MANAV RACHNA UNIVERSITY

Corporate Relations & Career Management Centre

Handbook for Quantitative Aptitude Semester-IV

Subject Name: PCE-II
Subject Code: CDO-202
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Branch: CSE, MECH

Student Name: …………………………

Roll Number: ……………………………

Section: …………………………………..

CONTENT

CHAPTER 1

SIMPLIFICATION

1. 'BODMAS' Rule:

This rule depicts the correct sequence in which the operations are to be executed, so as to find out the value of given expression.

Easy and simple way to remember **BODMAS** rule**!!**

B → **B**rackets first (parentheses)

O → **O**f (orders i.e. Powers and Square Roots, Cube Roots, etc.)

DM → **D**ivision and **M**ultiplication (start from left to right)

AS → **A**ddition and **S**ubtraction (start from left to right)

Thus, in simplifying an expression, first of all the brackets must be removed, strictly in the order (), {} and ||.

After removing the brackets, we must use the following operations strictly in the order:

(i) of (ii) Division (iii) Multiplication (iv) Addition (v) Subtraction.

Note:

(i) Start Divide/Multiply from left side to right side since they perform equally.

(ii) Start Add/Subtract from left side to right side since they perform equally.

2. Virnaculum (or Bar):

When an expression contains Virnaculum, before applying the **'BODMAS'** rule, we simplify the expression under the Virnaculum.

3. Modulus of a Real Number:

Modulus of a real number a is defined as

|a| = a, if a > 0 or -a, if a < 0 .

Thus, |5| = 5 and |-5| = -(-5) = 5.

Laws of Indices:

1. $a^m \times a^n = a^{m+n}$ **2.** $a^m/a^n = a^{m-n}$ **3.** $(a^m)^n = a^{mn}$ **4.** $(ab)^n = a^n b^n$

5. $(a/b)^n = a^n/b^n$ **6.** $a^0 = 1$ **7.** $a^{-n} = 1/a^n$ **8.** $(a/b)^{-(m/n)} = (b/a)^{(m/n)}$

Surds :

Let a be rational number and n be a positive integer such that $a^{1/n} = \sqrt[n]{a}$.
Then, a is called a surd of order n.

Laws of Surds :

1. $\sqrt[n]{a} = a^{1/n}$

2. $\sqrt[n]{ab} = \sqrt[n]{a} \times \sqrt[n]{b}$

3. $\sqrt[n]{\dfrac{a}{b}} = \dfrac{\sqrt[n]{a}}{\sqrt[n]{b}}$

4. $(\sqrt[n]{a})^n = a$

5. $\sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a}$

6. $(\sqrt[n]{a})^m = (\sqrt[m]{a})^n$

Some Basic Formulae:

1. $(a + b)(a - b) = (a^2 - b^2)$

2. $(a + b)^2 = (a^2 + b^2 + 2ab)$

3. $(a - b)^2 = (a^2 + b^2 - 2ab)$

4. $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

5. $(a^3 + b^3) = (a + b)(a^2 - ab + b^2)$

6. $(a^3 - b^3) = (a - b)(a^2 + ab + b^2)$

7. $(a^3 + b^3 + c^3 - 3abc) = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ac) = \frac{1}{2} (a+b+c)[(a-b)^2 + (b-c)^2 + (c-a)^2]$

8. When $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$.

Type 1 - BODMAS Rule & Applications

Q1. 78 - [5 + 3 of (25 - 2 × 10)] =?

A. 38   B. 58   C. 620   D. None of these

Q2. 52 - 4 of (17 - 12) + 4 × 7 =?

A. 268   B. 252   C. 60   D. 78

Q3. (4444 ÷ 40) + (645 ÷ 25) + (3991 ÷ 26) =?

A. 280.4   B. 290.4   C. 295.4   D. 285.4

Q4. $37.5 \div [\frac{1}{2} of(24 + 33) - 13\frac{1}{2}] =?$

A. 2.75   B. 2.5   C. 1.75   D. 2.28

Q5. $35^2 \div \sqrt[3]{125} + 25^2 \div 125 =?$

A. 200   B. 250   C. 50   D. 100

Q6. $\frac{2.39^2 - 1.61^2}{2.39 - 1.61} =?$

A. 2   B. 4   C. 6   D. 8

Q7. $\frac{[(469+174)^2 - (469-174)^2]}{(469 \times 174)} =?$

A. 2   B. 4   C. 295   D. 643

Q8. $\frac{0.0203 \times 2.92}{0.0073 \times 14.5 \times 0.7} =?$

A. 0.8   B. 1.45   C. 2.40   D. 3.25

Directions (Q9-Q22): What should come in place of question-mark (?) in the following question?

Q9. $\frac{[5^2 \times 14 + 1450]}{5} = \frac{1998}{?}$

A. 5.55   B. 55.5   C. 50.5   D. 5.05

Q10. [(15.5 × 28) ÷ 16 - 1230 ÷ 240] = ? × 5

A. 4.4   B. 4   C. 5   D. 4.2

Q11. $216^{1/3} \times 26^4 \times 39^4 \div [12^4 \times 3 \times 2^{-3}] = 13^?$

A. 8   B. 12   C. 4   D. 10

Q12. $[144^2 \div 48 \times ?] \div 22 = 216$

A. 23   B. 16   C. 11   D. 32

Q13. $(?)^2+65^2=160^2-90^2-7191$

A. 75   B. 77   C. 81   D. 78

Q14. $7^{2.3} \times 49^{4.7} \times 63^{3.4} \times 81^{5.85} = 63^?$

A. 16.25   B. 15.1   C. 13.4   D. 18.9

Q15. $\frac{1}{2} of\ 3842 + 15\%\ of\ ? = 2449$

A. 3520   B. 3250   C. 335   D. 3540

Q16. 1045.92 - 1033.86 + 496.002 - 49.116 =?

A. 438.946   B. 438.846   C. 456.946   D. 458.946

Q17. 45% of 1200 + 49% of 1223 + 23% of 563 =?

A. 1466.76   B. 1368.66   C. 1268.76   D. 1664.86

Q18. $(3675 \div 35 \div 3) + (3967.2 \div 24 \div 6)$ =?

A. 62.55   B. 72.55   C. 68.35   D. 24.55

Q19. ? x 10% of 25 + 25% of 17 = 73

A. 36.91   B. 38.25   C. 39.5   D. 27.5

Q20. $10.7 \times (375 \div 2.5) + 193 - 173$ =?

A. 1605   B. 1625   C. 1635   D. 1795

Q21. (476 x 24) - (576 x 13) + (373 x 93) =?

A. 34625   B. 35625   C. 37625   D. 38625

Q22. (96 x 96) + (97 x 98) - (95 x 85) + (116 x 75) =?

A. 18247   B. 19347   C. 15347   D. 16937

Q23. The expression (11.98 x 11.98 + 11.98 x A + 0.02 x 0.02) will be a perfect square for A equal to?

A. 0.02   B. 0.2   C. 0.04   D. 0.4

Q24. 4.036 divided by 0.04 gives?

A. 1.009   B. 10.09   C. 100.9   D. None of these

Q25. If $\sqrt{0.09 \times 0.9 \times a} = 0.009 \times 0.9 \times \sqrt{b}$, then a/b is?

A. 9×10^{-3} B. 9×10^{-5} C. 81×10^{-4} D. 81×10^{-5}

Type 2 – Fractions

Q26. (3/5) [4 + (1/3)] [2 + (2/3)] [3 + (4/3)] [7 + (5/3)] [1 - (12/13)] =?

A. 2004/105   B. 2704/135   C. 2604/105   D. 2704/105

Q27. $1\frac{1}{3} + 2\frac{1}{6} - 3\frac{1}{9} = 1 \div ?$

A. 2 4/7   B. 5 2/7   C. 2 1/3   D. 3 1/3

Q28. $\frac{9}{13} of\ 221 + 1\frac{4}{9} of\ 378 = 241 + ?$

A. 450   B. 410   C. 458   D. 350

Q29. [(19/10) - (31/15)] = ? - (4/5) - (2/3)

A. 1.9   B. 1.6   C. 1.5   D. 1.3

Q30. $113\frac{16}{27} + 472\frac{4}{9} + 373\frac{2}{3} + 576\frac{1}{3} = ?$

A. 1604 1/27   B. 1534 1/27   C. 1536 1/27   D. 1524 1/27

Q31. The correct expression of $6.\overline{46}$ in the fractional form is?

A. 646/99   B. 64640/1000   C.640/100   D. 640/99

Q32. The fraction $101\frac{27}{100000}$ in decimal form is?

A. 0.01027   B. 0.10127   C.101.00027   D. 101.000027

Q33. $3.\overline{87} - 2.\overline{59} = ?$

A. $1.\overline{20}$ B. $1.\overline{2}$ C. $1.\overline{27}$ D. $1.\overline{28}$

Q34. $\sqrt{0.\overline{4}} = ?$

A. 4/9   B. $0.\overline{1}$ C. $0.\overline{14}$ D. $0.\overline{6}$

Q35. Convert into fraction $2.1\overline{45}$?

A. 2145/9999   B. 2145/9900   C. 2124/9900   D. 2124/990

Type 3 - Surds & Indices

Q36. Solve for a: $(17)^{3.5} \times (17)^a = 17^8$?

A. 2.29   B. 2.75   C. 4.25   D. 4.5

Q37. If $(a/b)^{x-1} = (b/a)^{x-3}$, then the value of x is?

A. ½   B. 1   C. 2   D. 7/2

Q38. $\dfrac{32^{n/5} \times 2^{2n+1}}{4^n \times 2^{n-1}} = ?$

A. 4   B. 8   C. 2^n D. 2^{n+1}

Q39. Find the value of $1/(125)^{-2/3} + 1/(625)^{-3/4} + 1/(729)^{-3/6}$?

A. 132   B. 177   C. 185   D. 225

Q40. If $2^x \times 8^{(1/4)} = 2^{(1/4)}$, then find the value of x?

A. $-1/2$ B. $1/2$ C. $1/4$ D. $-1/4$

Q41. If $9^x - 9^{x-1} = 648$, then find the value of X^X ?

A. 4   B. 9   C. 27   D. 64

Q42. If $4^{(x-y)} = 64$ and $4^{(x+y)} = 1024$, then find the value of x?

A. 3   B. 1   C. 6   D. 4

Q43. If a and b are whole numbers such that $a^b = 121$, then find the value of $(a-1)^{b+1}$?

A. 0   B. 10   C. 10^2 D. 10^3

Q44. The value of $(32/243)^{-4/5}$ is?

A. 4/9   B. 9/4   C. 16/81   D. 81/16

Q45. $(1/216)^{-2/3} \div (1/27)^{-4/3} = ?$

A. 3/4   B. 2/3   C. 4/9   D. 1/8

Q46. $[(2^{n+4}) - (2 \times 2^n)/(2 \times 2^{n+3})] + 2^{-3} = ?$

A. 2^{n+1} B. $-2^{n+1} + 1/8$ C. $(9/8) - 2^n$ D. 1

Q47. If $5\sqrt{5} * 5^3 \div 5^{-3/2} = 5^{a+2}$, the value of a is?

A. 4   B. 5   C. 6   D. 8

Q48. If $(\sqrt2)^n = 64$, then the value of n is?

A. 2   B. 4   C. 6   D. 12

Q49. $\dfrac{1}{[1 + x^{(b-a)} + x^{(c-a)}]} + \dfrac{1}{1 + x^{(a-b)} + x^{(c-b)}} + \dfrac{1}{1 + x^{(b-c)} + x^{(a-c)}} = ?$

A. 0   B. 1   C. x^{a-b-c} D. None of these

Q50. If $x = 5 + 2\sqrt{6}$, then find the value of $\left(x - \dfrac{1}{x}\right)$?

A. $2\sqrt{6}$ B. 6   C. 8   D. $4\sqrt{6}$

Q51. If x = 3+2√2, then the value of [√x- (1/√x)] is?

A. 2   B. $\sqrt{2}$ C. $2\sqrt{2}$ D. None of these

Q52. The value of (√8)$^{1/3}$ is?

A.2   B. 4   C. $\sqrt{2}$ D. 8

Q53. Find the value of $\sqrt{10 + \sqrt{27 + \sqrt{65 + \sqrt{256}}}}$ =?

A. 9   B. 8   C. 6   D. 4

Q54. Find the value of $\sqrt[3]{\sqrt{0.000729}}$ =?

A. 0.3   B. 0.7   C. 0.09   D. None of these

Q55. $\sqrt{12 + \sqrt{12 + \sqrt{12}} + \ldots\ldots\ldots\ldots.\infty}$ =?

A. 12   B. 4   C. 3   D. None of these

Q56. $\sqrt{56 - \sqrt{56 - \sqrt{56} - \ldots\ldots\ldots\infty}}$ =?

A. 56   B. 7   C. 8   D. None of these

Q57. $\sqrt{72 \times \sqrt{72 \times \sqrt{72}} \times \ldots\ldots\ldots.\infty}$ =?
A. 72   B. 8   C. 9   D. None of these

Q58. $\sqrt{6 \times \sqrt{6 \times \sqrt{6}}}$ =?
A. 6   B. $2^{7/8}$ C. $6^{5/8}$ D. $6^{7/8}$

Q59. Simplify: 1 - {1 + (a² - 1)$^{-1}$}$^{-1}$?
A. 1/a²   B. a²   C. -1/a²   D. -a²

Q60. Which one is the largest: $\sqrt[3]{6}, \sqrt{3}, \sqrt[4]{8}$?
A.$\sqrt[3]{6}$ B.$\sqrt{3}$ C.$\sqrt[4]{8}$ D. Cannot be compared

FAQs @ Placements

Q61. The least among the following is?
A. 0.2   B. 1 ÷ 0.2   C. 0.$\overline{2}$ D. (0.2)²

Q62. The price of 2 sarees and 4 shirts is Rs. 1600. With the same money one can buy 1 saree and 6 shirts. If one wants to buy 12 shirts, how much shall he have to pay?
A. Rs. 1200   B. Rs. 2400   C. Rs. 4800   D. Cannot be determined

Q63. A fire 5 shot to B's 3 but A kills only once in 3 shots while B kills once in 2 shots. When B has missed 27 times, A has killed?
 A. 30 birds   B. 60 birds   C. 72 birds   D. 90 birds

Q64. The price of commodity X increases by 40 paisa every year, while the price of commodity Y increases by 15 paisa every year. If in 2001, the price of commodity X was Rs. 4.20 and that of Y was Rs. 6.30, in which year commodity X will cost 40 paisa more than the commodity Y?
 A. 2010   B. 2011   C. 2012   D. 2013

Q65. Which of the following is the greatest?
A. $4^{1/4}$ B. $3^{7/10}$ C. $5^{1/2}$ D. $6^{1/5}$

Q66. A shopkeeper divides an ice-cream brick in two halves, and then he cut one of the halves into several smaller portions of equal size. Each of smaller portions weighs 20 grams. The shopkeeper now has a total of 7 portions. How heavy was the original brick?
A. 40 grams   B. 120 grams   C. 240 grams   D. 160 grams

Q67. The shop sells 17/36 of the total amount of item A, 15/84 of total of item B and 3/504 of the total amount of item C. The shop buys back an amount equal to 2/36 of item A. what total fraction of item A,B and C was sold ?
A. 303/504   B. 331/504   C. 24/84   D. 329/504

Q68. One year payment to the servant is Rs. 200 plus one shirt. The servant leaves after 9 months and receives Rs. 120 and a shirt. Then find the price of the shirt?
A. Rs. 80   B. Rs. 100   C. Rs. 120   D. Cannot be determined

Q69. A perfect cube is an integer whose cube root is an integer. For example, 27, 64 and 125 are perfect cubes. If p and q are perfect cubes, which of the following will not necessarily be a perfect cube?
A. (8p)   B. (pq)   C. (pq + 27)   D. (-p)

Q70. $\dfrac{[(0.96)^3-(0.1)^3\ ]}{[(0.96)^2+0.096+(0.1)^2)]}=?$
A. 0.86   B. 1   C. 0   D. 0.76

CHAPTER 2

RATIO & PROPORTION
and
PARTNERSHIP

RATIO

Ratio is a comparison of two quantities by division. Ratio represents the relation that one quantity bears to the other. If **a** and **b** are two quantities of the same kind, then **a/b** is known as the ratio of **a** and **b**. Denoted as **a: b**, where the first term of the ratio is called as **antecedent,** while the second term is called as **consequent.**

A **"ratio"** is just a comparison between two different things.
The ratio between 30 kg and 50 kg is 3:5.

Example: In the park mentioned above, the ratio of ducks to geese is 16 to 9. How many of the 300birds are geese?
Solution: The ratio tells that, out of every 16 + 9 = 25 birds, 9 are geese. That is, $^9/_{25}$ of the birds are geese. Then there are (9/25) (300) = **108 geese.**

Example: In a school the ratio of number of boys and girls is 9:6.If there are present 180 boys. Find the total number of students in the school?
Solution: Let the number of boys and girls be 9x and 6x.
Then 9x=180, x=20
Therefore, the total number of students=15x,
Thus,   15(20) =300

Different Types of Ratios

1. Duplicate Ratio:
a^2: b^2 is called duplicate ratio of a: b

2. Triplicate Ratio:
a^3: b^3 is called triplicate ratio of a: b

3. Compound Ratio:
ab: cd is the compound ration of a: c and b:d. It is the ratio of the products of the antecedents to that of the consequents of the two or more given ratios.

PROPORTION

The equality of two ratios is called as proportion. a, b, c, and d are said to be in proportion if,
$$a : b = c : d \quad \text{or} \quad a : b :: c : d$$
In a proportion, the first and fourth terms are known as extremes, while second and third terms are known as means.

PRODUCT OF EXTREMES=PRODUCT OF MEANS
a*d=b*c

Continued Proportion

Four quantities: a, b, c and d are said to be in continued proportion, if **a:b=b:c=c:d .**
Three quantities: a, b and c are said to be in continued proportion, if   **a: b=b: c** or **ac=b*b**
b is said to be the **mean proportional** between **a** and **c** and **c** is said to be a **Third proportional** to **a** and **b.**

Example: If 40, x, x, 40 are in proportion, then find the value of x.
Solution: **Product of means = product of extremes**

    x * x = 40 * 40
$\Rightarrow$ x^2 = 1600 $\Rightarrow$ x = 40

FOURTH Proportion – If four quantities a, b, c and x are such that a : b :: c : x, then ax=bc and x is called fourth proportion of a, b and c.

Example: A can do a piece of work in 12 days, B is 60% more efficient than A. Find the number of days that B takes to do the same piece of work.
Solution: Ratio of efficiencies of
A and B=100 : 160 = 5 : 8
Since**, efficiency is inversely proportional to the number of days.**
Ratio of days taken to complete the job=8:5
No. of days taken by B=5/8 *12=15/2

Variation

If two quantities are related in such a way that as quantity 'x' changes, it also brings a change in the second quantity 'y', then the two quantities are in variation. There are two types of variations:-

1.Direct Variation: The quantity 'x' is in direct variation to 'y', if an increase in 'x' causes an increase in 'y' and decrease in 'x' causes 'y' to decrease proportionally. Therefore, **x= ky,** where 'k' is constant of proportionality.

2. Inverse Variation: The quantity 'x' is in inverse variation to 'y', if an increase in 'x' causes an decrease in 'y' and decrease in 'x' causes 'y' to increase proportionally. Therefore, **x=k/y,** where 'k' is constant of proportionality.

3. Joint Variation: If there are more than 2 quantities x,y and z; and x varies with both y and z, then x is in joint variation to y and z. It can be expressed as kyz, where k is constant of proportionality.
Example: Men doing a work in some number of days working certain hours a day.

4. Distribution of amount: If an amount A is distributed in ratio a:b, then 1st part is equals to $\frac{a}{a+b}$ * A and
2nd part is equals to $\frac{b}{a+b}$ * A

Partnership

Persons two or more than two persons when start and run the new business jointly of their own choice, the persons who start the business are called **partners** and the agreement between them is called **partnership.**

Working and Inactive partners:
A partner who manages the business is called **working/active partner** and the one who simply invests the money is called **inactive partner.**

Ratio of division of gains:
1. The amount investment of all the partners are for the same time period, the gain or loss amount is distributed among the partners in the ratio of their invested amount.

2. When investments are for different time periods
Example: A invests Rs. **R1 for T1 months** and B invests Rs. **R2 for T2 months**, then
 (**A's share of profit) : (B's share of profit) = A*T1 : B*T2**

Partnership is of two types:
1. Simple Partnership
2. Compound Partnership

1. Simple Partnership: When investments of all the partners are for the same period of time, the profit or loss is distributed among the partners in the ratio of their original investments.
Suppose A and B invest `p and `q respectively for a year in a business, then at the end of the year.
Share of A's profit (loss): Share of B's profit (loss) = p : q

2. Compound Partnership: When investments of all the partners are for different period of time, then equivalent capitals are calculated for a unit of time and the profit or loss is divided in the ratio of the product of time and investment.
Suppose A and B invest `p and `q for x months and y months respectively, **then**
Share of A's profit (loss): Share of B's profit (loss) = px : qy

Example: A and B started a business investing Rs. 90,000 and Rs 20,000 respectively. In what ratio should the profit earned after 2 years be divided between A and B respectively?

A. 9:2   B. 3:2   C. 18:20   D. 18:4
Solution: Exp: A: B = 90000 : 20000 = 90 : 20 = 18 : 4 = 9 : 2

Example: Ajay, Bhavan and Chetan started a business together. Thrice the investment of Ajay, twice the investment of Bhavan and the investment of Chetan are equal. Find the ratio of their respective profits at the end of the year?

A. 1:2:1   B. 2:3:6   C. 3:2:1   D. 1:2:3

Solution: Let the investments of Ajay, Bhavan and Chetan be Rs. a, Rs. b and Rs. c respectively.

$\quad$ 3b = 2b = c, a = c/3, b = c/2.

Ratio of profits of Ajay, Bhavan and Chetan at the end of one year = Ratio of their respective investments = 2:3:6.

Type 1 – Percentage & Ratio

Q1. The salaries of A, B, C are in the ratio 2:3:5. If the increments of 15%, 10% and 20% are allowed respectively 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't be determined

Q2. In a class of 125, 20% students can dance.2/5 of the total students can sing and 2/5 of the remaining students are good at sports. What is the respective ratio of the students who can dance to students who are good at sports?
A. 5:4   B. 3:2   C. 4:5   D. 3:7

Q3. X: Y: Z is in the ratio of 3: 2: 5.Then how much money will Z get out of Rs 500?
A. Rs. 200   B. Rs. 250   C. Rs. 300   D. Rs. 350

Q4. Rate of income tax is increased from 4% to 5%. However, the total tax liability of a person remains the same as was in the last year. If his income for the last year was Rs.10000, find his present income.
A. 9000   B. 8000   C. 5000   D. 6000

Q5. Mohan distributed his assets to his wife, three sons, two daughters and five grandchildren in such a way that each grandchild got one-eighth of each son and one-tenth of each daughter. His wife got 40% of the total share of his sons and daughter together. If each daughter receives asset of Rs.1.25 lakhs, what is the salary of his wife?
A. 2.5 Lakhs   B. 2.7 Lakhs   C. 2.2 Lakhs   D. 3.2 Lakhs

Q6. Rs.385 were divided among A,B and C. In such a way that A has Rs.20 more than B and C has Rs.15 more than A. How much was C's share?
  A.   145   B.154   C.175   D. 135

Q7. An amount of money to be divided between A, B and C is in the ratio 2:3:5 respectively. If the amount received by C is Rs.6000 more than the amount received by B. Then, the total amount of money received by A and B together is?
  A.   16, 000   B.15, 000   C.14, 000   D.13, 000

Q8. Rs.15,600 is divided among three persons A,B and C in such a way that A received 2/3rd of the total share of B and C together, while B received 3/7th of the total share of A and C together. Find the share of C?
  A.   4680   B.5400   C.4580   D.4500

Type 2 - Coin Based Problem

Q9. A sum of Rs. 36.90 is made up of 180 coins which are either 10 p coins or 25 p coins. The number of 10 p coins is?
A. 48   B. 54   C. 56   D. 60

Q10. A bag contains Rs 410 in the form of Rs 5, Rs 2 and Rs 1 coins. The numbers of coins are in the ratio 4:6: 9. So, find the number of 2 Rs coins.
A. 40   B. 50   C. 60   D. 70

Q11. A bag contains 50 P, 25 P and 10 P coins in the ratio 5: 9: 4, amounting to Rs. 206. Find the number of coins of each type respectively.
A. 360, 160, 200   B. 160, 360, 200   C. 200, 360, 160   D. 200,160,300

Q12. A bag contains some coins in the denominations 50, 20 and 10 paisa coins in the ratio 4:2:1. If their total value is Rs 12.50, then the number of 10 paisa coins is?
A. 10   B. 5   C. 20   D. 15

Q13. In a bag, there are coins of 25 p, 10 p and 5 p in the ratio of 1 : 2 : 3. If there is Rs. 30 in all, how many 5 p coins are there?
A. 50   B. 100   C. 150   D. 200

Type 3 - Income and Expenditure

Q14. Share of Rs.4200 among Rahul, Vijay and Mahinder in the ratio of 2:4:6.Find the amount received by Mahinder?
   A. 3100   B.2500   C.2100   D.4200

Q15. The ratio of the incomes of four persons A, B, C and D is 5:3:9:4.The sum of the incomes of A and C is 84,000.Find the difference of the incomes of B and D?
   A. 5000   B.7000   C.6000   D.8000

Q16. The ratio of income of A and B is 3:4. The Ratio of expenditure of both is 2: 3 and each saves RS 200. Find the income of A and B.
   A. Rs 500,600   B. Rs 600,800   C.Rs 600,900   D.Rs 800, 1000

Q17. The salary of two friend's Ramu and Raju are in the ratio of 4:5.If the salary of each one increases by Rs.6000, then the new ratio becomes 48:55.What is Raju's present salary?
   A. 11,500   B.10,500   C.9000   D.8,500

Type 4 - Ratios of Ratios

Q18. In a school, the ratio to the number of boys and girls is 4:9, after inclusion of 32 new girls, the ratio becomes 4:17.How many boys were present at the starting in this school?
   A. 20   B.16   C.25   D.18

Q19. In an examination, the number of those who passed and the number of those who failed were in the ratio 25:4.If five more had appeared and the number of failures was 2 less than earlier, the ratio of passers to failures would have been 22:3.The number of students who appeared at the examination, is?
   A. 154   B.145   C.160   D.150

Q20. The students in the 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. 125   B.130   C.100   D.150

Q21. At a start of seminar, the ratio of the number of male participants to the number of female participants was 3:1.During the tea break 16 participants left and 6 more participants registered. The ratio of the male to the female participants now becomes 2:1.What was the total number of participants at the start of the seminar?
     A. 50   B.60   C.30   D.40

Q22. The numerator and denominator of a fraction are in the ratio 2:3.If 6 is subtracted from the numerator the value of the fraction becomes 2/3 of the original fraction. The numerator of the original fraction is?
     A. 6   B.18   C.5   D.5

Q23. The ratio of the first and the second class train fares between two stations is 3:1 and that of the number of passengers travelling between the two stations by first and second class is 1:50.If on a particular day, Rs.1325 are collected from passengers travelling between the two stations, then the amount collected from the second class passenger is?
     A. 1250   B.1350   C.1520   D.1400

Type 5 - Simple & Compound Partnership

Q24. A, B, C subscribes together Rs.50, 000 for business. A subscribes Rs.4000 more than B and B Rs.5000 more than C. Out of a total profit Rs.35000, A receives?
     A. 14, 700   B.15, 500   C.16, 500   D.17, 400

Q25. A and B joined a partnership business by investing Rs.30, 000 and Rs.50, 000 respectively. If they earn a profit of Rs.4, 000, find A's share in profit.
     A. 2500   B.1500   C.2000   D.500

Q26. A starts a business with Rs.7, 000 and after 5 months, B joined as a partner. After a year, the profit is divided in ratio2:3. The capital of B is?
     A. 18,000   B.7,000   C.10,000   D.16,000

Q27. A and B starts a business jointly. A invests Rs.16, 000 for 8 months and B remains in the business for 4 months. Out of total, B claims 2/7 of the profit. How much money was contributed by B?
     A. 12,500,   B.12, 000   C.12,800   D.13,000

Q28. A and B are partners and invested Rs.50,000 and Rs.60,000 respectively. After 8 months B leaves and C joins with a capital of Rs.90,000. If the profit for 1 year is Rs.36,000, find A's share of profit.
     A. 15000   B. 12000   C.9000   D.14000

Q29. A, B and C started a business with investment in ratio 5:6:8 respectively. After 1 year, C withdrew 50% of his capital and A increase his capital by 60% of his investment. After 2 years, in what ratio should the earned profit be distributed among A, B and C respectively?
     A. 12:12:13   B.13:12:12   C.12:13:13   D.13:12:13

Q30. A began with Rs.45000 and was joined afterwards by B with Rs.54000. After how many months did B join, if the profits at the end of the year were divided in the ratio 2:1?
     A. 7 months   B.9 months   C. 5 months   D. 7.5 months

Q31. A and B entered in a partnership with capitals in the ratio 4:5, after 3 months a withdrew Rs.1,414 of his capital and B withdrew Rs.1,515 of his capital. At the end of 10 months, the gain was Rs.760. What is the ratio of profit between A and B?
   A. 43:33   B.33:43   C. 30:40   D. 32:42

Type 6 - Partnership with Ratio

Q32. A, B and C shared profits in ratio of 5:7:8. They partnered for 14 months, 8 months and 7 months respectively. Find the ratio of their investments.
   A. 64:49:20   B.49:64:20   C.20:49:64   D.20:64:49

Q33. A and B invests in the business in ratio 3:2. Assume that 5% of total profit goes to charity. If A's share is Rs. 855, what is the total profit?
   A. 1000   B. 4275   C.2525   D.1500

Q34. In a business, A and C invested amounts in the ratio 2:1, whereas the ratio between amount invested by A and B was 3:2. If Rs.1, 57,300 was their profit, how much amount did B receive?
   A. 48,400   B. 46, 400   C.72,600   D.36,300

Q35. A and B are partners. A contributes ¼ of the capital for 15 months and B received 2/3 of the profit. For how many months B's money was used?
   A. 15 months   B. 18months   C.10 months   D. 8 months

Q36. A, B and C started a business with capitals in the ratio 5:6:8. At the end of 1 year, they shared profits in the ratio 5:3:12 find the ratio of time for which they had contributed their capitals?
   A. 2:1:3   B. 1:2:3   C. 2:3:1   D. 2:3:3

Type 7 - Partnership and Shares

Q37. A and B started a business with Rs. 4000 and Rs. 3000 respectively. After 6 months, C joined them by investing Rs. 4,000. At the end of 2 years, profit was Rs.5,000, then find B's share of profit?
   A. 2000   B. 1500   C. 2500   D. 1000

Q38. A started a business with capital of Rs. 1,00,000. 1 year later, B joined him with capital of Rs. 2,00,000. At the end of 3 years, from the start of the business, profit was Rs.84,000. B's share in profit exceeded A's share in profit by?
   A. 12,000   B. 24,000   C. 48,000   D. 60,000

Q39. P, Q and R started a business by investing Rs.120000, Rs.135000 and Rs. 150000 respectively. Find the share of Q, out of annual profit of Rs.56,700?
   A. 16800   B. 21000   C. 18900   D. 27000

Type 8 - Miscellaneous

Q40. A and B have 78 marbles with them. When A gives to B half the number of marbles which B has, both have equal number of marbles. How many marbles did B have initially?

    A. 26   B. 28   C. 22   D. 35

Q41. In a zoo, there are rabbits and pigeons. If heads are counted, there are 340 heads and if legs are counted there are 1060 legs. How many pigeons are there?

    A. 190   B. 160   C. 150   D. 210

Q42. The ratio of any two angles of a triangle is 5:9.If the third angle is measured to be 110 degree, and then find the difference of the other two angles?

    A. 20 Degree   B. 30 Degree   C. 50 Degree   D. 45 Degree

Q43. A, B, C alone completed a piece of work in 30, 50 and 40 days. The ratio of the salary of each day is 4:3:2 respectively. If the total income of A is Rs 144, find the total income of B.

    A. Rs 180   B. Rs 185   C. Rs 190   D. Rs 195

Q44. A person covers a certain distance by Train, Bus and Car in the ratio 4:3:2.the ratio of fair is 1:2:4 per km. the total expenditure as a fair is Rs 720. Then, total expenditure as fair on train is?

    A. Rs 140   B. Rs 150   C. Rs 160   D. Rs 170

Q45. Manoj got Rs.6000 as his share out of a total profit of Rs.9000 which he and Ramesh earned at the end of one year. If Manoj invested Rs.20,000 for 6 months, whereas Ramesh invested his amount for the whole year, what was the amount invested by Ramesh?

    A. Rs.30000   B. Rs.40000   C. Rs.10000   D. Rs.5000

Q46. Yogesh started a business investing Rs. 45000. After 3 months, Pranab joined him with a capital of Rs. 60000. After another 6 months, Atul joined them with a capital of Rs. 90000. At the end of the year, they made a profit of Rs. 20000. What would be Atuls share in it?

    A. Rs 7000   B. Rs 6000   C. Rs 5000   D. Rs 4000

Q47. In business, A and C invested amounts in the ratio 2:1, whereas the ratio between amounts invested by A and B was 3:2, If Rs 157300 was their profit, how much amount did B receive?

    A. Rs 48000   B. Rs 47000   C. Rs 47400   D. Rs 48400

FAQs @ Placements

Q48. The ages of Raju and Biju are in the ratio 3:1. Fifteen years hence, the ratio will be 2:1. Their present ages are?

    A. 30yrs,10yrs   B. 45yrs,15yrs   C.21 yrs, 7 yrs   D. 60yrs, 20yrs

Q49. The speeds of three motor bikes are in the ratio 6 : 5 : 4. The ratio between the time taken by them to travel the same distance is?

    A. 10 : 12 : 15   B. 12 : 10 : 8   C.15 : 12: 10   D. 10 : 15 : 12

Q50. In a company 10% of male staff are same in number as 1/4th of the female staff. What is the ratio of male staff to female staff?

    A. 3 : 2   B. 5 : 2   C. 2 : 1   D. 4 : 3

Q51. The telephone bill of a certain establishment is party fixed and partly varies as the number of calls consumed. When in a certain month 540 calls made the bill is Rs.1800. In another month 620 calls are consumed then the bill becomes Rs.2040. In another month 500 units are consumed due to more holidays. The bill for that month would be?

    A. Rs.1560   B. Rs.1680   C. 1840   D. Rs.1950

Q52. The ratio of incomes of two person P1 and P2 is 5 : 4 and the ratio of their expenditures is 3 : 2. If at the end of the year, each saves Rs.1600, then what is the income of P1?

    A. Rs.800   B.Rs.2400   C.Rs.4000   D.3200

Q53. The seats in an Engineering college for Computer science, electronics and civil are in the ratio of 5 : 7 :8. There is a proportion 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

Q54. Ram, Sham and Suresh start business investing in the ratio 1/2 : 1/3: 1/6. The time for which each of them invested their money was in the ratio 8:6:12 respectively. If they get profit of Rs.18000 from the business, then how much share of profit will Ram get?

    A. Rs.4000   B. Rs.6000   C. Rs.9000   D. Rs. 10000

Q55. The ratio of the number of boys and girls in a college is 7: 8. If the percentage increase in the number of boys and girls be 20% and 10% respectively, what will be the new ratio?

    A. 8 : 9   B. 17 : 18   C. 21 : 22   D. Cannot be determined

Q56. A and B together have Rs. 1210. If 4/15 of A's amount is equal to 2/5 of B's amount, how much amount does B have?

    A. Rs. 460   B. Rs. 484   C. Rs. 550   D. Rs. 664

Q57. The ratio of the cost prices of two articles A and B is 4:5.The articles are sold at a profit with their selling prices being in the ratio 5:6.If the profit on article A is half of its cost price, find the ratio of the profits on the articles A and B?

    A. 7:10   B. 9:11   C. 5: 9   D. 10:11

Q58. A sum of money is to be distributed among A, B, C, D in the proportion of 5 : 2 : 4 : 3. If C gets Rs. 1000 more than D, what is B's share?

    A. Rs. 14000   B. Rs. 15000   C. Rs. 2000   D. None of these

CHAPTER 3

PERCENTAGE

PERCENT

When we say "Percent" we mean "per 100"

One percent (**1%**) means 1 per 100.
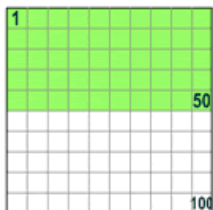
50% means 50 per 100
(50% of this box is green)

25% means 25 per 100
(25% of this box is green)
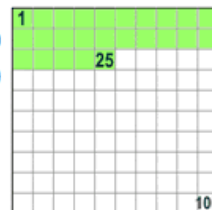
Remember: x% of y = y% of x=xy/100

Example: Find 8% of 50.

8% of 50 is the same as **50% of 8**
And 50% of 8 is 4
So, 8% of 50 is **4**

FRACTIONS   DECIMALS

PERCENTAGES

Decimals, Fractions & Percentages are just different ways of showing the same value:

A Half can be written as:

| *Fraction* | *1/2* | *Decimal* | *0.5* | *Percentage* | *50%* |

Common Fractions with Decimal and Percent Equivalents

Here is a table of commonly used values shown in Percent, Decimal and Fraction form:

Fraction	Decimal	Percent
½	0.5	50%
1/3	0.333...	33.333...%
2/3	0.666...	66.666...%
¼	0.25	25%
¾	0.75	75%
1/5	0.2	20%
2/5	0.4	40%
3/5	0.6	60%
4/5	0.8	80%
1/6	0.1666...	16.666...%
5/6	0.8333...	83.333...%
1/8	0.125	12.50%
3/8	0.375	37.50%
5/8	0.625	62.50%
7/8	0.875	87.50%
1/9	0.111...	11.111...%
2/9	0.222...	22.222...%
4/9	0.444...	44.444...%
5/9	0.555...	55.555...%
7/9	0.777...	77.777...%
8/9	0.888...	88.888...%
1/10	0.1	10%
1/12	0.08333...	8.333...%
1/16	0.0625	6.25%
1/32	0.03125	3.13%

LET'S PRACTICE THE CONVERSIONS NOW -

A. *FROM PERCENT TO DECIMAL:*

To convert from percent to decimal : divide by 100, and remove the "%" sign.

The easiest way to divide by 100 is to **move the decimal point 2 places to the left**:

From Percent		To Decimal	
75%	0.7.5. 2 Places	0.75	move the decimal point **2 places to the left**, and remove the "%" sign.

B. *FROM DECIMAL TO PERCENT:*

To convert from decimal to percent : multiply by 100, and add a "%" sign.

The easiest way to multiply by 100 is to **move the decimal point 2 places to the right**:

From Decimal		To Percent	
0.125	0.1.2.5 2 Places	12.5%	move the decimal point **2 places to the right**, and add the "%" sign.

Or you can simply multiply 0.125 with 100 and add the % sign to get 12.5%.

C. *FROM FRACTION TO DECIMAL:*

The easiest way to convert a fraction to a decimal is to divide the top number by the bottom number (divide the numerator by the denominator in mathematical language)

Example: Convert $^2/_5$ to a decimal.

Divide 2 by 5: $2 \div 5 = 0.4$
Answer: $^2/_5 = 0.4$

D. *FROM DECIMAL TO FRACTION:*

To convert a decimal to a fraction , remove the decimal by adding the denominator with appropriate number of zeroes and then simplify the fraction.

Example: To convert 0.75 to a fraction

Remove the decimal => 0.75 = 75/100
Simplify the fraction => 75/100 = 3/4
Answer: $^2/_5$ = 0.4

E. FROM FRACTION TO PERCENTAGE:

The easiest way to convert a fraction to a percentage is to multiply the fraction by 100 and reduce it to decimal form and add the "%" sign.

Example: Convert $^3/_8$ to a percentage

Multiply 3/8 by 100: 37.5
Add the "%" sign: 37.5%
Answer: $^3/_8$ = 37.5%

F. FROM PERCENTAGE TO FRACTION:

To convert a percentage to a fraction , first convert to a decimal (divide by 100), then use the steps for converting decimal to fractions (like above).

ATTENTION PLEASE!!!

REMEMBER THAT THE BASE TAKEN IS ALWAYS THE ORIGINAL QUANTITY!!!

Type 1 – Basic Questions

Q1. A person who spends 66 2/3% of his income is able to save Rs. 1,200 per month. His monthly expense is?
    A. 1,200   B. 2,400   C. 3,000   D. 3,200

Q2. If 80% of A = 50% of B and B = X% of A, then the value of X is?
    A. 400   B. 300   C. 160   D. 150

Q3. If x is 80% of y, what percent of x is y?
    A. 75%   B. 80%   C. 100%   D. 125%

Q4. If 50% of (x-y) = 30% of (x+y) then what percent of x is y?
    A. 33%   B. 30%   C. 25%   D. 23%

Q5. A is twice B and B is 200% more than C. By what percent is A more than C?
    A. 50%   B. 30%   C. 500%   D. 600%

Q6. Arun got 30% of the maximum marks in an examination and failed by 10 marks. However, Sujith who took the same examination got 40% of the total marks and got 15 marks more than the passing marks. What were the passing marks in the examination?

    A. 90   B. 250   C. 75   D. 85

Q7. P is six times as large as Q. The per cent that Q is less than P is?

    A. 88 1/3%   B. 16 2/3%   C. 90%   D. 60%

Q8. Dipin's score is 15% more than that of Rafi. Rafi's score is 10% less than that of Chandar. If the difference between the scores of Dipin and Chandar is 14, what is the score of Rafi?

    A. 180   B. 360   C. 120   D. 480

Q9. A student multiplied a number by 3/5 instead of 5/3. What is the percentage error in the calculation?

    A. 34%   B. 44%   C. 54%   D. 64%

Q10. Ritesh and Co. generated revenue of Rs. 1,250 in 2006. This was 12.5% of its gross revenue. In 2007, the gross revenue grew by Rs. 2,500. What is the percentage increase in the revenue in 2007?

    A. 12.5%   B. 20%   C. 25%   D. 50%

Q11. 8 is 4% of a, and 4 is 8% of b. c is equal to b/a. What is the value of c?

    A. 1/32   B. 1/4   C. 1   D. 4

Q12. Two numbers A and B are such that the sum of 5% of A and 4% of B is two-third of the sum of 6% of A and 8% of B. Find the ratio of A : B?

    A. 2:3   B. 1:1   C. 3:4   D. 4:3

Q13. In an examination, 5% of the applicants were found ineligible and 85% of the eligible candidates belonged to the general category. If 4275 eligible candidates belonged to other categories, then how many candidates applied for the examination?

    A. 28000   B. 30000   C. 32000   D. 33000

Q14. A batsman scored 110 runs which included 3 boundaries and 8 sixes. What percent of his total score did he make by running between the wickets?

    A. 45%   B. 45 5/11%   C. 54 6/11%   D. 55%

Q15. Two students appeared at an examination. One of them secured 9 marks more than the other and his marks was 56% of the sum of their marks. The marks obtained by them are?

    A. 39,30   B. 41,32   C. 42,33   D. 43,34

Type 2 – Successive Changes

Q16. If the price of article is decreased by 10%, then increased by 10%, the net effect on the price of the item is?

    A. 1%   B. -1%   C. 0%   D. 1.5%

Q17. A person salary is decreased by steps of 20%, 15% and 10%. What will be the percentage decrease, if the salary is decreased in a single shot?

    A. 38%   B. 38.8%   C. 39%   D. 40%

Q18. The price of a shirt is increased by 15% and then reduced by 15%. The final price of the shirt is?
  A. 1.25% increases   B. 1.25% decreases   C. 2.25% increases   D. 2.25% decreases

Q19. A's salary increased by 12% over last year and has become Rs. 6720. What will be his next year salary if it increases by 20% over last year's salary?
  A. Rs. 8000   B. Rs. 8064   C.Rs. 7500   D. Rs. 7200

Q20. Raman salary was decreased by 50% and subsequently increased by 50%. He has a loss of?
  A. 0%   B. 25%   C. 0.25%   D. 2.5%

Q21. A man gave 30% of his money to his wife, 40% of the remainder to his son and the remaining money equally to his three daughters. If each daughter gets Rs. 224, what does the wife get?
  A. 234   B. 445   C. 440   D. 480

Q22. In a town, the population was 8000. In one year, male population increased by 10% and female population increased by 8% but the total population increased by 9%. The number of males in the town was?
  A. 4000   B. 4500   C. 5000   D. 6000

Type 3 – Expenditure and Consumption

Q23. Price of sugar rises by 20%. By how much percent should the consumption of sugar be reduced so that the expenditure does not change?
  A. 20   B. 10   C. 16 2/3   D. 15

Q24. The price of an article is cut by 30%. To restore it to the former value the new price must be increased by?
  A. 30%   B. 300/13%   C. 300 1/13%   D. 300/7%

Q25. A reduction of 20% in the price of sugar enables a housewife to purchase 6 kg more for Rs. 240. What is original price per kg of sugar?
  A. Rs.10/kg   B. Rs.8/kg   C. Rs.6/kg   D. Rs.5/kg

Q26. A 10% hike in the price of rice forces a person to purchase 2 kg less for rupees 110. Find the price per kg of rice?
  A. Rs.5/kg   B. Rs.5.5/kg   C. Rs.6/kg   D. None of these

Q27. The price of oil is increased by 25%. If the expenditure is not allowed to increase, the ratio between the reduction in consumption & the original consumption is?
  A. 1:3   B. 1:4   C. 1:5   D. 1:6

Q28. A vendor sells 60 percent of apples he had and throws away 15 percent of the remainder. Next Day, he sells 50 percent of the remainder and throws away the rest. What percent of his apples does the vendor throw?
  A. 17   B. 23   C. 77   D. None of these

Type 4 – Venn Diagram and Miscellaneous

Q29. 30% of the men are more than 25 years old and 80% of the men are less than or equal to 50 years old. 20% of all men play football. If 20% of the men above the age of 50 play football, what percentage of the football players are less than or equal to 50 years?
    A. 15%   B.20%   C. 80%   D. 70%

Q30. A bag contains 600 coins of 25p denomination and 1200 coins of 50p denomination, If 12% of 25p coins and 24% of 50p coins are removed, the percentage of money removed from the bag is nearly?
    A. 21.6   B. 22.5   C. 20.6   D. 12.6

Q31. In an election contested by two parties, Party D secured 12% of the total votes more than Party R. If party R got 132,000 votes and there are no invalid votes, by how many votes did it lose the election?
    A. 300000   B. 168000   C. 36000   D. 24000

Q32. In a game show, the percentage of participants qualified to the number of participants participated from team A is 60%. In team B, the number of participants participated is 40% more than the participants participated from team A and the number of participants qualified from team B is 40% more than the participants qualified from team A. What is the percentage of participants qualified to the number of participants participated from team B?
    A. 20%   B. 40%   C. 60%   D. 80%

Q33. A student has to secure 40% marks to pass. He gets 178 marks and fails by 22 marks. What are the maximum marks?
    A. 500   B. 450   C. 560   D. 600

Q34. Forty percent of the employees of a company are men, and 75 percent of the men earn more than Rs.25,000 per year. If 45 percent of the company's employees earn more than Rs.25,000 per year, what fraction of the women employed by the company earn Rs.25,000 per year or less?
    A. 2/11   B. 1/4   C. 1/3   D. 3/4

Q35. In a library, 20% of the books are in Hindi. 50% of the remaining in English and 30% of the remaining are in French. The remaining 6,300 books are in regional languages. What is the total number of books in library?
    A. 19,500   B. 20,500   C. 21,500   D. 22,500

Q36. In an election only two candidates contested 20% of the voters did not vote and 120 votes were declared as invalid. The winner got 200 votes more than his opponent, thus he secured 41% votes of the total voters on the voter list. Percentage votes of the defeated candidate out of the total votes casted are?
    A. 47.5%   B. 41%   C. 38%   D. 45%

FAQs @ Placements

Q37. If the price of sugar rises from Rs. 6 per kg to Rs. 7.50 per kg, a person, to have no increase in his expenditure on sugar, will have to reduce his consumption of sugar by?
    A. 15%   B. 20%   C. 25%   D. 30%

Q38. Fresh fruit contains 68% water and dry fruit contains 20% water. How much dry fruit can be obtained from 100 kg of fresh fruits?

    A. 20   B. 30   C. 40   D. 50

Q39. Rajeev buys good worth Rs. 6650. He gets a rebate of 6% on it. After getting the rebate, he pays sales tax @ 10%. Find the amount he will have to pay for the goods?

    A. Rs.6876.10   B. Rs.6999.20   C. Rs.6654   D. Rs.7000

Q40. A car has an original value of $30000, depreciates $12000 in the first year and thereafter, at the rate of 3% of the original cost per year. What is the value after 11 years?

    A. $8100   B. $12600   C. $3960   D. $12060

Q41. Three papers were set in an examination and the maximum marks per were in the ratio of 1 : 2 : 2 respectively. If a student obtained 50% in the first paper, 60% in the second, and 65% in the third, what percent did he obtain overall?

    A. 58.3%   B. 66.66%   C. 33.33%   D. 60%

Q42. A recipe gives directions to mix 4 pats of substance A with 7 parts of substance B. These substances are to be taken by weight, but by mistake they were taken by volume. Find the error in the percentage of the weight of A in the mixture, if 117 cm3 of the substance A weighs as much as 151 cm3 of the substance B?

    A. 5.05%   B. 6.00%   C. 7.05%   D. None of these

Q43. Tom's salary is 125% of Tina's salary. Tito's salary is 80% of Tina's salary. The total of all the three salaries is Rs. 61,000. What is Tito's salary?

    A. Rs. 16,000   B. Rs. 16,500   C. Rs. 15,500   D. Rs. 15,000

Q44. A bag contains 600 pens of brand A and 1200 pens of brand B. If 12% of brand A pens and 25% of brand B pens are removed, then what is the approximately percentage of total pens removed from the bag?

    A. 37%   B. 36%   C. 22%   D. 18%

Q45. A person spends 40% of his salary on his educational expenses. He spends 60% of it in purchasing books and one-half of the remaining in purchasing stationery items. If he saves Rs. 160 every month, which is one-fourth of the balance after spending over books and stationery items, what is his monthly salary?

    A. Rs. 8000   B. Rs. 4800   C. Rs. 9600   D.   Data inadequate

CHAPTER-4

PROFIT and LOSS

Basic Terminology

Cost Price: C.P. is the price at which one buys anything.

Selling Price: S.P. is the price at which one sells anything.

Profit/Loss: This is the difference between the selling price and the cost price. If the difference is positive it is called the profit and if negative it is called as loss.

Profit/Loss %: This is the profit/loss as a percentage of the C.P.

Margin: Normally is in % terms only. This is the profit as a percentage of S.P.

Marked Price: This is the price of the product as displayed on the label.

Discount: This is the reduction given on the marked price before selling it to a customer. If the trader wants to make a loss he can offer a discount on the cost price as well

Mark-up: This is the increment on the cost price before being sold to a customer.

It is also known as list price or Tag price which is written on the item. The markup price written is always greater than the actual C.P of the item and the percentage rise in the mark-up price is on the C.P of the item.

Percentage increase in the Mark-up price = (MP - CP)/ CPx100

IMPORTANT FORMULAE

1. Gain = (S.P.) - (C.P.)

2. Loss = (C.P.) - (S.P.)

3. Loss or gain is always reckoned on C.P.

4. Gain Percentage: (Gain %)

$$\text{Gain \%} = \left(\frac{\text{Gain x 100}}{\text{C.P.}} \right)$$

5. Loss Percentage: (Loss %)

$$\text{Loss \%} = \left(\frac{\text{Loss x 100}}{\text{C.P.}} \right)$$

6. Selling Price: (S.P.)

$$\text{SP} = \left[\frac{(100 + \text{Gain \%})}{100} \times \text{C.P} \right]$$

7. Selling Price: (S.P.)

$$\text{SP} = \left[\frac{(100 - \text{Loss \%})}{100} \times \text{C.P.} \right]$$

8. Cost Price: (C.P.)

$$\text{C.P.} = \left[\frac{100}{(100 + \text{Gain \%})} \times \text{S.P.} \right]$$

9. Cost Price: (C.P.)

$$\text{C.P.} = \left[\frac{100}{(100 - \text{Loss \%})} \times \text{S.P.} \right]$$

10. If an article is sold at a gain of say 35%, then S.P. = 135% of C.P.

11. If an article is sold at a loss of say, 35% then S.P. = 65% of C.P.

12. When there are two successive profits of a% and b%, then the resultant profit percent = $\left(a + b + \frac{a \times b}{100} \right) \%$

13. When there is a profit of a% and a loss of b% in a transaction,

then the resultant profit percent = $\left(a - b - \frac{a \times b}{100} \right) \%$

14. Buy x get y free i.e., if x+y articles are sold at cost price of x articles, then the percentage discount = $\frac{y}{x+y} \times 100$

15. Successive Discounts

In case of successive discounts of a% and b%, the effective discount = $\left(a + b - \frac{a \times b}{100} \right) \%$

16. If two items are sold each at rupees R, one at a gain of say x%, and the other at a loss of x%, then the seller always incurs a loss given by:

$$\text{Loss \%} = \left(\frac{\text{Common Loss and Gain \%}}{10} \right)^2 = \left(\frac{x}{10} \right)^2.$$

The value of loss is given by $\frac{2x^2 R}{100^2 - x^2}$

In case the cost price of both the items is the same and percentage loss and gain are equal, then net loss or profit is zero. The difference between the two cases is that the cost price in the first case is not the same, and in the second case, it is the same.

17. If a trader professes to sell his goods at cost price, but uses false weights, then

Gain % = $\left[\frac{Error}{True\ Value - Error} \times 100 \right] \%$

Type 1 – Profit & Loss Percentage

Q1. If the cost price is 96% of selling price then what is the profit %?
    A. 3.13   B. 2.45   C. 2.34   D. 4.17

Q2. Monika purchased a pressure cooker at 9/10th of its selling price and sold it at 8% more than its S.P. Find her gain percent?
    A.20%   B. 10%   C. 15%   D. 30%

Q3. A vendor bought bananas at 6 for Rs.10 and sold them at 4 for Rs.6 .What is the gain/ loss percent?
    A. 12% profit   B. 20% loss   C. 10% loss   D. 15% profit

Q4. A vendor bought toffees at 6 for a rupee. How many for a rupee must he sell to gain 20%?
    A. 10   B. 5   C. 15   D. 22

Q5. A shopkeeper buys scientific calculators in bulk for Rs. 15 each. He sells them for Rs. 40 each. Calculate the profit on each calculator as percentage of the cost price.
    A. 166.67%   B. 150%   C. 66.67%   D. 123%

Q6. If the cost price of a book is Rs. 150 and selling price is 137.50, then calculate the percentage loss on the book?
    A. 12.33%   B. 8.33%   C. 10%   D. 15%

Q7. What is the loss percent if a man loses Rs.10 on selling and article for Rs.100?
    A. 120/13   B. 111/12   C. 100/11   D. 120/11

Q8. If selling price is doubled, the profit triples. Find the profit percent?
    A. 300%   B. 200%   C. 150%   D. 100%

Q9. A shopkeeper bought an article for Rs.319.60. Approximately at what price should he sell the article to make 25% profit?
    A. 389   B. 400   C. 405   D. 395

Q10. A trader mixes 26 kg of rice at Rs. 20 per kg with 30 kg of rice of other variety at Rs. 36 per kg and sells the mixture at Rs. 30 per kg. His profit percent is?
    A. No profit, no loss   B. 5 %   C. 8 %   D. 10 %

Q11. By selling 45 lemons for Rs 40, a man loses 20%. How many should he sell for Rs 24 to gain 20% in the transaction?
    A. 16   B. 18   C. 20   D. 22

Type 2 – Cost Price in Terms of Selling Price

Q12. The cost price of 21 articles is equal to selling price of 18 articles. Find gain or loss %?
    A. 50/3% gain   B. 60/3% gain   C. 70/3% loss   D. 80/3% loss

Q13. A man sells 320 mangoes at the cost price of 400 mangoes. His gain percent is?
    A. 25%   B. 30%   C. 35%   D. 15%

Q14. If the cost of 30 articles is equal to the selling of 20 articles, find the profit percent?
    A. 40   B. 50   C. 45   D. 55

Type 3 – Error in Weight and Dishonest Dealer

Q15. A dishonest dealer professes to sell his goods at cost price but uses a weight of 900 grams for a kg weight. Find his gain percent.
    A. 11.11   B. 33.33   C. 12   D. Cannot be determined

Q16. A shopkeeper claims that he is selling sugar at Rs 23/kg which cost him Rs 25/kg but he is giving 800gm instead of 1000gm. What is his percentage profit or loss?
    A. 15% profit   B. 15% loss   C. no profit no loss   D. Cannot be determined

Q17. Lalit marks up his goods by 40% and gives a discount of 10%. Apart from this, he uses a faulty balance also, which reads 1000 gm for 800 gm. What is his net profit percentage?
    A. 57.5% loss   B. 57.5% profit   C. 60% profit   D. Cannot be determined

Q18. A shopkeeper sells rice to a customer, using false weights and gains 100/8 % on his cost. What weight has he substituted for a kilogram?
    A. 750 gms   B. 800 gms   C. 880 gms   D. 888.89 gms

Type 4 – When SP is Same for Two Items

Q19. A man sells 2 flats for Rs 675958 each. On one he gains 16% while on the other his losses 16%. How much does his gain/loss in the whole transaction?
    A. 3.56% loss   B. 3.56% gain   C. 2.56% gain   D. 2.56% loss

Q20. If a shopkeeper sells two items at the same price. If he sells one of them at a profit of 10% and the other at a loss of 10%, find his profit/loss percentage?
    A. 1%profit   B.1% loss   C. No profit no loss   D. None of these

Type 5 – Single and Successive Discounts

Q21. A shopkeeper marks the price of the price of the article at Rs.80. Find the cost if after allowing a discount of 10%, he stills gains 20% on the cost price?
    A. 60   B. 40   C. 29   D. 39

Q22. An article was sold for Rs. Y after giving a discount of x%. Then, its list price is _____?
    A. 100y/(100-x)   B. (100-x)/y   C. (100-x)/90y   D. x/(100-y)

Q23. How much % must be added to the cost price of goods so that a profit of 20% must be made after throwing off a discount of 10% from the marked price?
    A. 14%   B. 20%   C. $33\frac{1}{3}$ %   D. 35 %

Q24. After getting 2 successive discounts, a shirt with a list price of Rs 150 is available at Rs 105. If the second discount is 12.55, find the first discount.
    A. 50%   B. 20%   C. 67%   D. 40%

Q25. Find the single discount equivalent to successive discounts of 40% and 20%.
    A. 52%   B. 45%   C. 46%   D. 48%

Q26. An article is listed at Rs. 65. A customer bought this article for Rs. 56.16 and got two successive discounts of which the first one is 10%. What was the other rate of discount of this scheme that was allowed by the shopkeeper?

    A. 3%   B. 4%   C. 6%   D. 2%

Q27. Tarun got 30% concession on the labelled price of an article and sold it for Rs. 8750 with 25% profit on the price he bought. What was the labelled price?

    A. 10000   B. 12000   C. 13000   D. 14000

Q28. Raj got a new chair for 35% discount. Had Raj got no discount, Raj would have had to pay Rs. 224 more. How much did Raj pay for the chair?

    A. Rs. 416   B. Rs. 640   C. Rs. 208   D. Rs. 224

Q29. Which of the following will yield maximum discount on Rs. 6896?

1) 2 successive discounts of 5% and 5%
2) Single discount of 10%
3) 2 successive discounts of 8% and 2%

    A. 3   B. 2   C. 1   D. All will yield same discount

Q30. Sonali could not decide between discount of 30% or two successive discounts of 25% and 5%, both given on shopping of Rs. 2000. What is the difference between both the discounts?

    A. Rs.15   B. Rs. 25   C. Rs. 100   D. There is no difference

Q31. Chandrika raised the price of their products by 40%. How much discount should they give so as to sell the products on no profit no loss basis?

    A. 40%   B. 28.5%   C. 22.5%   D. 32.75%

Type 6 – Goods Passing Through Successive Hands

Q32. Peter bought an item at 20% discount on its original price. He sold it with 40% increase on the price he bought it. The new sale price is by what percentage more than the original price?

    A. 12%   B. 13%   C. 15%   D. 17%

Q33. A man bought an article and sold it at a gain of 5 %. If he had bought it at 5% less and sold it for Re 1 less, he would have made a profit of 10%. The C.P. of the article was?

    A. Rs. 100   B. Rs. 150   C. Rs. 200   D. Rs. 250

Q34. A trader sold an article at a loss of 5% but when he increased the selling price by Rs.65 he gained 3.33% on the cost price. If he sells the same article at Rs. 936, what is the profit percentage?

    A. 15%   B. 16.66 %   C. 20 %   D. Data Insufficient

Q35. A person incurs a loss of 5% be selling a watch for Rs. 1140. At what price should the watch be sold to earn 5% profit?

    A. Rs.1200   B. Rs.1230   C. Rs.1260   D. Rs.1290

Q36. The marked price of an article is increased by 25% and the selling price is increased by 16.66%, then the amount of profit doubles. If the original marked price be Rs. 400 which is greater than the corresponding cost price by 33.33%, what is the increased selling price?

    A. 240   B. 360   C. 420   D. 600

Q37. Bhajan Singh purchased 120 reams of paper at Rs 80 per ream. He spent Rs 280 on transportation, paid octroi at the rate of 40 paise per ream and paid Rs 72 to the coolie. If he wants to have a gain of 8 %, what must be the selling price per ream?

    A. 90   B. 89   C. 87.48   D. 86

Q38. If the manufacturer gains 10 %, the wholesale dealer 15 % and the retailer 25 %, then find the cost of production of a table if the retail price was Rs 1265

    A. Rs. 750   B. Rs. 800   C. Rs. 850   D. Rs. 900

FAQs @ Placements

Q39. One year payment to the servant is Rs. 200 plus one shirt. The servant leaves after 9 months and receives Rs. 120 and a shirt. Then find the price of the shirt?

A. Rs. 80   B. Rs. 100   C. Rs. 120   D. Cannot be determined

Q40. A merchant buys two articles for $600. He sells one of them at a profit of 22% and the other at a loss of 8% and marks no profit or loss in the end. What is the selling price of the article that he sold at a loss?

A. $404.80   B. $440   C. $536.80   D. $160

Q41. A person has Rs 100/- in his pocket, he can as 25 pencils or 15 books. He kept 15% of the money for traveling expenses and purchased 5 pencils. So how many books he can purchase with the remaining money?

A. 10   B. 9   C. 12   D. Cannot be determined

Q42. As a means of encouraging company employees to use public transportation an employer is offering a $0.50 per ride discount on bus fares. John normally spends $16.00 per week to ride the bus and from work Monday-Friday. How much will it cost him after the discount?

A. $12.00   B. $11.00   C. $13.50   D. $15.50

Q43. By selling 99 pens, a trader gains the cost of 33 pens. Find his gain percentage?

A. 33 1/3%   B. 66 2/3%   C. 50%   D. 75%

Q44. If by selling an article for RS.100, a man gains Rs.15 then his gain percent is?

A. 16 11/17%   B. 17 11/16%   C. 17 11/17%   D. 18 11/18%

Q45. The cost of an article including the sales tax is Rs 616.The rate of sales tax is 10%. If the shopkeeper has made a profit of 12%, then the cost price of the article is?

A. 500   B. 600   C. 700   D. 800

Q46. Kunal bought a suitcase with 15% discount on the labeled price. He sold suitcase for Rs 2880 with 20% profit on the labeled price. At what price did he buy the suitcase?

A. 1040   B. 2040   C. 4040   D. 3040

Q47. If a merchant offers a discount of 40% on the marked price of his goods and thus ends up selling at cost price, what was the % mark up?
A. 28.57%   B. 40%   C. 66.66%   D. 58.33%

Q48. Rahim buys mangoes at the rate of 3kg for Rs.21 and sells them at 5kg for Rs.50. To earn Rs.102 as profit, he must sell?
A. 34Kg   B. 33Kg   C. 32Kg   D. 31Kg

Q49. A shopkeeper sells 25 articles at Rs. 45 per article after giving a discount of 10% and earns 50% profit. If the discount is not given, the profit gained is?
A. 66 2/3 %   B. 23 2/5 %   C. 30 2/41 %   D. 89 %

Q50. A coal merchant makes a profit of 20% by selling coal at Rs. 25 per quintal. If he sells the coal at Rs. 22.50 per quintal, what is his profit percentage on the whole investment?
A. 7 %   B. 8 %   C. 9 %   D. 10 %

Q51. A shopkeeper bought 240 chocolates at Rs. 9 per dozen. If he sold all of them at Re. 1 each what was his profit percentage?
A. 3 1/3 %   B. 11 1/11 %   C. 11 1/3 %   D. 33 1/3%

Q52. The cost price of 20 articles is the same as the selling price of x articles. If the profit is 25%, then the value of x is?
A. 12   B. 20   C. 16   D. 22

Q53. On selling 17 balls at Rs. 720, there is a loss equal to the cost price of 5 balls. The cost price of a one ball is?
A. 70   B. 60   C. 50   D. 80

Q54. When a plot is sold for Rs. 18,700, the owner loses 15%. At what price must that plot be sold in order to gain 15%?
A. 24,500   B. 25,300   C. 24,600   D. 25,400

Q55. After successive discounts of 12% and 5% an article was sold for Rs. 209. What was the original price of the article?
A. 200   B. 250   C. 300   D. 150

Q56. A machine is sold at a profit of 10%. Had it been sold for Rs.40 less, there would have been a loss of 10%. What was the cost price?
A. Rs. 175   B. Rs. 200   C. Rs. 225   D. Rs. 250

Q57. The retail price of a water geyser is Rs.1265. if the manufacturer gains 10%, the wholesale dealer gains 15% and the retailer gains 25%, then the cost of the product is?
A. Rs. 800   B. Rs. 900   C. Rs. 700   D. Rs. 600

Q58. If 7% of the sale price of an article is equivalent to 8% of its cost price and 9% or its sale price exceeds 10% of its cost price by Rs.1, then what is the cost price of the article?
A. Rs. 400   B. Rs. 350   C. Rs. 300   D. Rs. 280

Q59. A man purchased two TV set for Rs. 5000 each. He sold first TV set on 20% profit and second TV set at 20% loss. Find his profit or loss percentage on the whole transaction?
A. 20% profit   B. 10% profit   C. 10% loss   D. No profit no loss

Q60. A man purchased two bicycles for Rs. 4000 each. He sold first bicycle on 30% profit and second bicycle at 10% loss. Find his profit or loss percentage on the whole transaction?

A. 20% profit   B. 10% profit   C. 15% profit   D. 10% loss

Q61. A man sold two cars for Rs. 250000 each. The first one at 40% profit and second one at 40% loss. Find his profit or loss percentage?

A. 16% loss   B. 20% profit   C. 20% loss   D. No profit no loss

Q62. A man sold two radios for Rs.720 each. The first one at 20% profit and second one at 10% loss. Find his gain or loss percentage?

A. 20/7 % profit   B. 10/7 % profit   C. 10/7 % loss   D. No profit no loss

Q63. A trader professes to sell his goods at a loss of 8% but weights 900 grams in place of a kg weight. Find his real loss or gain per cent?

A. 2% loss   B. 2.22% gain   C. 2% gain   D. None of these

CHAPTER-5

AVERAGE

AVERAGE

The result obtained by adding several quantities together and then dividing this total by the number of quantities is called Average.

Average= Sum of quantities / Number of Quantities

An average is the mean value of a set of numbers or values. It is given by:-

Average= (x1+x2+x3+……..+xn)/n

Example: If the ages of 4 students are 20 years, 22 years, 18 years and 24 years, then what is the average age of the students?

Solution: Average Age = (20+22+18+24)/4

Important Points to Remember

1.If all the numbers are increased by 'a' then their average is also increased by 'a'.
2. If all the numbers are decreased by 'a' then their average is also decreased by 'a'.
3. If all the numbers are multiplied by 'a' then their average is also multiplied by 'a'.
4. If all the numbers are divided by 'a' then their average is also divided by 'a'.

Age and Average

1. If the average age of n persons decreases by x years. Then, the total age of n persons decreases by (n*x) yr
2. If the average age of n persons increases by x years. Then, the total age of n persons increases by (n*x) yr

Example: The average age of 6 persons is increased by 2 years when one of them, whose age is 26 years is replaced by a new man. What is the age of the new person?

Solution: Total age increased=6*2=12 year
Age of new persons= (26+12) =38 year
The increase in the total age of 6 persons is due to the replacement of a person aged 26 year with a person who is 12 years older to him.

Average of Some Important Series of Numbers

The average of odd numbers from 1 to n,
= **(Last odd number +1)/2**   (n=Last odd number)

The average of even numbers from 2 to n,
= **(Last even number +2)/2**   (n=Last even number)

Important Points

1. Average of first 'n' natural numbers   = (n+1)/2

2. The average of first 'n' consecutive even numbers = (n+1)

3. The average of first 'n' consecutive odd numbers   = n

4. The average of consecutive numbers   = (First Number+ Last Number)/2

5. The average of 1 to 'n' odd numbers   = (Last Odd Number+1)/2

6. The average of 1 to 'n' even numbers   = (Last Even Number+2)/2

7. The average of square of natural numbers till n   = [(n+1) (2n+1)]/6

8. The average of cubes of natural numbers till n   = [n(n+1)^2]/4

9. Correct Sum = Wrong Sum-Wrong Value+ Right Value

10. The average of squares of 1st n consecutive even no's   = [2(n+1) (2n+1)]/3

11. The average of squares of consecutive even no's from 1 to n   = [(n+1) (n+2)]/3

12. The average of squares of consecutive odd no's from 1 to n   = [n (n+2)]/3

13. If the average of n1 observation is a1 and n2 observation is a2.Then, the average of all the observations is:-

A= $\dfrac{n1a1+n2a2+n3a3+\ldots\ldots\ldots\ldots\ldots}{n1+n2+n3+\ldots\ldots\ldots\ldots\ldots\ldots\ldots}$

14.If the average of 'm' observations is 'a 'and average of 'n' observations taken out of 'm' is 'b'.Then,
 Average of rest of the observations= (ma-nb)/(m-n)

Average Speed

1. Average Speed=**Total Distance/ Total Time**
Let the distance between two points A and B is d and speed in travelling from point A to B is x km/hr and from point B to A is y km/hr.
Then, average speed= (2xy) / (x+y)

Example: If a person travels two equal distances at 10 km/hr. and 30 km/hr. What is the average speed for the entire journey?
Solution: Average Speed =   2xy / (x+y)

$$= (2*30*10)/30+10$$
$$= 600 / 40 \qquad = 15 \text{ km/hr.}$$

2. If a person covers three equal distances at a speed of A km/hr, B Km/hr and C Km/hr. Then, the average speed for the whole journey will be = **3 ABC/ (AB+BC+CA)**

3. If a person covers 'P' part of his total distance with a speed of 'x', 'Q' part of his total distance with a speed of 'y', 'R' part of his total distance with a speed of 'z'. Then,

Average Speed = $\dfrac{xyz}{Pyz+Qxz+Rxy}$

Example: Find the average of cubes of natural numbers till 7?
Solution: Average= $[7(7+1)^2]/4$

$$= (7*8*8)/4$$

$$= 112$$

Type 1 - Averages and Numbers

Q1. Find the average of the following set of scores 216,463,154,605,446,336?
  A. 370   B. 560   C. 360   D. 520

Q2. The average of four consecutive even numbers A, B, C and D is 55.What is the product of A and C?
  A. 2812   B. 2912   C. 2512   D. 2069

Q3. Average of 4 consecutive odd numbers is 106.What is the third number in the ascending order?
  A. 109   B. 107   C. 110   D. 120

Q4. The average of 5 positive integers is 55.8.If the average of first two integers is 4 and the average of fourth and fifth integers is 69.5.Then, find the third integer?
  A. 42   B. 68   C. 72   D. 45

Type 2 - Partial Average

Q5. In a college, 16 girls have the average age as 18 years and 14 boys have the average age as 17 years. What would be the average age of the entire college?
  A. 18.64   B. 17.54   C. 20.84   D. 16.34

Q6. The average salary of 25 employees in a company per month is Rs.6000.If the manager's salary is also added then the average increases by Rs.500.What would be the salary of the manager?
  A. 17,000   B. 19,000   C. 21,000   D. 25,000

Q7. The average wages of a worker during a fortnight comprising 15 consecutive working days was Rs.90 per day. During first 7 days, his average wages was Rs.87 per day. And the average wages during the last 7 days was Rs.92 per day. What was his wage on the 8th day?
  A. 67   B. 79   C. 97   D. 98

Q8. 40% of the employees in a factory are workers. All the remaining employees are executive. The annual income of each worker is Rs.390. The annual income of each executive is Rs.420.What is the average annual income of all the employees in the factory together?
  A. 480   B. 580   C. 408   D. 690

Q9. The average annual income of Ramesh and Suresh is Rs.3800.The average annual income of Suresh and Pratap was Rs.4800.The average annual income of Pratap and Ramesh was Rs.5800.What is the average of the incomes of three?
  A. 3600   B. 4800   C. 5200   D. 4600

Q10. On a School's annual day sweets were to be distributed amongst 112 children. But on that particular day, 32 children were absent. Thus, the remaining children got extra 6 sweets. How many sweets did each child originally supposed to get?
  A. 15   B. 25   C. 30   D. 45

Q11. Arithmetic mean of the scores of a group of students in a test was 52.The brightest 20% of them secured a mean score of 80 and the dullest 25% a mean score of 31.The mean of remaining 55% is?
  A. 52.5%   B. 51.4%   C. 62.5%   D. 72.7%

Type 3 - With/Without Replacement

Q12. When a student weighing 45 kg left a class, the average weight of the remaining 59 students increased by 200 grams. What is the average weight of the remaining 59 students?
   A. 50   B. 57   C. 65   D. 80

Q13. There were 35 students in a hostel. Due to the admission of 7 new students the expenses of the mess were increased by Rs.42 per day while the average expenditure per head diminished by Re.1.What was the original expenditure of the mess?
   A. 240   B. 440   C. 420   D. 540

Q14. The average age of 40 students of a class is 18 years. When 20 new students are admitted to the same class the average age of the class is increased by 6 months. The average age of the newly admitted students is?
   A. 19 Years 6 months   B. 19 years   C. 18 Years   D. 20 years 2 months

Type 4 - Mistaken Average

Q15. The average of 8 observations was 25.5.It was noticed later that two of those observations were wrongly taken. One observation was 14 more than the original value and the other observation was wrongly taken as 31 instead of 13.What will be the correct average of those 8 observations?
   A. 22.5   B. 21.5   C. 25   D. 24.5

Q16. The Arithmetic mean of 100 numbers was computed as 89.05.It was later found that two numbers 92 and 83 have been misreads as 192 and 33 respectively. What is the correct Arithmetic Mean of the numbers?
   A. 88.66   B. 88.55   C. 77.02   D. 90.54

Q17. In an examination, the average marks of all the students calculated to be 58 marks. It was later found that marks of 60 students were wrongly written as 70 instead of 50.If the corrected average is 55, find the total number of students who took the exam?
   A. 500   B. 450   C. 400   D. 420

Type 5 – Problems on Cricket

Q18. A cricketer has completed 10 innings and his average is 21.5 runs. How many runs must he make in his next innings so as to raise his average to 24?
   A. 50   B. 24   C. 49   D. 52

Q19. A cricketer had a certain average of runs for his 64th innings. In his 65th innings, he is bowled out for no score on his part. This brings down his average by 2 runs. His new average of run is?
   A. 135 Runs   B. 128 Runs   C. 150 Runs   D. 132 Runs

Q20. The batting average of a cricket player for 64 innings is 62 runs. His highest score exceeds his lowest score by 180 runs. Excluding these two innings, the average of the remaining innings becomes 60 runs. His highest score is?
   A. 212 Runs   B. 220 Runs   C. 214 Runs   D. 241 Runs

Type 6 - Miscellaneous

Q21. 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. The average age of the family is?

    A. 31.7   B. 32.7   C. 13.7   D. 35.5

Q22. The average temperature from 9th to 16th of a month is 30 degree C and that from 10th to 17th is 31 degree C. What is the temperature on 17th, if temperature on 9th is 35 degree C?

    A. 40 Degree C   B. 43 Degree C   C. 45 Degree C   D. 30 Degree C

Q23. Some students planned a trip an estimated their total expenses to be Rs.500.However,5 of them could not go for the trip and as a result average expenditure of the remaining students is increased by Rs.5.How many students have gone for the trip?

    A. 20   B. 25   C. 23   D. 22

Q24. A ship 40 km from shore springs a leak which admits 3 ¼ Quintals of water in 12 mins.60 Quintals would suffice to sink the ship, but its pump can throw out 12 quintals of water in 1 hour. Find the average rate of sailing so, that it may reach the shore just it begins to sink?

    A. 4.5 Km/hr   B. 5.4 Km/hr   C. 6 Km/hr   D. 7 Km/hr

FAQs @ Placements

Q25. The average of 2,7,6 and x is 5 and the average of 18,1,6,x and y is 10. What is the value of y?

    A. 5   B. 10   C. 20   D. 30

Q26. Nine persons went to a hotel for taking their meals. Eight of them spent Rs 12 each on their meals and the ninth spent Rs.8 more than the average expenditure of all the nine. What was the total money spent by them?

    A. 117   B. 180   C. 150   D. 200

Q27. In seven given numbers, the average of first four numbers is 4 and that of the last four numbers is also 4. If the average of these seven numbers is 3, the fourth number is?

    A. 3   B. 4   C. 7   D. 11

Q28. The average weight of 29 students is 28 kg. By the admission of a new student, the average weight is reduced to 27.8 kg. The weight of the new student is?

    A. 22 kg   B. 21.6 kg   C. 22.4 kg   D. 21 kg

Q29. The average age of a committee of 8 members is 40 years. A member aged 55 years retired and his place was taken by another member aged 39 years . The average age of present committee is?

    A. 39 years   B. 38 years   C. 36 years   D. 35 years

Q30. Eight persons participated in a shooting competition. The top score in the competition is 85 points. Had the top score been 92 points instead of 85 points, the average score would have been 84. Find the number of points actually scored in the competition?

    A. 645   B. 655   C. 665   D. 636

Q31. The average mark of a class of twenty students is 64. If three students whose marks are 32,28 and 34 are removed , then find the approximate average mark of the remaining students of the class?

    A. 71   B. 74   C. 57   D. 70

Q32. The number of students in the three sections of a class are in the ratio 2:3:4. The average marks scored in each of these sections is in the ratio 4:3:1. By what percent is the average mark of the second section more than the class average?

    A. 23.27%   B. 28.57%   C. 32.38%   D. 36.74%

Q33. The average age of 40 students is 8 years. If the age of teacher is also included , then their average age increases by half a year. What is the age of the teacher?

    A. 45 years   B. 48.5 years   C. 28.5 years   D. 26.5 years

Q34. The average wages of a worker during a fortnight comprising 15 consecutive working days was Rs.90 per day. During the first 7 days, his average wages was Rs.87/day and the average wages during the last 7 days was Rs.92 per day. What was his wage on the 8th day?

    A. 83   B. 92   C. 90   D. 97

Q35. The average temperature on Wednesday, Thursday and Friday was 25°. The average temperature on Thursday, Friday and Saturday was 240. If the temperature on Saturday was 27°, what was the temperature on Wednesday?

    A. 24°   B. 21°   C. 27°   D. 30°

Q36. The average age of a group of 12 students is 20years. If 4 more students join the group, the average age increases by 1 year. The average age of the new students is?

    A. 24   B. 26   C. 23   D. 22

Q37. When a student weighing 45 kg left a class, the average weight of the remaining 59 students increased by 200g. What is the average weight of the remaining 59 students?

    A. 57 kg   B. 56.8 kg   C. 58.2 kg   D. 52.2 kg

Q38. The average of 5 quantities is 10 and the average of 3 of them is 9. What is the average of the remaining 2?

    A. 11   B. 12   C. 11.5   D. 12.5

Q39. The average age of a family of 5 members is 20 years. If the age of the youngest member be 10 years then what was the average age of the family at the time of the birth of the youngest member?

    A. 13.5   B. 14   C. 15   D. 12.5

Q40. A man whose bowling average is 12.4 takes 5 wickets for 26 runs and thereby decreases his average by 0.4. Find the number of wicket taken by him before his last match**.**

    A. 85   B. 90   C. 95   D. None of these

CHAPTER 6

PROBLEMS ON AGES & NUMBERS

Practice Exercise – Problems on Ages

Q1. Present ages of Sameer and Anand are in the ratio of   5 : 4 respectively. Three years hence, the ratio of their ages will become 11 : 9 respectively. What is Anand's present age in years?
   A.   22   B. 24   C. 26   D. 30

Q2. One year ago, Promila was four times as old as her daughter Sakshi. Six years hence, Promila's   age will exceed her daughter's age by 9 years. The ratio of the present ages of Promila and her daughter is?
   A.   13 : 4   B. 4 : 13   C. 5 : 20   D. 20 : 5

Q3. A father said to his son, "I was as old as you are at present at the time of your birth." If the father's age is 38 years now, the son's age five years back was?
   A.   14   B. 19   C. 38   D. 40

Q4. Ayesha's father was 38 years of age when she was born while her mother was 36 years old when her brother four years younger to her was born. What is the difference between the ages of her parents?
   A.   2 years   B. 4 years   C. 6 years   D. 8 years

Q5. Father is aged three times more than his son Ronit. After 8 years, he would be two and a half times of Ronit's age. After further 8 years, how many times would he be of Ronit's age?
   A.   1.5   B. 2   C. 2.5   D. 3

Q6. The total age of A and B is 12 years more than the total age of B and C. C is how many years younger than A?
   A.   12   B. 13   C. 14   D. 15

Q7. A person's present age is two-fifth of the age of his mother. After 8 years, he will be one-half of the age of his mother. How old is the mother at present?
   A.   38   B. 40   C. 42   D. 44

Q8. In 10 years, A will be twice as old as B was 10 years ago. If A is now 9 years older than B, the present age of B is?
   A.   19   B. 29   C. 39   D. 49

Q9. Sachin is younger than Rahul by 7 years. If the ratio of their ages is 7:9, find the age of Sachin?
   A.   24.5   B. 25.5   C. 26.5   D. 27.5

Q10. The sum of the present ages of a father and his son is 60 years. Five years ago, father's age was four times the age of the son. So, now the son's age will be?
   A.   5   B. 10   C. 15   D. 20

Q11. The ratio of the ages of Maala and Kala is 4 : 3. The total of their ages is 2.8 decades. The proportion of their ages after 0.8 decades will be [1 Decade = 10 years]?
   A.   4 : 3   B. 12 : 11   C. 7 : 4   D. 6 : 5

Q12. The ages of Krish and Vaibhav are in the proportion of 3 : 5. After 9 years, the proportion of their ages will be 3 : 4. Then the current age of Vaibhav is?
   A.   10   B. 13   C. 15   D. 18

Q13. The age of a person is thrice the total ages of his 2 daughters. 0.5 decades hence, his age will be twice of the total ages of his daughters. Then what is the father's current age [0.5 Decades = 5 Years]?

    A. 35   B. 40   C. 45   D. 47

Q14. Sivagami is 2 years elder than Meena. After 6 years the total of their ages will be 7 times of their current age. Then age of Sivagami is?

    A. 19   B. 17   C. 15   D. Data inadequate

Q15. A man is 24 years older than his son. In two years, his age will be twice the age of his son. The present age of his son is?

    A. 20   B. 21   C. 22   D. 23

Q16. If one-third of one-fourth of a number is 15, then three-tenth of that number is?

    A. 54   B. 45   C. 36   D. 58

Q17. The difference between a two-digit number and the number obtained by interchanging the digits is 36. What is the difference between the sum and the difference of the digits of the number if the ratio of the unit digit to tenth digit of the number is 1 : 2?

    A. 8   B. 16   C. 4   D. 12

Q18. Three times the first of the three consecutive odd integers is 3 more than twice the third. What is the third integer?

    A. 15   B. 14   C. 12   D. 17

Q19. A two-digit number is such that the product of the digits is 8. When 18 is added to the number, then the digits are reversed. The number is?

    A. 18   B. 42   C. 24   D. None of these

Q20. In a two-digit, if it is known that its unit's digit exceeds its ten's digit by 2 and that the product of the given number and the sum of its digits is equal to 144, then the number is?

    A. 24   B. 26   C. 28   D. 30

CHAPTER 7

Interest

SIMPLE INTEREST

If the interest on a sum borrowed for certain period is calculated uniformly, it is called **simple interest (SI).**Simple interest is a quick method of calculating the interest charge on a loan.

Principal: The amount borrowed or invested.

Loan period or duration: Is the time that the principal amount is either borrowed or invested. It is usually given in years, but in some cases, it may be quoted in months or even days.

Interest: Is the extra money paid by the borrower to the owner (lender) as a form of compensation for the use of the money borrowed.

The statement **"rate of interest 10% per annum"** means that the interest for one year on a sum of **Rs.100** is **Rs.10**. If not stated explicitly, rate of interest is assumed to be for one year.

Formula

SIMPLE INTEREST = $\dfrac{\text{PRINCIPAL*RATE OF INTEREST*TIME}}{100}$

Example: Calculate the simple interest on Rs. 1000 at the rate of 5% per annum for a time period of 2 years.
Solution: Principal=1000
          Rate of interest=5% p.a.
          Time= 2 years
          SIMPLE INTEREST= $\dfrac{P*R*T}{100} = \dfrac{1000*5*2}{100}$ = Rs.100

Points to Remember

$P = \left(\dfrac{100 \times S.I.}{R \times T}\right)$; $R = \left(\dfrac{100 \times S.I.}{P \times T}\right)$ and $T = \left(\dfrac{100 \times S.I.}{P \times R}\right)$.

COMPOUND INTEREST

Compound Interest is the interest calculated on a sum of money which includes principal and interest calculated for the previous year.

Example: Calculate the interest if compounded annually for an amount of Rs. 100 for a time period of 3 years at the rate of 10 % per annum.
Solution: Here, Principal =Rs. 100
    Time Period=3 years
    Rate of interest =10% per annum

compounding is regular addition of interest

100 interest for 1st year **110** interest for 2nd year **121** interest for 3rd year **133.31**
at 10% p.a. is 10   at 10% p.a. is 11   at 10% p.a. is 12.1

Amount 110 is the principal for the 2nd year, amount 121 is the principal for the 3rd year, and amount 133.1 is the principal for the 4th year.

Under compound interest, Amount is found by the formula given below:

$$A = P(1 + \frac{R}{100})^n$$

Points to Remember

Let Principal = P, Rate = R% per annum, Time = n years.

1. When interest is compound Annually:

   Amount = P $\left(1 + \frac{R}{100}\right)^n$

2. When interest is compounded Half-yearly:

   Amount = P $\left[1 + \frac{(R/2)}{100}\right]^{2n}$

3. When interest is compounded quarterly:

   Amount = P $\left[1 + \frac{(R/4)}{100}\right]^{4n}$

4. Present worth of Rs. x due n years hence is given by:

   Present Value = $\frac{x}{(1+\frac{R}{100})^n}$

5. Compound interest, **C.I.** = (Amount, **A**) – (Principal, **P**)

Type 1 – Simple Interest

Q1. A sum of money at simple interest amounts to Rs. 815 in 3 years and to Rs. 945 in 5 years. The sum is?

A. 650   B. 690   C. 620   D. 700

Q2. How much time will it take for an amount of Rs. 450 to yield Rs. 81 as interest at 4.5% per annum of simple interest?

A. 3.5 years   B. 4 years   C. 4.5 years   D. 5 years

Q3. A sum of Rs. 12,500 amounts to Rs. 15,500 in 4 years at the rate of simple interest. What is the rate of interest?

A. 3%   B. 4%   C. 5%   D. 6%

Q4. What will be the ratio of simple interest earned by certain amount at the same rate of interest for 6 years and that for 9 years?

A. 1: 3   B. 1: 4   C. 2: 3   D. Data inadequate

Q5. A person borrows Rs. 5000 for 2 years at 4% p.a. simple interest. He immediately lends it to another person at 6 ¼% per annum for 2 years. Find his gain in the transaction per year?

A. Rs. 112.50   B. Rs. 125   C. Rs. 150   D. Rs. 167.50

Q6. A father left a will of Rs.35 lakhs between his two daughters aged 8.5 and 16 such that they may get equal amounts when each of them reach the age of 21 years. The original amount of Rs.35 lakhs has been instructed to be invested at 10% p.a. simple interest. How much did the elder daughter get at the time of the will?

A. 17.5 lakhs   B. 21 lakhs   C. 15 lakhs   D. 20 lakhs

Q7. At what rate percent per annum will a sum of money double in 8 years?

A. 12.5%   B. 13.5%   C. 11.5%   D. 14.5%

Q8. A sum of Rs. 725 is lent in the beginning of a year at a certain rate of interest. After 8 months, a sum of Rs. 362.50 more is lent but at the rate twice the former. At the end of the year, Rs. 33.50 is earned as interest from both the loans. What was the original rate of interest?

A. 3.46%   B. 5%   C. 4.5%   D. 6%

Type 2 – Compound Interest

Q9. The compound interest on Rs. 30,000 at 7% per annum is Rs. 4347. The period (in years) is?

A. 2   B. 2.5   C. 3   D. 4

Q10. The Compound interest on Rs. 20,480 at 6 1⁄4 % per annum for 2 years 73 days is?

A. Rs. 2929   B. Rs. 2219   C. Rs. 3021   D. Rs. 3049

Q11. A man invests Rs.5000 for 3 years at 5% p.a. compound interest reckoned yearly. Income tax at the rate of 20% on the interest earned is deducted at the end of each year. Find the amount at the end of the third year?

A. Rs. 5624.32   B. Rs. 5423   C. Rs. 5634   D. Rs. 5976

Q12. The population of a town was 3600 three years back. It is 4800 right now. What will be the population three years down the line, if the rate of growth of population has been constant over the years and has been compounding annually?

A. Rs. 600   B. Rs. 6400   C. Rs. 6500   D. Rs. 6600

Q13. A tree increases annually by 1⁄5 th of its height. If its height today is 50 cm, what will be the height after 2 years?
A. 64 cm   B. 72 cm   C. 66 cm   D. 84 cm

Q14. The compound interest on Rs. 30,000 at 7% per annum is Rs. 4347. The period (in years) is?
A. 1   B. 2   C. 3   D. 3.5

Q15. A sum amounts to Rs. 882 in 2 years at 5% compound interest. The sum is?
A. Rs. 800   B. Rs. 822   C. Rs. 840   D. Rs. 816

Q16. What annual payment will discharge a debt of Rs. 1025 due in 2 years at the rate of 5% compound interest?
A. Rs. 560   B. Rs. 560.75   C. Rs. 551.25   D. Rs. 550

Q17. The present worth of Rs. 242 due in 2 years at 10% per annum compound interest is?
A. Rs. 180   B. Rs. 240   C. Rs. 220   D. Rs. 200

Q18. If in a certain number of years Rs. 10000 amounts to Rs. 160000 at compound interest, in half that time Rs. 10000 will amount to?
A. Rs. 50000   B. Rs. 40000   C. Rs. 80000   D. Rs. 60000

Q19. The compound interest on Rs. 30,000 at 7% per annum is Rs. 4347. The period (in years) is?
A. 1   B. 2   C. 3   D. 3.5

Type 3 – Relations and Applications

Q20. What annual payment will discharge a debt of Rs.7620 due in 3years at 16 2/3 % per annum interest compounded annually?
A. 5430   B. 4430   C. 3430   D. 2430

Q21. There is 60% increase in an amount in 6 years at simple interest. What will be the compound interest of Rs. 12,000 after 3 years at the same rate?
A. Rs. 2160   B. Rs. 3120   C. Rs. 3972   D. Rs. 6240

Q22. The difference between simple interest and compound on Rs. 1200 for one year at 10% per annum reckoned half-yearly is?
A. Rs. 2.50   B. Rs. 3   C. Rs. 3.75   D. Rs. 4

Q23. The difference between compound interest and simple interest on a sum for two years at 8% per annum, where the interest is compounded annually is Rs.16. if the interest were compounded half yearly, then the difference in two interests would be nearly?
A. Rs. 24.64   B. Rs. 21.85   C. Rs. 16   D. Rs. 16.80

Q24. On a certain sum of money, the simple interest for 2 years is Rs. 200 at the rate of 7% per annum. Find the difference in C.I. and S.I. for 2 years?
A. Rs. 11   B. Rs. 9   C. Rs. 7   D. None of these

Q25. The difference between compound interest and simple interest on an amount of Rs. 15,000 for 2 years is Rs. 96. What is the rate of interest per annum?
  A. 9%   B. 12%   C. 8%   D. 6%

Q26. A certain sum of money amounts to Rs. 1125 in 5 years and to Rs. 1200 in 8 years. Find the sum and the rate of interest?
A. Rs. 1000, 2.5% p.a.   B. Rs. 1000, 3% p.a.   C. Rs. 1500, 2.5% p.a.   D. Rs. 1500, 3% p.a.

FAQs @ Placements

Q27. Alok deposits Rs.5,000 in his bank account for 5 years to earn an interest of 12%.what amount will he get after 5 years?
A. Rs 2000   B. Rs 3000   C. Rs 5300   D. Rs 8000

Q28. Ramakant wants to earn Rs. 1,500 interest on his deposits. He plans to buy a sack of grains with the interest. He puts Rs. 5,000 into his account that earns 2.5% interest. How long will he need to leave his money in the account to earn this interest that would help him buy the sack of grains?
A. 8 years   B. 10 years   C. 12 years   D. 15 years

Q29. A Certain sum of money amounts to Rs 2500 in a span of 5 years and further to Rs.3000 in a span of 7 years at simple interest. The sum is?
A. 1200   B. 1050   C. 1250   D. 1000

Q30. The difference between the SI and CI on a certain sum of money at 10 % rate of annual interest for 2 years is Rs. 549. Find the sum.
A. 54900   B. 54000   C. 54800   D. None of these

Q31. If the rate increases by 2%, the simple interest received on a sum of money increases by Rs. 108. If the time period is increased by 2 years, the simple interest on the same sum increases by Rs. 180.The sum is?
A. Rs. 1800   B. Rs. 3600   C. Rs. 5400   D. Data inadequate

Q32. The difference between C.I. and S.I. on a certain sum of money at 10% per annum for 3 years is Rs. 620. Find the principal if it is known that the interest is compounded annually?
A. Rs. 2,00,000   B. Rs. 20,000   C. Rs. 10,000   D. Rs. 1,00,000

Q33. Two equal sums of money were invested, one at 4% and the other at 4.5%. At the end of 7 years, the simple interest received from the latter exceeded to that received from the former by Rs. 31.50. Each sum was?
A. Rs. 1,200   B. Rs. 600   C. Rs. 750   D. Rs. 900

Q34. Mr. X invested an amount for 2 years at 15 percent per annum at simple interest. Had the interest been compounded annually, he would have earned Rs. 450/- more as interest. What was the amount invested?
A. Rs. 22,000   B. Rs. 24,000   C. Rs. 25000   D. None of these

Q35. Subash purchased a refrigerator on the terms that he is required to pay Rs. 1,500 as cash down payment followed by Rs, 1,020 at the end of first year, Rs. 1,003 at the end of second year and Rs. 990 at the end of third year. Interest is charged at the rate of 10% per annum. Calculate the cost price?
A. Rs. 3,000   B. Rs. 2,000   C. Rs. 4,000   D. Rs. 5000

Q36. A person invested in all Rs. 2600 at 4%, 6% and 8% per annum simple interest. At the end of the year, he got the same interest in all the three cases. The money invested at 4% is?
A. Rs. 200   B. Rs. 600   C. Rs. 800   D. Rs. 1200

Q37. Arun invested a sum of money at a certain rate of simple interest for a period of 4 yrs. The total interest earned by him would have been 50% more than the earlier interest amount when invested for 6 years. What was the rate of interest per cent per annum?
A. 4   B. 8   C. 5   D. None of these

Q38. Three persons Amar, Akbar and Anthony invested different amounts in a fixed deposit scheme for one year at the rate of 12% per annum and earned a total interest of Rs. 3,240 at the end of the year. If the amount invested by Akbar is Rs. 5000 more than the amount invested by Amar and the invested by Anthony is Rs. 2000 more than the amount invested by Akbar, what is the amount invested by Akbar?
A. Rs. 12,000   B. Rs.10,000   C. Rs. 7000   D. Rs. 5000

Q39. An investment doubles itself in 15 years if the interest is compounded annually. How many years will it take to become 8 times?
A. 45 years   B. 40 years   C. 42 years   D. 44 years

Q40. A man borrowed a certain sum of money at the rate of 6 % per annum for the first two years, 9% per annum for the next three years, and 14% per annum for the period beyond 5 years. If he pays a total interest of Rs. 22,800 at the end of 9 years, find the amount he borrowed.
A. 24000   B. 25000   C. 30000   D. 21000

CHAPTER 8

ALLIGATIONS
&
MIXTURES

The technique of alligation is applicable in all the cases where two extreme values are given and one average value is given. It is a very useful technique which can be applied in chapters like Percentage, Simple interest, Ratio & proportion, Average etc.

This technique enables us to calculate the ratio in which extreme values/ prices/ interests/ ratios and averages should be mixed so that a given average value/price/interest/ratio and average can be obtained.

Alligation is the rule that enables us to find the proportion in which the two or more ingredients at the given price must be mixed to produce a mixture at a given price. Thus,

$$\frac{\text{Quantity of cheaper}}{\text{Quantity of dearer}} = \frac{\text{(C.P. of dearer)} - \text{(Mean Price)}}{\text{Mean Price} - \text{CP of cheaper}}$$

Find it complicated to remember the Formula?? Don't worry, keep in mind the below short cut by following the direction of the arrows:
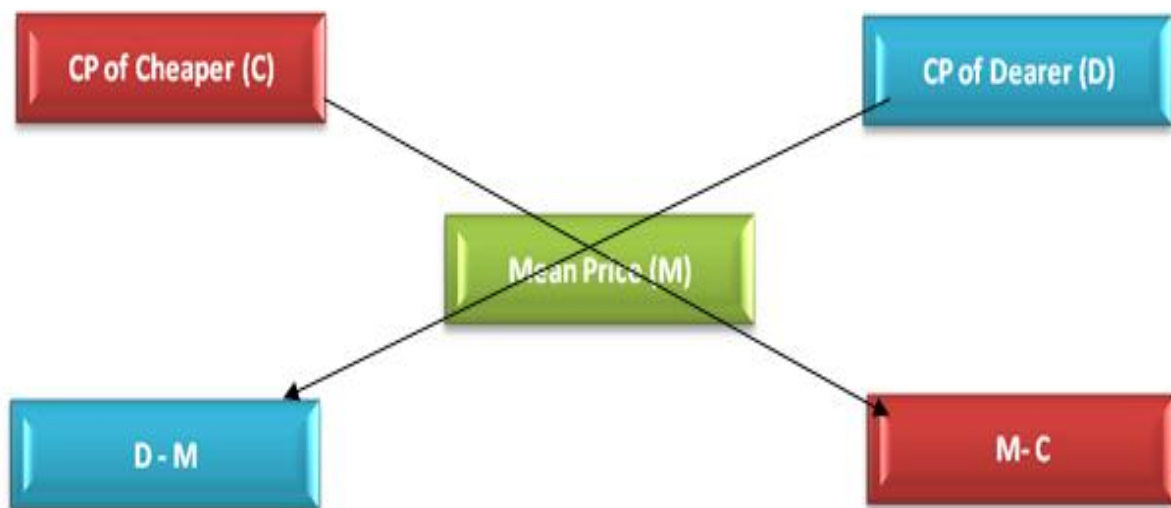
Attention please!!
1. Mean price is always less then dearer price and is always more than cheaper price.
2. The price of the first kind should always be on the left hand side.
3. *Keep in mind the simple point that the order of the ratio follows the order of what is written at the top.*

MIXTURES

Mixture or alloys contains two or more ingredients of certain quantity mixed together to get a desired quantity. The quantity can be expressed as a ratio or percentage. For ex: 1 liter of a mixture contains 250ml water and 750 ml milk. That means, ¼ of mixture is water and ¾ of mixture is milk. In other words, 25% of mixture is water and 75% of mixture is milk.

Concept 1: Finding the Quantity of an Ingredient in the Mixture

Illustration 1:
A mixture contains alcohol and water in the ratio 4 : 3. If 7 litres of water is added to the mixture, the ratio of alcohol and water becomes 3 : 4. Find the quantity of alcohol in the mixture.

Solution:
Let the alcohol : water be 4x : 3x.
Adding 7 litres of water, the fraction becomes 4x/(3x + 7) = 3∕4. On solving, we get x = 3 and alcohol = 4x = 12.

Concept 2: Quantity of Ingredient to be Added to Increase the Content of Ingredient in the Mixture to y%

Illustration 2:
A mixture of water and milk contains 80% milk. In 50 litres of such a mixture, how many litres of water is required to increase the percentage of water to 50%?

Solution:
Total mixture = 50 litres   Milk = 80% of 50 = 40 litres   Water = 20% of 50 = 10 litres
Let 'x' litres of water is added.
Now, milk = 40 litres
Water = 10+x
Total = 50+x
Now, 50% of total = Water
½ x (50 + x) = 10 + x
x = 30 litres

Concept 3: Quantity of Ingredient to be Added to Change the Ratio of Ingredients in a Mixture

Illustration 3:
729 ml of a mixture contains milk and water in the ratio 7 : 2. How much more water is to be added to get a new mixture containing milk and water in the ratio of 7 : 3?
Solution:
Milk and water in the original liquid = 7/9 × 729 = 567 and water = 2/9 × 729 = 162.
Let water to be added = x.
Then, 567/(162 + x) = 7/3
Hence, we get 1701 = 1134 + 7x; or 7x = 567; or x = 81

Concept 4: Replacement of a Part of a Solution

If a vessel contains A liters of milk and if B litres of milk is withdrawn and replaced by water, and again if B litres of mixture is withdrawn and replaced by water and this operation is replaced n times in all, then

$$\frac{\text{(Quantity of milk left after n}^{th}\text{ operation)}}{\text{(Initial quantity of milk)}} = \left[\frac{(A - B)}{A} \right]^n$$

Thus, quantity of milk/alcohol left after nth operation = $[A(1 - (B/A))^n]$
Or in other words,

Final Amount of ingredient that is not replaced =

$$\text{Initial Amount} \times \left(\frac{\text{Vol. after removal}}{\text{Vol. after replacing}} \right)^n$$

Type 1- Alligation

Q1. In what ratio must rice at Rs. 43/kg be mixed with rice at Rs 56/kg, so that mixture be worth Rs. 51/kg?

    A. 3:7   B. 5:8   C. 7:3   D. 7:5

Q2. In what ratio must rice at Rs. 20/kg be mixed with rice at Rs 12/kg, so that mixture be sold at Rs. 18/kg, with profit of 20%?

    A. 3:5   B. 5:3   C. 7:5   D. 7:3

Q3. In what ratio must rice at Rs. 42/kg be mixed with rice at Rs 24/kg, so that by selling the mixture at 40/kg, shopkeeper gain 25%?

    A. 3:4   B. 5:4   C. 4:5   D. 4:3

Q4. A shopkeeper has 50 kg rice, some part of rice he sold at 8 % profit & remaining at 18% profit. He gain 14% on the whole transaction. Find the quantity of rice sold at 8 % profit?

    A. 20 kg   B. 21 kg   C. 22 kg   D. 23 kg

Q5. A merchant has 25 kg rice, some part of rice he sold at 10 % profit & remaining at 5% loss. He gain 7% on the whole transaction. Find the quantity of rice sold at 10 % profit?

    A. 20 kg   B. 30 kg   C. 25 kg   D. 35 kg

Q6. A shopkeeper has 1000 kg sugar, some part he sold at 14 % profit & remaining at 6% loss. He lost 4% on the whole transaction. Find the quantity of rice he sold at 6 % loss?

    A. 700 kg   B. 900 kg   C. 800 kg   D. 600 kg

Type 2- Mixtures

Q7. When 16 liter water be mixed with 108 Rs/liter pure milk. The price of mixture becomes 90 Rs/liter. Find the quantity of pure milk in the mixture?

    A. 83 liters   B. 80 liters   C.82 liters   D. 81 liters

Q8. When 25 liter water be mixed with Rs. 12/liter pure milk so that the cost of mixture becomes Rs. 2 /liter. Find the quantity of pure milk in the mixture?

    A. 3 liters   B. 4 liters   C. 5 liters   D. 6 liters

Q9. How much water must be added to a bucket containing 40 liter of milk at 3.5 Rs/liter so that the cost of mixture becomes 2 Rs/liter?

    A. 30 liters   B. 40 liters   C. 50 liters   D. 60 liters

Type 3 –Removal of Some Quantity of the Mixture

Q10. From 100 liter milk 10 liter milk is taken out instead of milk 10 liter water is added & this process repeated 2 more times than find quantity of pure milk left after 3 such processes (in liter)?

    A. 70   B. 80   C. 72.9   D. 80.9

Q11. From 100 liter milk 10 liter milk is taken out. Instead of milk, 10 liter water is added ,again 9 liter milk is taken out instead of this 9 liter water is added, again 8 liter water is taken out instead 8 liter water is added .Find the quantity of pure milk left after such processes (in liter)?

    A. 74   B. 80   C. 75.34   D. 76

Q12. A container has 80 litres mixture of milk & water, if we pour out 70 % milk & 30 % water then an average 55 % container is empty, find quantity of milk and water in container?

    A. 30 lt, 50 lt   B. 50 lt, 40 lt   C. Rs. 50 lt, 30 lt   D. 20 lt, 30 lt

Q13. A can contains a mixture of two liquids A and B is the ratio 7 : 5. When 9 litres of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7 : 9. How many litres of liquid A was contained by the can initially?

    A. 10   B. 20   C. 21   D. 25

Q14. A jar contains a mixture of two liquids A and B in the ratio 4 : 1. When 10 litres of the mixture is taken out and 10 litres of liquid B is poured into the jar, the ratio becomes 2 : 3. How many litres of liquid A was contained in the jar?

    A. 14 litres   B. 18 litres   C. 20 litres   D. 16 litres

Type 4 – Mixing of Mixtures

Q15. Two equal glass having milk & water in ratio 3:2 & 4:1. Both glasses get mixed in third glass, than ratio of milk & water in third glass is?

    A. 3:7   B. 7:3   C. 7:2   D. 2:7

Q16. Three equal glass are having milk & water in ratio 9:2, 7:4 & 6:5. These glasses are mixed in fourth glass, then ratio of milk & water in fourth glass is?

    A. 2:1   B. 1:2   C. 3:1   D. 1:3

Q17. Two equal glass having milk & water in ratio 4:3 & 3:2 respectively. If content of both glasses are mixed in third glass, than ratio of milk & water in third glass is?

    A. 41:29   B. 29:41   C. 40:15   D. 15:40

Q18. Milk and water in two vessels are in ratio 4:3 & 2:3. In what ratio the liquid in both the vessels should be mixed to obtain the new mixture in vessel C, containing half milk & half water?

    A. 7:5   B. 5:3   C. 5:7   D. 3:5

Q19. Zinc and copper in two ports A&B are in ratio 1:2 & 2:3. In what ratio zinc & copper from both the ports can be mixed to obtain the new mixture in port C, in the ratio of 5:8?

    A. 10:3   B. 3:10   C. 5:10   D. 10:5

Q20. A vessel contain a mixture of 2 liquid A & B in the ratio 3:2, when 20 liter of mixture is taken out & 20 liter of liquid of type B is added, than ratio becomes 1:4. Find quantity of liquid A & B in the container (in liter)?

    A. 18, 12   B. 20,12   C. 12,20   D. 12,18

Q21. One type of liquid contains 25% of milk, the other contains 30% of milk. A container is filled with 6 parts of the first liquid and 4 parts of the second liquid. The percentage of milk in the mixture is?

    A. 27%   B. 31%   C. 29%   D. 33%

Q22. There are 2 bottles containing a mixture of wine, water and alcohol. The first bottle contains wine, water and alcohol in the ratio 3 : 5 : 2. The second bottle contains water and wine in the ratio 5 : 4. 1 litre of the first and 2 litres of the second are mixed together. What fraction of the mixture is alcohol?

| A. 1/15 litres | B. 6/13 litres | C. 2/15 litres | D. 6/19 litres |

Type 5- Applications

Q23. In what ratio milk and water be mixed so that the mixture be sold at CP, The milkman gain 20%?
    A. 1:3   B. 2:3   C. 3:4   D. 5:1

Q24. In what ratio milk and water be mixed so that the mixture be sold at CP, The milkman gain 25%?
    A. 4:1   B. 1:4   C. 1:5   D. 5:1

Q25. In what ratio must water be mixed with milk to gain 16 2/3% on selling the mixture at cost price?
    A. 1:6   B. 6:1   C. 2:3   D. 4:3

Q26. A dishonest milkman professes to sell his milk at cost price but he mixes it with water and thereby gains 25%. The percentage of water in the mixture is?
    A. 4 %   B. 6 ¼ %   C. 20 %   D. 25 %

Q27. A man purchased, 150 pen at the rate 12 Rs/pen, out of them he sold 50 pen @ 10 % profit, remaining pen should be sold at what profit, if he earns a total profit of 15 %?
    A. 4 %   B. 17.5 %   C. 20 %   D. 25 %

Q28. A man purchased, 200 pen at the rate Rs. 15/pen, out of them he sold 75 pen @ 5 % loss, remaining pen should be sold at what percent to gain 10% on the whole transaction?
    A. 16 %   B. 17 %   C. 19 %   D. 20 %

Q29. In a class there are 65 students & 39 Rs is distributed among them in such a way that each boy gets 80 paise and each girl gets 30 paise. Find the number of boys and girls?
    A. 39, 26   B. 26, 36   C. 26, 39   D. 25, 35

Q30. In a class there are 75 students & 48 Rs is distributed among them in such a way that each boy get 1 Rs and each girl gets 40 paise. Find the number of boys and girls?
    A. 30, 20   B. 20, 30   C. 45, 30   D. 30, 45

Q31. Gold is 19 times as heavy as water & Copper is 9 times as heavy as water, in what ratio these metals be mixed so that mixture becomes 15 times as heavy as water?
    A. 3:2   B. 2:3   C. 4:2   D. 2:4

Q32. A man has 10,000 Rs with him, he invest some part of it 8% annually on SI & remaining at 10% per annum on SI. His total annual income was Rs. 880. Find the amount he invested at 8% per annum?
    A. 6000   B. 5000   C. 6500   D. 4500

FAQs @ Placements

Q33. A dairy man pays Rs. 6.4 per litre of milk. He adds water and sells the mixture at Rs. 8 per litre, thereby making 37.5% profit. Find the proportion of the water to that of the milk received by the customers?

    A.   1 : 15   B. 1 : 10   C. 1 : 20   D. 1 : 12

Q34. Mr X mixed 10 kg of variety A rice with 15 kg of variety B rice and sold the mixture at a price 40% more than that of A. He did not get any profit. What is the ratio of the cost price of variety A to that of B per kg?

    A.   2 : 5   B. 3 : 5   C. 4 : 5   D. 5 : 8

Q35. A jar contains a mixture of two liquids A and B in the ratio 4 : 1. When 10 litres of the mixture is taken out and 10 litres of liquid B is poured into the jar, the ratio becomes 2 : 3. How many litres of liquid A was contained in the jar?

    A.   14 litres   B. 18 litres   C. 20 litres   D. 16 litres

Q36. A trader has 50 kg of rice, a part of which he sells at 10 percent profit and the rest at 5 percent loss. He gains 7 percent on the whole. What is the quantity sold at 10 percent gain and 5 percent loss?

    A.   30 kg, 10 kg   B. 40 kg, 15 kg   C. 35 kg, 40 kg   D. 40 kg, 10 kg

Q37. The wheat sold by a grocer contained 10% low quality wheat. What quantity of good quantity wheat should be added to 150 kg of wheat so that the percentage of low quality wheat becomes 5%?

    A.   85 kg   B. 50 kg   C. 135 kg   D. 150 kg

Q38. One type of liquid contains 25% of milk, the other contains 30% of milk. A container is filled with 6 parts of the first liquid and 4 parts of the second liquid. The percentage of milk in the mixture is?

    A.   27%   B. 31%   C. 29%   D. 33%

Q39. There are 2 bottles containing a mixture of wine, water and alcohol. The first bottle contains wine, water and alcohol in the ratio 3 : 5 : 2. The second bottle contains water and wine in the ratio 5 : 4. 1 litre of the first and 2 litres of the second are mixed together. What fraction of the mixture is alcohol?

    A.   1/15 litres   B. 6/13 litres   C. 2/15 litres   D. 6/19 litres

Q40. A bottle is full of dettol. One-third of it is taken out and then an equal amount of water is poured into the bottle to fill it. This operation is done four times. Find the final ratio of dettol and water in the bottle?

    A.   13 : 55   B. 20 : 74   C. 16 : 65   D. 10 : 48

Q41. An alloy of gold and silver weighs 50 g. It contains 80% gold. How much gold should be added to the alloy so that percentage of gold is increased to 90?

    A.   50 g   B. 60 g   C. 30 g   D. 40 g

Q42. Vijay purchased two different kinds of alcohol. In the first mixture, the ratio of alcohol to water is 3 : 4 and the second mixture it is 5 : 6. If he mixes, the two given mixtures and makes a third mixture of 18 litres in which the ratio of alcohol to water is 4 : 5, the quantity of the first mixture (whose ratio is 3 : 4) that is required to make 18 litres of the third kind of mixture is?

    A.   6   B. 7   C. 8   D. 9

Q43. An alloy contains only zinc and copper. One such alloy weighing 15 gm contains zinc and copper in the ratio of 2 : 3 by weight. If 10 gm of zinc is added then find what amount of copper has to be removed from the alloy such that the final alloy has zinc and copper in the ratio of 4 : 1 by weight?

    A.   5 gm   B. 5.5 gm   C. 6 gm   D. 4.8 gm

Q44. There are two alloys made up of copper and aluminum. In the first alloy copper is half as much as aluminum and in the second alloy, copper is thrice as much as aluminum. How many times the second alloy must be mixed with the first alloy to get the new alloy in which copper is twice as much as aluminum?

    A. 2   B. 3   C. 4   D. 5

Q45. A solution of sugar syrup has 15% sugar. Another solution has 5% sugar. How many litres of the second solution must be added to 20 litres of the first solution to make a solution of 10% sugar?

    A. 10   B. 5   C. 15   D. 20