari          | Ram           |
| Capital: | 15000         | 12000         |
|          | 5             | 4             |
| Profit:  | 5000          | 3000          |
|          | 5             | 3             |
| Time:    | $\frac{5}{5}$ | $\frac{3}{4}$ |
|          | 4             | 3             |

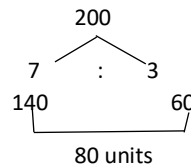
Ram put his capital for 3 months

27. Let the total capital = 6 units and total time = 6 years.

|          |                        |                        |     |
|----------|------------------------|------------------------|-----|
|          | A                      | B                      | C   |
| Capital: | $\frac{1}{6} \times 6$ | $\frac{1}{2} \times 6$ | 3   |
| Time :   | $\frac{1}{6} \times 6$ | $\frac{1}{6} \times 6$ | 6   |
| Profit:  | 1×1                    | 2×2                    | 3×6 |
|          | 1                      | 4                      | 18  |

$$\text{Share of A} = \frac{1}{1+4+18} \times 2300 = \text{Rs. } 100$$

28. Let the total profit = 300 units.  
 Remaining profit after equally divided = 300 -  $\frac{1}{3} \times 300 = 200$  units  
 200 units divided in the ratio of their investment.  
 Capital: 700 : 300 = 7 : 3



ATQ, 80 units = Rs. 800  
 300 units = 300 × 10 = Rs. 3000

29. Investment of A, B and C  
 = 9150 : 7320 : 5490 = 5 : 4 : 3

$$\text{Share of A} = \frac{5}{5+4+3} \times 3000 = \text{Rs. } 1250$$

30.

|          |               |                 |
|----------|---------------|-----------------|
|          | X             | Y               |
| Capital: | 44000         | : 33000         |
|          | 4             | : 3             |
| Profit:  | 8             | : 3             |
| Time:    | $\frac{8}{4}$ | : $\frac{3}{3}$ |
|          | 2             | : 1             |

1 unit = 80 units

ATQ, 2 units = 12 months

1 unit = 6 months

31.

|          |      |        |        |
|----------|------|--------|--------|
|          | A    | B      | C      |
| Capital: | 6100 | : 7100 | : 8100 |
| Time :   | 5    | : 4    | : 3    |
| Profit:  | 61×5 | : 71×4 | : 81×3 |
|          | 305  | : 284  | : 243  |

$$B's \text{ share} = \frac{305}{(305+284+243)} \times 12480 = \text{Rs. } 4575$$

32. Let the total profit = 100 units  
 Remaining profit after charity = 100 – 10% of 100 = 90 units

$$\text{Share of A} = \frac{3}{3+2} \times 90 \text{ units} = 54 \text{ units}$$

ATQ, 54 units = Rs. 1404

1 unit = Rs. 26

Total profit = 100 units = 100 × 26 = Rs. 2600

33. Let the total profit = 100 units  
 Remaining profit after charity = 100 – 15% of 100 = 85 units

$$\text{Share of A} = \frac{4}{4+1} \times 85 \text{ units} = 68 \text{ units}$$

ATQ, 68 units = Rs. 1836

1 unit = Rs. 27

Total profit = 100 units = 100 × 27 = Rs. 2700

34.

|                                               |                |                 |
|-----------------------------------------------|----------------|-----------------|
|                                               | A              | B               |
| Capital = $\frac{\text{Profit}}{\text{Time}}$ | $\frac{2}{12}$ | : $\frac{3}{7}$ |
|                                               | 7              | : 8             |

ATQ, 7 units = Rs. 3500

1 unit = Rs. 500

18 units = 18×500 = Rs. 9000

35.

|          |        |          |
|----------|--------|----------|
|          | Simran | Nandu    |
| Capital: | 50,000 | : 80,000 |
|          | 5      | : 8      |

|              |    |       |
|--------------|----|-------|
| Time:        | 3  | : 2.5 |
| Profit:(C×T) | 15 | : 20  |
|              | 3  | : 4   |

$$\text{Profit amount of Ram} = \frac{3}{3+4} \times 24,500 = \text{Rs. } 10,500$$

36. Let the total profit = 100 units  
 Remaining profit after CSR activity = 100 – 2% of 100 = 98 units

$$\text{Share of A} = \frac{3}{3+4} \times 98 \text{ units} = 42 \text{ units}$$

ATQ, 42 units = Rs. 840

1 unit = Rs. 20

Total profit = 100 units = 100 × 20 = Rs. 2000

37.

|          |               |                 |
|----------|---------------|-----------------|
|          | P             | Q               |
| Capital: | 4500          | : 5400          |
|          | 5             | : 6             |
| Profit:  | 2             | : 1             |
| Time:    | $\frac{2}{5}$ | : $\frac{1}{6}$ |
|          | 12            | : 5             |

Q joined the business after 12 – 5 = 7 months

38.

|         |       |        |
|---------|-------|--------|
|         | Priya | Ayushi |
| Profit: | 2900  | : 4100 |
|         | 29    | : 41   |

$$\text{Ayushi invested} = \frac{41}{29+41} \times 35,000 = \text{Rs. } 20,500$$

39.

|          |               |                 |                  |
|----------|---------------|-----------------|------------------|
|          | Rima          | Sima            | Nilima           |
| Capital: | 2             | : 3             | : 4              |
| Profit : | 3             | : 6             | : 10             |
| Time :   | $\frac{3}{2}$ | : $\frac{6}{3}$ | : $\frac{10}{4}$ |
|          | 18            | : 24            | : 30             |
|          | 3             | : 4             | : 5              |

40.

|          |        |        |        |
|----------|--------|--------|--------|
|          | Sharma | Gupta  | Sinha  |
| Capital: | 4000   | : 8000 | : 6000 |
| Capital: | 2      | : 4    | : 3    |
| Time :   | 6      | : 8    | : 8    |
| Profit:  | 2×6    | : 4×8  | : 3×8  |

3 : 8 : 6

$$B's \text{ share} = \frac{8}{(3+8+6)} \times 34,000 = \text{Rs. } 16,000$$