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## PERCENTAGE AND ITS APPLICATIONS

- **Percentage:** Percent means per every hundred and denoted by the symbol ‘%’. A fraction with denominator 100 is called a ‘Percent’.

- **Percent as a fraction:** Drop the % sign and multiply the given number by  $\frac{1}{100}$  and simplify it.

- **Percent as a decimal:** Drop the % sign and insert or move the decimal point two places to the left.

- **Fraction as a percent :** Multiply the fraction by 100, simplify it and mark ‘%’ sign.

- **Decimal as a percent:** Shift the decimal point two places to the right and mark ‘%’ sign.

- **Cost Price (c.p.):** Amount paid to buy an article.

- **Selling Price (s.p.):** Amount at which an article is sold.

- **Profit or Gain:** When  $s.p. > c.p.$ , the seller makes a profit or gain.

$$\text{Gain} = s.p. - c.p.$$

- **Loss:** When  $c.p. > s.p.$ , the seller incurs a loss.

$$\text{Loss} = c.p. - s.p.$$

Gain and loss are always calculated on the c.p.

- **Gain %:** Gain on Rs. 100,  $\text{Gain \%} =$

$$\frac{\text{Gain} \times 100}{c.p.}, \text{ Overhead expenses are also}$$

included in the c.p.

- **Loss %:** Loss on Rs. 100,  $\text{Loss \%} =$

$$\frac{\text{Loss} \times 100}{c.p.}$$

- **Relation between s.p and c.p:** In case of Gain:

$$c.p. = \frac{100}{100 + \% \text{gain}} \times s.p.$$

$$s.p. = \frac{100 + \% \text{gain}}{100} \times c.p.$$

$$\text{In case of loss: } c.p. = \frac{100}{100 - \% \text{loss}} \times s.p.$$

$$s.p. = \frac{100 - \% \text{loss}}{100} \times c.p.$$

- **Principal (P):** Money borrowed
- **Interest (I):** Extra/Additional money paid by

$$\text{the borrower. S.I.} = \frac{p \times r \times t}{100}$$

$$p = \frac{\text{S.I.} \times 100}{t \times r}, t = \frac{\text{S.I.} \times 100}{p \times r} \text{ and}$$

$$r = \frac{\text{S.I.} \times 100}{p \times t}$$

- **Amount (A):** Total money paid by the borrower  $A = P + I$  or  $I = A - P$

- **Rate (R):** Interest on Rs. 100 for 1 year is known as the rate percent per annum.

- **Simple Interest (S.I):** Interest which is calculated uniformly on P throughout the loan period.

- **Compound Interest (C.I):** Interest obtained during the first time period is added to the original P and amount becomes new P for the second time period and so on. The difference between the amount obtained at the last time period and original principal is called compound interest

$$A = P \left( 1 + \frac{R}{100} \right)^n \text{ or C.I.} = P \left[ \left( 1 + \frac{R}{100} \right)^n - 1 \right]$$

- **Conversion Period:** Fixed time period after which the interest is calculated and added to P to form the new P for the next time period

If rates are different for different periods then,

$$A = P \left(1 + \frac{R_1}{100}\right) \left(1 + \frac{R_2}{100}\right) \dots\dots\dots$$

- **Growth:** Increase in the amount or anything over a period of time.

$$V_n = V_0 \left(1 + \frac{R}{100}\right)^n, V_n = \text{Value after growth}$$

in  $n$  conversions.

$V_0$  = Value in the beginning.

If the rate of growth varies for each conversion period then

$$v_n = v_0 \left(1 + \frac{R_1}{100}\right) \left(1 + \frac{R_2}{100}\right) \left(1 + \frac{R_3}{100}\right) \dots$$

- **Depreciation :** Decrease in the amount or anything over a period of time

$$V_n = V_0 \left(1 - \frac{R}{100}\right)^n, V_n = \text{depreciated value}$$

after  $n$  conversion periods.  $V_0$  = Value in the beginning.

If the rate of depreciation varies for each conversion period then

$$V_n = V_0 \left(1 - \frac{R_1}{100}\right) \left(1 - \frac{R_2}{100}\right) \left(1 - \frac{R_3}{100}\right) \dots$$

- **Marked price or list price (M.P):** Price at which a article is listed for sale.
- **Discount:** Reduction in the marked price of an article.
- **Net selling price (S.P.):**  $SP = M.P - \text{Discount}$

### CHECK YOUR PROGRESS:

- 0.0045 can be written, in percent, as:  
(A) 45%                      (B) 4.5%                      (C) 0.45%                      (D) 0.045%
- In a fruit garden, there are 120 trees out of which 30 are mango trees. Percentage of other fruit trees in the garden is :  
(A) 25                      (B) 30                      (C) 70                      (D) 75
- What percent of the letters in the word 'PERCENTAGE' are E's?  
(A) 10                      (B) 20                      (C) 30                      (D) 40
- Mohit purchased a watch for Rs. 1620 and spent Rs. 180 on its repair. If he sold it for Rs. 1980, then his gain percent is :  
(A) 19.8                      (B) 16.2                      (C) 18                      (D) 10
- Marked price of a rain coat is Rs. 450. If the shopkeeper sells it for Rs. 360, the discount given to the customer is :  
(A) 10%                      (B) 20%                      (C) 25%                      (D) 40%
- A man sells two cows for Rs. 39600 each. On one he loses 10% while on the other, he gains 10%. Find the total loss or gain percent in the transaction.
- The present cost of a machine is Rs. 4, 50, 000. In the first year its value depreciates at the rate of 10%. In second year by 8% and by 5% in the subsequent years. Find the worth of the machine at the end of 3 years.

8. In how much time will a sum of Rs. 8,000 amount to Rs. 9261 at 10% per annum, compounded semi-annually?
9. A sum of money amounts to Rs. 1680 in 2 years and to Rs. 1860 in 4 years at simple interest. Find the sum and the rate of interest per annum.
10. An article listed at Rs. 6800 is offered at a discount of 15%. Due to festival season, the shopkeeper allows a further discount of 5%. Find the selling price of the article.

**STRETCH YOURSELF :**

1. A watch was sold at a profit of 10%. Had it been sold for Rs. 35 more, the profit would have been 12%. Find the cost price of the watch.
2. If the cost price of 10 articles is equal to the selling price of 8 articles, then find the gain percent in this transaction.
3. A man bought bananas at 6 for Rs. 20 and sold at the rate of 4 for Rs. 18. Find the profit percent in this transaction.
4. A shopkeeper marks his goods 20% more than the cost price and allows a discount of 10%. Find the gain percent of the shopkeeper.
5. A reduction of 10% in the price of tea enables a dealer to buy 21 kg more tea for Rs. 2,000. Find the reduced and original price of the tea per kg.

**ANSWERS****CHECK YOUR PROGRESS:**

1. C                      2. D                      3. C
4. D                      5. B                      6. Loss: 1%
7. Rs. 3, 53, 970                      8.  $1\frac{1}{2}$  years
9. Sum: Rs. 1500, rate of interest : 6%
10. Rs. 5491

**STRETCH YOURSELF:**

1. Rs. 1750
2. 25%
3. 35%
4. 8%
5. Reduced price/Kg = Rs. 135, Original Price/Kg = Rs. 150.