COMPARING QUANTITIES

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CHAPTER

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➢ PERCENTAGE

A fraction with its denominator as 100 is called percent, the symbol '%' is used for percent and it indicates multiplication with $\frac{1}{100}$.

For example,

$$\frac{18}{100} = 18 \text{ hundredths}$$
$$= 18 \text{ per hundred}$$
$$= 18 \times \frac{1}{100}$$
$$= 18 \text{ percent}$$
$$= 18\%$$

$\frac{18}{100}$ can also be expressed as 18 : 100.

30% is equivalent to the ratio 30 : 100.

Or

30% is equivalent to the fraction $\frac{30}{100}$ or $\frac{3}{10}$.

Working Rules

To Find the Percentage of a Number

To find the value of a given percent of a given quantity, we multiply the given quantity by the fraction or decimal fraction of the given percent, i.e., **value of a given percent = Given quantity × given percent converted into fraction**.

❖ EXAMPLES ❖

Ex.1 If 8.5% of a number is 51, then find the number.

Sol. Let the required number be x.

$\therefore$ 8.5% of x = 51

or $\frac{85}{10}$ % of x = 51

or $\frac{85}{10} \times \frac{1}{100} \times x = 51$

or $x = \frac{\cancel{51}^{3} \times 100 \times \cancel{10}^{2}}{\cancel{85}_{5}} = 3 \times 100 \times 2 = 600$

Thus, 8.5% of 600 is 51.

Ex.2 The difference between increasing a number by 8% and decreasing it by 7% is 75. What is the number ?

Sol. Let the required number be x.

$\therefore$ 8% of x = $\frac{8x}{100}$

Therefore, Increased number = $x + \frac{8x}{100} = \frac{108x}{100}$

Similarly, the number decreased by

$$7\% = x - \frac{7x}{100} = \frac{93x}{100}$$

Now, $= \frac{108x}{100} - \frac{93x}{100} = \frac{15x}{100}$

But, actual difference = 75

So, $\frac{15x}{100} = 75$

Thus, $x = \frac{75 \times 100}{15}$

$= 5 \times 100 = 500$

Hence, the required number is 500.

Ex.3 Rani's weight is 25% that of Meena's weight and 40% that of Tara's weight. What percentage of Tara's weight is Meena's weight ?

Sol.: Let Meena's weight be x kg and Tara's weight be y kg.

Then, Rani's weight = 25% of Meena's weight

$$= \frac{25}{100} \times x \qquad \text{... (i)}$$

Also, Rani's weight = 40% of Tara's weight

$$= \frac{40}{100} \times y \qquad \text{... (ii)}$$

From (i) and (ii), we get

$$\frac{25}{100} \times x = \frac{40}{100} \times y$$

$\Rightarrow$ 25x = 40 y [Multiplying both sides by 100]

$\Rightarrow$ 5x = 8y [Dividing both sides by 5]

$$\Rightarrow x = \frac{8}{5} y \qquad \text{... (iii)}$$

We have to find Meena's weight as the percentage of Tara's weight, i.e.,

$$\frac{x}{y} \times 100 = \frac{\frac{8}{5}y}{y} \times 100 \qquad \text{[Using (iii)]}$$

$$= \frac{8}{5} \times 100 = 160$$

Hence, Meena's weight is 160% of Tara's weight.

Ex.4 Rakesh's income is 25% more than that of Rohan's income. What percent is Rohan's income less than Rakesh's income ?

Sol. Let Rohan's income be Rs 100. Then,

Rakesh's income = Rs 125.

If Rakesh's income is

Rs 125, Rohan's income = Rs 100

If Rakesh's income is

Rs 1, Rohan's income $= \text{Rs}\frac{100}{125}$

If Rakesh's income is Rs 100,

Rohan's income $= \text{Rs}\left(\frac{100}{125} \times 100\right)$

= Rs 80.

Now, difference between Rohan's and Rakesh's income= Rs (100 – 80)

= Rs 20

Hence, Rohan's income is 20% less than that of Rakesh.

Ex.5 The price of sugar goes up by 20%. By how much percent must a house wife reduce her consumption so that the expenditure does not increase ?

Sol. Let the consumption of sugar originally be 100 kg and its price be Rs 100. Then,

New price of 100 kg sugar = Rs 120

[Θ Price increases by 20%]

Now, Rs 120 can fetch 100 kg sugar.

$$\therefore \quad \text{Rs 100 can fetch} = \left(\frac{100}{120} \times 100\right) \text{kg sugar}$$

$$= \frac{250}{3} \text{ kg sugar}$$

$$\therefore \text{Reduction in consumption} = \left(100 - \frac{250}{3}\right)\%$$

$$= \frac{50}{3}\% = 16\frac{2}{3}\%$$

Ex.6 A number is increased by 10% and then it is decreased by 10%. Find the net increase or decrease percent.

Sol: Let the number be 100.

Increase in the number = 10% of 100

$$= \frac{10}{100} \times 100 = 10$$

$\therefore$ Increased number = 100 + 10 = 110.

This number is then decreased by 10%.

Therefore, decrease in the number = 10% of 110

$$= \left(\frac{10}{100} \times 110\right) = 11.$$

$\therefore$ New number = 110 – 11 = 99

Thus, net decrease = 100 – 99 = 1

$$\text{Hence, net percentage decrease} = \left(\frac{1}{100} \times 100\right)\%$$

= 1%.

Ex.7 The salary of an officer has been increased by 50%. By what percent the new salary must be reduced to restore the original salary ?

Sol. Let original salary be Rs 100.

Then, Increase in the salary = 50% of Rs 100
= Rs 50.

Salary after increment = Rs 150.

Now, in order to restore the original salary, a reduction of Rs 50 should be made on Rs 150.

Thus, Reduction on Rs 150 = Rs 50

$\Rightarrow$ Reduction on Rs 1 = Rs $\frac{50}{150}$

$\Rightarrow$ Reduction on Rs 100 = Rs $\left(\frac{50}{150}\times 100\right)$

$= 33\frac{1}{3}$

$\therefore$ Reduction on new salary = $33\frac{1}{3}\%$.

➢ PROFIT AND LOSS

Profit and Loss :

In our daily routine, we have to buy some articles from various shops. The shopkeepers purchase these articles either from wholesalers or directly from the manufacturers by paying a certain price. Generally, the shopkeeper sells his articles at a different price. These prices and difference in these prices are given special names such as cost price, selling price, profit, loss etc.

Cost Price :

The price for which an article is purchased is called the cost price and abbreviated as C.P.

Selling Price :

The price for which an article is sold is called the selling price and abbreviated as S.P.

Profit :

If selling price is more than cost price, then the difference between selling price and the cost price is called the profit.

$\therefore$ Profit = Selling Price – Cost Price

Loss :

If selling price is less than cost price, then the difference between the selling price and cost price is called loss.

$\therefore$ Loss = Cost Price – Selling Price

Overheads :

Usually, a merchant has to spend some money on freight or transport, labour or maintenance of the purchased articles. These extra expenditures are called overheads. The overheads are an essential part of cost price.

$\therefore$ Cost Price = (Payment made while purchasing the articles) + overhead charges

Some useful Formulae to Find the above defined Terms :

A. Profit or Gain (S.P. > C.P.)

1. Profit = S.P. – C.P.
2. S.P. = Profit + C.P.
3. C.P. = S.P. – Profit
4. $\text{Profit \%} = \frac{\text{Profit}}{\text{C.P.}} \times 100$
5. $\text{Profit} = \frac{\text{C.P.} \times \text{Profit\%}}{100}$
6. $\text{S.P.} = \text{C.P.}\left(\frac{100 + \text{Profit\%}}{100}\right)$
7. $\text{C.P.} = \left(\frac{100 \times \text{S.P.}}{100 + \text{Profit\%}}\right)$

B. Loss (S.P. > C.P.)

1. Loss = C.P. – S.P.
2. S.P. = C.P. – Loss
3. C.P. = Loss + S.P.
4. $\text{Loss \%} = \frac{\text{Loss}}{\text{C.P.}} \times 100$
5. $\text{Loss} = \frac{\text{C.P.} \times \text{Loss\%}}{100}$
6. $\text{S.P.} = \text{C.P.}\left(\frac{100 - \text{Loss\%}}{100}\right)$
7. $\text{C.P.} = \frac{100 \times \text{S.P.}}{(100 - \text{Loss\%})}$

❖ EXAMPLES ❖

Ex.8 Anshul purchased 100 oranges at the rate of Rs 2 per orange. He sold 60% of the oranges at the rate of Rs 2.50 per orange and the remaining oranges at the rate of Rs 2 per orange. Find his profit percent.

Sol. S.P. of 100 oranges = Rs 2 × 100 = Rs 200

$$60\% \text{ of } 100 \text{ oranges} = \frac{60}{100} \times 100 \text{ oranges}$$

= 60 oranges

Now S.P. of 60 oranges = Rs 2.50 × 60 = Rs 150

and S.P. of the remaining (100 – 60), i.e.,

40 oranges = Rs 2 × 40 = Rs 80

∴ S.P. of all the 100 oranges

= Rs 150 + Rs 80 = Rs 230

Therefore, profit = S.P. – C.P.

= Rs (230 – 200) = Rs 30

$$\text{Hence, Profit percent} = \frac{30}{200} \times 100 = 15\%$$

Thus, Anshul's profit is 15%.

Ex.9 By selling 144 eggs, Anuj lost the S.P. of 6 eggs. Find his loss percent.

Sol. Let S.P. of 1 egg = Rs 1

∴ S.P. of 144 eggs = Rs 144 × 1 = Rs 144

and, Loss = S.P. of 6 eggs

= Re 1 × 6 = Rs 6

∴ C.P. of 144 eggs = S.P. + Loss

= Rs 144 + Rs 6 = Rs 150

$$\text{Therefore, loss \%} = \frac{\text{Loss}}{\text{C.P.}} \times 100$$

$$= \frac{6}{150} \times 100 = 4$$

Thus, Anuj's loss is 4%.

Ex.10 Mahender bought two cows at Rs 20,000 each. He sold one cow at 15% gain. But he had to sell the second cow at a loss. If he had suffered a loss of Rs 1,800 on the whole dealing, find the selling price of the second cow.

Sol. Total C.P. of the two cows = 2 × Rs 20000

= Rs 40000

Loss = Rs 1800

∴ Total S.P. = Rs 40000 – Rs 1800

= Rs 38200 ... (i)

Now, S.P. of the first cow at 15% profit

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

$$= \text{Rs } 20000 \times \frac{(100+15)}{100}$$

$$= \text{Rs } 20000 \times \frac{115}{100}$$

= Rs 200 × 115

= Rs 23000 ... (ii)

∴ S.P. of the second cow = Rs 38200 – Rs 23000 [From (i) and (ii)]

= Rs 15200

Thus, the selling price of the second cow is Rs 15,200.

Ex.11 A man buys 60 pens at Rs 10 per pen and sells 40 pens at Rs 12 per pen and remaining 20 pens at Rs 9 per pen. Find his gain or loss percent.

Sol. Cost of 60 pens = Rs 10 × 60 = Rs 600

S.P. of 40 pens = Rs 12 × 40 = Rs 480

S.P. of 20 pens = Rs 9 × 20 = Rs 180

⇒ Total S.P. = Rs 480 + Rs 180 = Rs 660

Since, S.P. > C.P.

∴ Profit = Rs 660 – Rs 600 = Rs 60

$$\therefore \text{ Profit percent} = \frac{\text{Profit}}{\text{C.P.}} \times 100$$

$$= \frac{60}{600} \times 100 = 10\%.$$

Ex.12 By selling an air-cooler for Rs 6,800, Mr. Avinash lost 15%. For what price should he sell it to get a profit of 10% ?

Sol. This sum will be solved in two parts. In 1st part, we find the C.P. and in 2nd part, we find the required S.P.

Part I :

S.P. of the air cooler = Rs 6800

Loss = 15% i.e., for every Rs 100 he is losing Rs 15.

∴ If C.P. is Rs 100,

then S.P. Rs 100 – Rs 15 = Rs 85

∴ If S.P. is Rs 85, then C.P. = Rs 100

$$\text{If S.P. is Rs 1, then C.P.} = \text{Rs } \frac{100}{85}$$

$$\text{If S.P. is Rs 6800, then C.P.} = \text{Rs } \frac{100}{\cancel{85}_{5}} \times \overset{80}{\cancel{6800}}_{\cancel{400}}$$

= Rs 100 × 80

= Rs 8000.

Part II :

C.P. = Rs 8000

Profit = 10%

∴ Profit = 10% of Rs 8000

$$= \frac{10}{100} \times 8000 = \text{Rs } 800$$

∴ S.P. = C.P. + Profit

= Rs 8000 + Rs 800 = Rs 8800.

Hence, the air-cooler should be sold for Rs 8,800 in order to make a profit of 10%.

Ex.13 A man sold two scooters for Rs 18000 each. On one, he gained 20% and on the other, he lost 20%. Find his total loss or gain.

Sol. S.P. of the first scooter = Rs 18000

Gain = 20%

Therefore, $C.P. = \frac{100 \times S.P.}{(100 + Profit\%)}$

$= Rs\ \frac{100 \times 18000}{(100 + 20)}$

$= Rs\ \frac{100 \times 18000}{120}$

$= Rs\ 100 \times 150$

$= Rs\ 15000$ ... (i)

S.P. of the second scooter = Rs 18000

Loss = 20%

Therefore, $C.P. = \frac{100 \times S.P.}{(100 - Loss\%)}$

$= Rs\ \frac{100 \times 18000}{(100 - 20)}$

$= \frac{100 \times 18000}{80}$

$= Rs\ 100 \times 225$

$= Rs\ 22500$ ... (ii)

Now, total C.P. = Rs 15000 + Rs 22500 [From (i) and (ii)]

= Rs 37500

and total S.P. = 2 × Rs 18000 = Rs 36000

Hence, loss = C.P. – S.P.

= Rs 37500 – Rs 36000

= Rs 1,500.

Ex.14 The cost price of 10 tables is equal to the selling price of 8 tables. Find the loss or profit percent.

Sol. Let the C.P. of each table = Rs 100

$\therefore$ C.P. of 10 tables = Rs 1000

$\therefore$ S.P. of 8 tables = Rs 1000

So, S.P. of 1 table = $Rs\ \frac{1000}{8} = Rs\ 125$

$\therefore$ Profit on 1 table = Rs 125 – Rs 100 = Rs 25

or Profit percent = $\frac{25}{100} \times 100 = 25\%$.

➢ DISCOUNT

We read advertisements in our day-to-day life in newspapers. magazines, banners, posters given by various companies and shopkeepers declaring discounts such as :

"Off Season Discount",

"Grand Puja Discount",

"Goods at Throw away prices",

"Now get 1100 g Desi Ghee for the cost of just 1 kg.",

"Get a Steel Glass free with every 500 g pack of tea", etc.

When discount is given, a certain price is attached to the article which the shopkeeper professes to be the cost of the article for the customer. This price is called the marked price (or list price). Then, the shopkeeper offers discount on this marked price. Customer pays the difference between the marked price and the discount.

Some useful formulae regarding Discount, Marked Price, Selling Price, etc.

1. Net Selling Price = Marked Price – Discount
2. Discount = Marked Price – Net Selling Price
3. Marked Price = Net Selling Price + Discount
4. $Discount\% = \left(\frac{Discount}{Marked\ Price}\right) \times 100\%$
5. $S.P. = M.P. - \frac{Discount\% \times M.P.}{100}$
6. $S.P. = M.P. \left(1 - \frac{Discount\%}{100}\right)$
7. $S.P. = M.P. \left(\frac{100 - Discount\%}{100}\right)$
8. $M.P. = \frac{100 \times S.P.}{(100 - Discount\%)}$

Let us now consider some examples to illustrate the above facts.

❖ EXAMPLES ❖

Ex.15 Marked price of a pen is Rs 20. It is sold at a discount of 15%. Find the discount allowed on the pen and its selling price.

Sol. Marked Price of the pen = Rs 20

Rate of discount = 15%

$\therefore$ Discount allowed = 15% of Rs 20

$= \frac{15}{100} \times Rs\ 20 = Rs\ 3$

Therefore, selling price of the pen

= Rs 20 – Rs 3 = Rs 17.

Ex.16 A chain with marked price Rs 1,200 was sold to a customer for Rs 1,000. Find the rate of discount allowed on the chain.

Sol. Marked Price = Rs 1200

Selling Price = Rs 1000

Discount = Rs 1200 – Rs 1000 = Rs 200

Rate of discount = $\frac{Discount}{M.P.} \times 100\%$

$$= \frac{200}{1200} \times 100\% = 16.66\%$$

Ex.17 A shopkeeper offers 15% season discount to the customers and still makes a profit of 19%. What is the cost price for the shopkeeper on a saree marked at Rs 2,240 ?

Sol. M.P. = Rs 2240

Rate of discount = 15%

Discount allowed = Rs $\frac{15}{100} \times 2240$ = Rs 336

Thus, S.P. of the saree = Rs (2240 – 336)

= Rs 1904

Now, profit % of the shopkeeper = 19%

Therefore, C.P. = $\frac{100 \times \text{S.P.}}{(100 + \text{Profit}\,\%)}$

= Rs $\frac{100 \times 1904}{(100+19)}$

= Rs $\frac{100 \times 1904}{119}$

= Rs 100 × 16 = Rs 1600

Thus, the cost price of the saree is Rs 1,600.

Ex.18 A Jacket was sold for Rs 680 after allowing a discount of 15% on the marked price. Find the marked price of the Jacket.

Sol. Let M.P. be Rs x.

∴ Discount = 15% on Rs x

= Rs $\frac{15}{100} \times x$ = Rs $\frac{3x}{20}$

∴ S.P. = Rs $\left(x - \frac{3x}{20}\right)$ = Rs $\left(\frac{20x - 3x}{20}\right)$

= Rs $\frac{17x}{20}$

According to the given condition,

$$\frac{17x}{20} = 680$$

or $x = \frac{680 \times 20}{17}$ = Rs 800

Thus, marked price of the Jacket is Rs 800.

Ex.19 Abbas and Tony run a ready-made garments shop. They mark the garments at such a price that even after allowing a discount of 12.5%, gain a profit of 25%. Find the marked price of a ladies suit which costs them Rs 2,100.

Sol. First method : C.P. of a suit = Rs 2100

Profit = 25% of Rs 2100

= Rs $\frac{25}{100} \times 2100$ = Rs 525

∴ S.P. of the suit = Rs (2100 + 525)

= Rs 2625

Let the marked price be Rs 100.

Then, Discount = 12.5% of Rs 100

= $\frac{12.5}{100} \times 100$ = Rs 12.50

∴ S.P. = Rs (100 – 12.50) = Rs 87.50

Now, if S.P. is Rs 87.50, M.P. = Rs 100

∴ If S.P. is Rs 2625, M.P. = Rs $\frac{100}{87.50} \times 2625$

= $\frac{100 \times 2625 \times 100}{8750}$

= Rs 3000

Thus, the marked price of the ladies suit is Rs 3,000.

Alternate Method : (after S.P. in above)

Let the marked price be Rs x.

We have M.P. = $\frac{100 \times \text{S.P.}}{(100 - \text{Discount}\%)}$

or $x = \frac{100 \times 2625}{(100 - 12.5)} = \frac{262500}{87.5}$

= Rs 3000

Thus, the marked price of the suit is Rs 3,000

➢ SALES TAX

Sales tax is an indirect tax. In purchasing of some specified items from the market, we have to pay a certain extra amount (at a rate specified by the Government), in addition to the cost of the item. This additional amount is called sales tax.

Working Rules

Sales tax is calculated on the selling price in the same way as we calculate percentage.

❖ EXAMPLES ❖

Ex.20 Amar buys a pair of shoes costing Rs 470. If the rate of sales tax is 7%, calculate the total amount payable by him for shoes.

Sol. Rate of sales tax = 7%

Sales tax = Rs $\frac{7}{100} \times 470$

= $\frac{3290}{100}$ = Rs 32.90

Hence, total amount to be paid = Rs 470 + Rs 32.90

= Rs 502.90

Ex.21 Rakesh purchased a cycle for Rs 660 including sales tax. If the rate of sales tax is 10%, find the selling price of cycle.

Sol. Let the selling price be Rs x.

Sales tax = 10% of x

$$= \frac{10}{100} \times x = \frac{x}{10}$$

$\therefore$ Amount to be paid for the cycle

$$= x + \frac{x}{10} = \frac{11x}{10}$$

Now, $\frac{11x}{10} = 660$ (given)

Therefore, $x = \frac{660 \times 10}{11} = 600$

Hence, the selling price of the cycle is Rs 600.

Ex.22 Nazim purchases a motorcycle, having marked price of Rs 46,000 at a discount 5%. If sales tax is charged at 10%, find the amount Nazim has to pay to purchase the motorcycle.

Sol. Marked price of motor cycle = Rs 46000

Discount = 5%

$\therefore$ Discounted price of motorcycle

$$= \text{Rs}\left(46000 - 46000 \times \frac{5}{100}\right)$$

= Rs (46000 – 2300) = Rs 43700

Sales tax on Rs 43700 = Rs $43700 \times \frac{10}{100}$ = Rs4370

Amount, Nazim has to pay for motorcycle

= Rs (43700 + 4370)

= Rs 48,070.

➢ COMPOUND INTEREST

When we borrow money from a financial agency (bank, financial agency or individual), it is called the lender.

The borrowed money is called the principal.

We have to pay some additional money together with the borrowed money for a certain time period, for the benefit of using his or her money. The additional money that we pay is called the interest.

If the principal remains the same for the whole loan period (or time), then the interest is called the simple interest.

The interest together with the principal is called the amount.

If the principal does not remain the same for the whole loan period due to addition of (compounding of) interest to the principal after a certain interval of time to form the new principal, then the interest so obtained is called the compound interest.

Simple Interest :

(i) Simple Interest

$$= \frac{\text{Principal} \times \text{Rate of interest} \times \text{Time}}{100}$$

(ii) Amount = Principal + Simple Interest.

Compound Interest :

To understand compound interest, we consider the following example -

"A man lends Rs 5,000 to a finance company at 10% per annum. What interest does he get after one year ? What will be the amount then ? At the end of the year, if he decides to deposit the whole sum (amount after one year) for another year, what interest does he get at the end of the second year ?"

Interest after one year = Rs $\frac{5000 \times 1 \times 10}{100}$

= Rs 500

$\therefore$ Amount after one year = Rs 5000 + Rs 500

= Rs 5500.

When the deposit is Rs 5,500 in the company for one more year, the amount of Rs 5,500 due at the end of first year becomes the principal for the second year.

$\therefore$ Interest at the end of the second year

$$= \text{Rs}\ \frac{5500 \times 1 \times 10}{100} = \text{Rs}\ 550$$

Thus, the interest for two years is

Rs 500 + Rs 550 = Rs 1050.

We notice that the interest for the second year is more than that for the first year.

It is clear that in the second year, interest has been calculated on Rs 5500, which is equal to Rs 5,000 (Principal at the beginning) + Rs 500 (Interest for the first year). So, for the second year, interest on the interest has also been calculated. Interest calculated in this manner is known as compound interest.

Computation of Compound Interest by Using Formulae

Formula 1 :

Let P be the principal and the rate of interest be R% per annum. If the interest is compounded annually, then the amount A and the compound interest C.I. at the end of n years are given by

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

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

Formula 2 :

Let P be the principal and the rate of interest be R% per annum. If the interest is compounded annually, then the amount A and the compound interest C.I. at the end of n years are given by

$$A = P\left(1+\frac{R}{100k}\right)^{nk}$$

and, C.I. = A – P

$$= P\left\{\left(1+\frac{R}{100k}\right)^{nk}-1\right\}$$ respectively.

Here, interest is payable k times in a year.

Particular Cases :

Case 1 : When the interest is compound half-yearly or semi-annually.

In this case, k = 2

$$\therefore \quad A = P\left(1+\frac{R}{2\times 100}\right)^{2n}$$

and $$C.I. = P\left[\left(1+\frac{R}{2\times 100}\right)^{2n}-1\right]$$

Case 2 : When interest is compounded quarterly.

In this case, k = 4

$$\therefore \quad A = P\left(1+\frac{R}{4\times 100}\right)^{4n}$$

and $$C.I. = P\left[\left(1+\frac{R}{4\times 100}\right)^{4}-1\right]$$

❖ EXAMPLES ❖

Ex.23 A man deposits Rs 1,000 in a savings bank account. How much will it amount in three years if the rate of interest is 5% per annum and the interest is payable annually ?
(Solve without using formulae)

Sol. Interest on Rs 1000 for the first year

$$= \text{Rs } \frac{1000\times 1\times 5}{100}$$

= Rs 10 × 1 × 5

= Rs. 50

Amount after one year = Rs 1000 + Rs 50

= Rs 1050

$\therefore$ Interest for the second year $= \frac{1050\times 1\times 5}{100}$

$$= \text{Rs } \frac{105}{2} = \text{Rs } 52.50$$

Amount after two years = Rs 1050 + Rs 52.50

= Rs 1102.50

$\therefore$ Principal for the third year

$$= \text{Rs } \frac{1102.50\times 1\times 5}{100}$$

$$= \text{Rs } \frac{5512.5}{100}$$

= Rs 55.13

Amount after three years

= Rs 1102.50 + Rs 55.13

= Rs 1157.63

Thus, Rs 1,000 will become Rs 1,157.63 in three years.

Ex.24 Find the amount and the compound interest on Rs 5,000 lent at compound interest at 5% per annum for one year if the interest is payable half-yearly.
(Solve without using formulae)

Sol. Here, we calculate the compound interest for the period of one year in such a way that interest is calculated after six months. So, there will be two time intervals, each of six months, for the calculation of interest.

First Interval of Six Months

Interest on Rs 5000 for 6 months $= \frac{5000\times 5\times 1}{2\times 100}$

= Rs 125

$\therefore$ Amount at the end of the first interval of six months

= Rs 5000 + Rs 125 = Rs 5125

Second Interval of Six Months

Amount at the end of the first interval of six months will be taken as the principal for the second interval of six months.

interest on Rs 5125 for 6 months

$$= \text{Rs } \frac{5125\times 5\times 1}{2\times 100} = \text{Rs } \frac{1025}{8}$$

= Rs 128.13

$\therefore$ Total interest on Rs 5000 for one year

= Rs 125 + Rs 128.13

= Rs 253.13.

Amount at the end of one year

= Rs 5000 + Rs 253.13

= Rs 5253.13.

Ex.25 Find the compound interest on Rs 90,000 for 3 years at the rate of 10% per annum compounded annually.

Sol. P = Rs 90000

n = 3 [Θ Interest is compounded annually]

r = 10% p.a.

Since $A = P\left(1+\frac{r}{100}\right)^n$

$\therefore \quad A = \text{Rs } 90000\left(1+\frac{10}{100}\right)^3$

$= \text{Rs } 90000\left(1+\frac{1}{10}\right)^3$

$= \text{Rs } 90000\left(\frac{11}{10}\right)^3$

$= \text{Rs } 90000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$

$= \text{Rs } 90 \times 11 \times 11 \times 11 = \text{Rs } 119790$

Now, C.I. = A – P = Rs 119790 – Rs 90000

= Rs 29,790.

Ex.26 Calculate the amount due in 3 years on Rs 5,000, if the rates of compound interest for successive years are 7%, 8% and 10% respectively.

Sol. Interest for 1st year $= \text{Rs}\frac{5000\times7\times1}{100} = \text{Rs } 350$

and,amount at the end of 1st year

= Rs 5000 + Rs 350

= Rs 5350

= Principal for 2nd year

Interest for 2nd year $= \text{Rs } \frac{5350\times8\times1}{100}$

$= \text{Rs } \frac{42800}{100} = \text{Rs } 428$

and amount at the end of 2nd year

= Rs 5350 + Rs 428

= Rs 5778

= Principal for 3rd year

Interest for 3rd year $= \text{Rs } \frac{5778\times10\times1}{100}$

$= \text{Rs } \frac{57780}{100} = \text{Rs } 577.80$

and amount due at the end of 3rd year

= Rs 5778 + Rs 577.80

= Rs 6,355.80.

Ex.27 Compute the compound interest on Rs 20,000 for 2 years at 20% per annum when compounded half yearly.

Sol. Here,

Principal (P) = Rs 20000

Rate (r) = 20% per annum

$= \frac{20}{2}$ % or 10% per half year

Time(n) = 2 years

= 4 half years

Since, $A = P\left(1+\frac{r}{100}\right)^n$

$\therefore \quad \text{Amount} = \text{Rs } 20000 \times \left(1+\frac{10}{100}\right)^4$

$= \text{Rs } 20000 \times \left(1+\frac{1}{10}\right)^4$

$= \text{Rs } 20000 \times \left(\frac{11}{10}\right)^4$

$= \text{Rs } 20000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$

$= \text{Rs } 2 \times 11 \times 11 \times 11 \times 11$

$= \text{Rs } 29282$

$\therefore$ C.I. = A – P

$\therefore$ Compound Interest = Rs (29282 – 20000)

= Rs 9282.

Ex.28 Find the compound interest on Rs 15,625 for 9 months at 16% per annum, compounded quarterly.

Sol. Here, Principal (P) = Rs 15625

Rate (r) = 16% p.a.

= 4% per quarter

Time (n) = 9 months

= 3 quarters

Now, Amount, (A) $= P\left(1+\frac{r}{100}\right)^n$

$= \text{Rs } 15625\left(1+\frac{4}{100}\right)^3$

$= \text{Rs } 15625\left(1+\frac{1}{25}\right)^3$

$= \text{Rs } 15625\left(\frac{26}{25}\right)^3$

$= \text{Rs } 15625 \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25}$

$= \text{Rs } 26 \times 26 \times 26$

$= \text{Rs } 17576$

Since, Compound Interest = Amount – Principal

$\therefore$ C.I. = Rs 17576 – Rs 15625

= Rs 1,951.

<u>Inverse Problems</u> -

[To find Principal, Time or Rate of Interest]

Ex.29 A certain sum was borrowed at 15% per annum. If at the end of 2 years, Rs 1,290 was compounded as C.I., then find the sum borrowed.

Sol. **First Method :**

Let the sum be Rs 100

Then, $\text{Amount} = \text{Rs } 100\left(1+\frac{15}{100}\right)^2$

$\left[\Theta\ \text{Amount} = P\left(1+\frac{r}{100}\right)^n\right]$

$= \text{Rs } 100\left(1+\frac{3}{20}\right)^2$

$= \text{Rs } 100\left(\frac{23}{20}\right)^2$

$= \text{Rs}\left(100\times\frac{23}{20}\times\frac{23}{20}\right) = \text{Rs}\frac{529}{4}$

$\therefore$ Compound Interest $= \frac{529}{4} - 100 = \text{Rs}\frac{129}{4}$

If C.I. is Rs $\frac{129}{4}$, then the sum borrowed

= Rs 100

If C.I. is Rs 1,

then the sum borrowed = Rs $100 \times \frac{4}{129}$

If C.I. is Rs 1290, then the sum borrowed

= Rs $100 \times \frac{4}{129} \times 1290$

= Rs $100 \times 4 \times 10$ = Rs 4,000

Hence, the sum borrowed is Rs 4,000.

Alternate Method :

$\text{Amount} = P\left(1+\frac{r}{100}\right)^n = P\left(1+\frac{15}{100}\right)^2$

$= P\left(1+\frac{3}{20}\right)^2 = P\left(\frac{23}{20}\right)^2$

$= P\times\frac{23}{20}\times\frac{23}{20}$

$\therefore$ $\text{C.I.} = \left(P\times\frac{23}{20}\times\frac{23}{20}\right) - P$

$= P\left(\frac{529}{400}-1\right)$

But, C.I. = Rs 1290

$\therefore$ $P\left(\frac{529}{400}-1\right) = 1290$

or $P\left(\frac{529-400}{400}\right) = 1290$

or $P\left(\frac{129}{400}\right) = 1290$

or $P = \frac{129\times400}{129}$

or $P = 10 \times 400 = 4000$

Hence, Principal = Rs 4,000.

Ex.30 In how many years will Rs 800 amount to Rs 882 at 5% per annum compounded annually ?

Sol. Here, P = Rs 800

A = Rs 882

r = 5% p.a.

Let number of years be n.

Since, $A = P\left(1+\frac{r}{100}\right)^n$

$\therefore$ $882 = 800\left(1+\frac{5}{100}\right)^n = 800\left(1+\frac{1}{20}\right)^n$

or $\frac{882}{800} = \left(1+\frac{1}{20}\right)^n$

or $\frac{441}{400} = \left(\frac{21}{20}\right)^n$

or $\left(\frac{21}{20}\right)^n = \left(\frac{21}{20}\right)^n$

[Θ $441 = 21^2$ and $400 = 20^2$]

Since the bases are same on both sides, hence n = 2

Since interest is compounded annually

$\therefore$ Time = 2 years.

Ex.31 Determine the rate percent per annum if Rs 25,000 amounts to 26,010 in 6 months, interest being compounded quarterly.

Sol. Here, n = 2 [Θ 6 months = 2 quarters]

Now, $A = P\left(1+\frac{r}{100}\right)^n$, where r is the rate per quarter.

$\therefore$ $26010 = 25000\left(1+\frac{r}{100}\right)^2$

or $\left(1+\frac{r}{100}\right)^2 = \frac{26010}{25000} = \frac{2601}{2500} = \left(\frac{51}{50}\right)^2$

or $\left(1+\frac{r}{100}\right) = \frac{51}{50}$

or $\frac{r}{100} = \frac{51}{50} - 1 = \frac{51-50}{50} = \frac{1}{50}$

or $r = \frac{1}{50} \times 100 = 2\%$

Hence, the required rate is 2% p.a.

➢ TIME AND WORK

We use the principles of direct and indirect variations to solve problems on 'time and work', such as :

"More men do more work and less men do less work" (Direct variation)

"More men take less time to do a work and less men take more time to do the same work." (Indirect variation)

The problems on "time and work" are divided in two categories:

(i) To find the work done in a given period of time.

(ii) To find the time required to complete a given job.

Working Rules

We shall use the unitary method by considering the following fundamental rules for solving problems regarding time and work :

(i) A complete job or work is taken to be one.

(ii) Time to complete a work

$$=\frac{\text{Total work to be done}}{\text{Part of the work done in one day}}$$

❖ EXAMPLES ❖

Ex.32 Ratan takes 5 days to complete a certain job and shankar takes 8 days to do the same job. If both of them work together, how long will they take to complete the work ?

Sol. Since, Ratan takes 5 days to complete the given work

$\therefore$ Ratan finishes $\frac{1}{5}$ part in 1 day.

Similarly, Shankar takes 8 days to complete the work.

Therefore, Shankar finishes $\frac{1}{8}$ part in 1 day.

$\therefore$ In a day, they together will finish

$$=\frac{1}{5}+\frac{1}{8}=\frac{8+5}{40}=\frac{13}{40}$$

i.e., $\frac{13}{40}$ part of the work.

So, they both will take $\frac{40}{13}$ days $3\frac{1}{13}$ days to complete the work. Hence, the complete work will be finished by them together in $3\frac{1}{13}$ days.

Ex.33 Kshitij can do a piece of work in 20 days and Rohan can do the same work in 15 days. They work together for 5 days and then Rohan leaves. In how many days will Kshitij alone finish the remaining work ?

Sol. Since, Kshitij completes the work in 20 days

$\therefore$ Kshitij's 1 day work $=\frac{1}{20}$ part

Now, Rohan completes the work in 15 days.

Similarly, Rohan's 1 day work $=\frac{1}{15}$ part

$\therefore$ Their combined work for 1 day

$$=\frac{1}{20}+\frac{1}{15}=\frac{3+4}{60}=\frac{7}{60}$$

$\therefore$ Their combined work for 5 days

$$=5\times\frac{7}{60}=\frac{7}{12}\text{ part}$$

Remaining work

= Complete work – Work done in 5 days

$$=1-\frac{7}{12}$$

$$=\frac{12-7}{12}=\frac{5}{12}\text{ part}$$

Now, the remaining work is to be completed by Kshitij alone.

Kshitij can complete the whole work in 20 days.

So, he will complete $\frac{5}{12}$ work in $\left(\frac{5}{12}\times 20\right)$ days, i.e., $\frac{25}{3}$ days or $8\frac{1}{3}$ days.

Ex.34 A and B can do a piece of work in 10 days; B and C in 15 days; C and A in 12 days. How long would A and B take separately to do the same work ?

Sol. A and B can complete the work in 10 days.

$\therefore$ (A and B)'s one day work = $\frac{1}{10}$ part

Similarly,

(B and C)'s one day work = $\frac{1}{15}$ part

(C and A)'s one day work = $\frac{1}{12}$ part

Adding up, we get

2(A and B and C)'s work in 1 day

$$=\left(\frac{1}{10}+\frac{1}{15}+\frac{1}{12}\right)\text{part}$$

$$=\frac{6+4+5}{60}=\frac{15}{60}=\frac{1}{4}\text{part}$$

$\therefore$ (A and B and C) can do in 1 day

$$=\frac{1}{4}\times\frac{1}{2}=\frac{1}{8}\text{ part}$$

Now,

Part of work A can do in 1 day

= (1 day work of A and B and C)

– (1 day work of B and C)

$$=\left(\frac{1}{8}\right)-\left(\frac{1}{15}\right)$$

$$=\frac{15-8}{120}=\frac{7}{120}\text{ part}$$

Hence, A can complete the work in $\left(1\times\frac{120}{7}\right)$ days, i.e. $\frac{120}{7}$, or $17\frac{1}{7}$ days.

Similarly,

Part of the work B can do in 1 day

= (1 day work of A and B and C)

– (1 day work of A and C)

$$=\left(\frac{1}{8}\right)-\left(\frac{1}{12}\right)=\frac{3-2}{24}=\frac{1}{24}$$

Hence, B can complete the work in $\left(1\times\frac{24}{1}\right)$ days, i.e., 24 days.

Ex.35 A contractor undertakes to construct a road in 20 days and engages 12 workers. After 16 days, he finds that only $\frac{2}{3}$ part of the work has been done. How many more workers should he now engage in order to finish the job in time ?

Sol. From the question, it is clear that $\frac{2}{3}$ part of the work has been completed by 12 workers in 16 days.

$\therefore$ Remaining work = $1-\frac{2}{3}=\frac{1}{3}$

Remaining number of days = 20 – 16 = 4

Thus, $\frac{1}{3}$ part of the work is to be finished in 4 days.

$\therefore$ Number of workers required to complete $\frac{2}{3}$ part of work in 16 days = 12

Number of workers required to complete 1 work in 16 days

$$=12\times\frac{3}{2}\times 16$$

Number of workers required to complete $\frac{1}{3}$ work in 1 day

$$=12\times\frac{3}{2}\times 16\times\frac{1}{3}$$

Number of workers required to complete $\frac{1}{3}$ work in 4 days

$$=12\times\frac{3}{2}\times 16\times\frac{1}{3}\times\frac{1}{4}$$

$\therefore$ Number of additional workers required

= 24 – 12 = 12

Hence, the contractor will have to engage 12 more workers to complete the work in time.

EXERCISE # 1

Q.1 The ratio 5 : 4 expressed as a percent equals:
(A) 12.5% (B) 40%
(C) 80% (D) 125%

Q.2 3.5 can expressed in terms of percentage as:
(A) 0.35% (B) 3.5%
(C) 35% (D) 350%

Q.3 Half of 1 percent written as a decimal is :
(A) 0.005 (B) 0.05 (C) 0.02 (D) 0.2

Q.4 What is 15 percent of Rs. 34 ?
(A) Rs. 3.40 (B) Rs. 3.75
(C) Rs. 4.50 (D) Rs. 5.10

Q.5 63% of $3\ \frac{4}{7}$ is:
(A) 2.25 (B) 2.40 (C) 2.50 (D) 2.75

Q.6 88% of 370 + 24% of 210 – ? = 118
(A) 256 (B) 258 (C) 268 (D) 358

Q.7 860% of 50 + 50% of 860 = ?
(A) 430 (B) 516 (C) 860 (D) 960

Q.8 45% of 750 – 25% of 480 = ?
(A) 216 (B) 217.50
(C) 236.50 (D) 245

Q.9 40% of 1640 + ? = 35% of 980 + 150% of 850
(A) 372 (B) 842
(C) 962 (D) 1052

Q.10 218% of 1674 = ? × 1800
(A) 0.5 (B) 4
(C) 6 (D) None of these

Q.11 60% of 264 is the same as :
(A) 10% of 44
(B) 15% of 1056
(C) 30% of 132
(D) None of these

Q.12 270% candidates appeared for an examination, of which 252 passed. The pass percentage is :
(A) 80% (B) $83\ \frac{1}{2}\%$
(C) $90\ \frac{1}{3}\%$ (D) $93\ \frac{1}{3}\%$

Q.13 5 out of 2250 parts of earth is sulphur. What is the percentage of sulphur in earth?
(A) $\frac{11}{50}$ (B) $\frac{2}{9}$ (C) $\frac{1}{45}$ (D) $\frac{2}{45}$

Q.14 What percent of 7.2 kg is 18 gms ?
(A) .025% (B) .25%
(C) 2.5% (D) 25%

Q.15 0.01 is what percent of 0.1 ?
(A) $\frac{1}{100}$ (B) $\frac{1}{10}$
(C) 10 (D) 100

Q.16 What percent of Rs. 2650 is Rs. 1987.50 ?
(A) 60% (B) 75%
(C) 80% (D) 90%

Q.17 What percent of a day is 3 hours?
(A) $12\ \frac{1}{10}\%$ (B) $16\ \frac{2}{3}\%$
(C) $18\ \frac{2}{3}\%$ (D) $12\frac{1}{2}\%$

Q.18 It costs Rs. 1 to photocopy a sheet of paper. However, 2% discount is allowed on all photocopies done after first 1000 sheets. How much will it cost to copy 5000 sheets of paper?
(A) Rs. 3920 (B) Rs. 3980
(C) Rs. 4900 (D) Rs. 4920

Q.19 A housewife saved Rs. 2.50 in buying an item on sale. If she spent Rs. 25 for the item, approximately how much percent she saved in the transaction ?
(A) 8% (B) 9% (C) 10% (D) 11%

Q.20 How many litres of pure acid are there in 8 litres of a 20% solution ?
(A) 1.4 (B) 1.5 (C) 1.6 (D) 2.4

Q.21 Amit can do a piece of work in 4 days and Sumit can do it in 6 days. How long will they take, if both Amit and Sumit work together ?

Q.22 Kami, Karya and Kirti can together weave a carpet in 4 days. Kami by herself can weave the same sized carpet in 12 days and Kirti can do it in 10 days. How long will Karya take to do the work by herself ?

Q.23 A can do a piece of work in 25 days and B can finish it in 20 days. They work together for 5 days and then A goes away. In how many days will B finish the remaining work ?

Q.24 A and B can polish the floors of a building in 25 days, A alone can do $\frac{1}{3}$ of this job in 15 days. In how many ays can B alone polish the floors of the building ?

Q.25 15 boys earn Rs 900 in 5 days, how much will 20 boys earn in 7 days ?

Q.26 Spinning 3 hours daily, Kanta can spin 2 kg cotton-balls in 12 days. Spinning 4 hours daily, how many days will she take to spin 10 kg cotton balls ?

Q.27 Somari sweeps 600 m long railway platform in $2\frac{1}{2}$ hours. His wife Imarati sweeps $\frac{2}{3}$rd of the same platform in $1\frac{1}{2}$ hours. Who sweeps more speedily ?

Q.28 A cistern can be filled by one tap in 4 hours and by another in 3 hours. How long will it take to fill it if both taps are opened together ?

Q.29 Pipe A can fill an empty tank in 6 hours and pipe B in 8 hours. if both the pipes are opened and after 2 hours pipe A is closed, how much time B will take to fill the remaining tank ?

Q.30 A pipe can fill a cistern in 6 hours. Due to a leak in the bottom it is filled in 7 hours. When the cistern in full, in how much time will it be emptied by the leak ?

Q.31 A tank can be filled by two taps A and B in 12 hours and 16 hours respectively. The full tank can be emptied by a third tap in 8 hours. if all the taps be turned on t the same time, in how much time will the empty tank be filled by completely ?

Q.32 If 23% of a is 46, then find a.

Q.33 72% of 25 students are good at Mathematics. How many are not good at it ?

Q.34 If Chameli had Rs 600 left after spending 75% of her money, how much did she have in the beginning ?

Q.35 Malvika gets 98 marks in her exams. This amounts to 56% of the total marks. What are the maximum marks ?

Q.36 A certain company has 80 employees who are engineers. In this company engineers constitute 40% of its work force. how many people are employed in the company ?

Q.37 Kishan spends 30% of his salary on food and donates 3% of his salary in a temple. In a particular month, he spends Rs 231 on these two items. What is his total salary for this month ?

Q.38 A man loses 20% of his money. After spending 25% of the remainder, he has Rs 480.00 left. How much money did he originally have ?

Q.39 A man bought an article and sold it at a gain of 10%. If he had bought it at 20% less and sold it for Rs 10 more, he would have made a profit of 40%. Find the C.P. of the article ?

Q.40 The value of a machine depreciates every year by 10%. What will be its value after 2 years if its present value is Rs 50,000 ?

Q.41 The population of a town increases by 6% every year. If the present population is 15900, find its population a year ago.

Q.42 A number is increased by 10% and then it is decreased by 10%. Find the net increase or decrease percent.

Q.43 A shopkeeper buys a toy for Rs 250 and sells it for Rs 285. Find his gain and gain percent.

Q.44 Rishi bought a wrist watch for Rs 2200 and sold it for Rs 1980. Find has loss and loss percent.

Q.45 If the cost price of 18 mangoes is the same as the selling price of 16 mangoes, find the gain percent.

Q.46 A girl buys lemons at 4 for Rs 3 and sells them at 5 for Rs 4. How much percent loss or gain does she make ?

Q.47 A person sells an article for Rs 550, gaining $\frac{1}{10}$ of its C.P. Find gain percent.

Q.48 A man purchases two fans for Rs 2160.By selling one fan at a profit of 15% and the other at a los of 9% he neither gains nor losses in the whole transaction. Find the cost price of each fan.

Q.49 If a man were to seel his hand-cart for Rs 720, he would lose 25%. What must he sell it for to gain 25% ?

Q.50 A toy was sold at a gain of 12%. Had it been sold for Rs 33 more, the gain would have been 14%. Find the cost price of the toy ?

ANSWER KEY

EXERCISE # 1

Q.No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	D	D	A	D	A	B	C	B	C	D	B	D	B	A	C	B	D	D	B	C

21. 12/5 days **22.** 15 days **23.** 11 days **24.** 225/4 days **25.** Rs. 1680

26. 45 days **27.** $266\frac{2}{3}$ m **28.** 12/7 hrs. **29.** 10/3 hrs. **30.** 42 hrs.

31. 48 hrs. **32.** 200 **33.** 18 **34.** 2400 **35.** 175

36. 200 **37.** 700 **38.** Rs. 800 **39.** 500 **40.** Rs. 40050

41. 15000 **42.** 1% **43.** Rs. 35 & 14% **44.** Rs. 220 & 10% **45.** 12.5%

46. $\frac{20}{3}$ % **47.** 10% **48.** Rs. 1350 **49.** 1200 **50.**1650

EXERCISE # 2

Q.1 Rajeev buys goods 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

Q.2 Which one of the following shows the best percentage ?
(A) $\frac{384}{540}$ (B) $\frac{425}{500}$ (C) $\frac{570}{700}$ (D) $\frac{480}{660}$

Q.3 5% of (25% of Rs. 1600) is -
(A) Rs. 5 (B) Rs. 17.50
(C) Rs. 20 (D) Rs. 25

Q.4 0.15% of $33\frac{1}{3}$% of Rs. 10,000 is -
(A) Rs. 0.05 (B) Rs. 5
(C) Rs. 105 (D) Rs. 150

Q.5 30% of 28% of 480 is the same as -
(A) 15% of 56% of 240
(B) 60% of 28% of 240
(C) 60% of 56% of 240
(D) None of these

Q.6 What is 25% of 25% equal to ?
(A) 0.00625 (B) 0.0625
(C) 0.625 (D) 6.25

Q.7 What percent is 3% of 5% ?
(A) 15% (B) 30% (C) 50% (D) 60%

Q.8 4598 is 95% of ?
(A) 4800 (B) 4840 (C) 4850 (D) 4880

Q.9 ?% of 360 = 129.6
(A) 36 (B) 64 (C) 72 (D) 77

Q.10 ?% of 932 + 30 = 309.6
(A) 25 (B) 30 (C) 35 (D) 40

Q.11 45% of 1500 + 35% of 1700 = ?% of 3175
(A) 30 (B) 35
(C) 45 (D) None of these

Q.12 65% of ? = 20 % of 422.50
(A) 84.5 (B) 130
(C) 139.425 (D) 200

Q.13 An agent gets a commission of 2.5% on the sell of cloth. If on a certain day, he gets Rs. 12.50 as commission, the cloth sold through him on that day is worth
(A) Rs. 250 (B) Rs. 500
(C) Rs. 750 (D) Rs. 1250

Q.14 If Rs. 2800 is $\frac{2}{7}$ percent of the value of a house, the worth of the house (in Rs.) is :
(A) 8,00,000 (B) 9,80,000
(C) 10,00,000 (D) 12,00,000

Q.15 15% of (?)% of 582 = 17.46
(A) 2 (B) 10
(C) 20 (D) None of these

Q.16 $\sqrt{784}$ + ? = 78% of 500 :
(A) 342 (B) 352 (C) 362 (D) 372

Q.17 If 120 is 20% of a number, then 120% of that number will be:
(A) 20 (B) 120 (C) 360 (D) 720

Q.18 If 35% of a number is 175, then what percent of 175 is that number ?
(A) 35% (B) 65%
(C) 280% (D) None of these

Q.19 Two-fifth of one-third of three-seventh of a number is 15. What is 40 percent of that number?
(A) 72 (B) 84
(C) 136 (D) None of these

Q.20 The difference between a number and its two-fifth is 510. What is 10% of that number?
(A) 12.75 (B) 85
(C) 204 (D) None of these

Q.21 If 15% of 40 is greater than 25% of a number by 2, then the number is :
(A) 12 (B) 16 (C) 24 (D) 32

Q.22 Subtracting 40% of a number from the number, we get the result as 30. The number is :
(A) 28 (B) 50 (C) 52 (D) 70

Q.23 If 35% of a number is 12 less than 50% of that number, then the number is :

(A) 40 (B) 50 (C) 60 (D) 80

Q.24 The number which exceeds 16% of it by 42 is:
(A) 50 (B) 52 (C) 58 (D) 60

Q.25 What percentage of numbers from 1 to 70 have squares that end in the digit 1 ?
(A) 1 (B) 14 (C) 20 (D) 21

Q.26 By how much percent is four-fith of 70 less than five-seventh of 112 ?
(A) 24% (B) 30% (C) 36% (D) 42%

Q.27 If a number x is 10% less than another number y and y is 10% more than 125, then x is equal to:
(A) 123.75 (B) 140.55
(C) 143 (D) 150

Q.28 If 75% of a number is added to 75, then the result is the number itself. The number is :
(A) 50 (B) 60 (C) 300 (D) 400

Q.29 A number, when 35 is subtracted from it, reduces to its 80 percent. What is four-fifth of that number ?
(A) 70 (B) 90 (C) 120 (D) 140

Q.30 Which of the following multipliers will cause a number to be increased by 29.7% ?
(A) 1.297 (B) 12.97 (C) 129.7 (D) 1297

Q.31 I gain 70 paise on Rs. 70. My gain percent is :
(A) 0.1% (B) 1% (C) 7% (D) 10%

Q.32 In terms of percentage profit, which is the best transaction ?

	C.P. (in Rs.)	**Profit (in Rs.)**
(A)	36	17
(B)	50	24
(C)	40	19
(D)	60	29

Q.33 If books bought at prices ranging from Rs.200 to Rs. 350 are sold at prices ranging from Rs.300 to Rs. 425, what is the greatest possible profit that might be made in selling eight books ?
(A) Rs. 400
(B) Rs. 600
(C) Cannot be determined
(D) None of these

Q.34 A shopkeeper buy an article for Rs. 2090.42. Approximately, what will be the percentage profit if the sold that article for Rs. 2602.58 ?
(A) 15% (B) 20% (C) 25% (D) 30%

Q.35 Alfred buys an old scooter for Rs. 4700 and spends Rs. 800 on its repairs. If he sells the scooter for Rs. 5800, his gain percent is :
(A) $4\frac{4}{7}\%$ (B) $5\frac{5}{11}\%$ (C) 10% (D) 12%

Q.36 A shopkeeper purchased 70 kg of potatoes for Rs. 420 and sold the whole lot at the rate of Rs. 6.50 per kg. What will be his gain percent?
(A) $4\frac{1}{6}\%$ (B) $6\frac{1}{4}\%$ (C) $8\frac{1}{3}\%$ (D) 20%

Q.37 Sam purchased 20 dozens of toys at the rate of Rs. 375 per dozen. He sold each one of them at the rate of Rs. 33. What was his percentage profit ?
(A) 3.5 (B) 4.5
(C) 6.5 (D) None of these

Q.38 100 oranges are bought at the rate of Rs. 350 and sold at the rate of Rs. 48 per dozen. The percentage of profit or loss is :
(A) $14\frac{2}{7}\%$ gain (B) 15% gain
(C) $14\frac{2}{7}\%$ loss (D) 15% loss

Q.39 A man buys a cycle for Rs. 1400 and sells it at a loss of 15%. What is the selling price of the cycle ?
(A) Rs. 1090 (B) Rs. 1160
(C) Rs. 1190 (D) Rs. 1202

Q.40 A sells an article which costs him Rs. 400 to B at a profit of 20%. B then sells it to C, making a profit of 10% on the price he paid to A. How much does C pay B ?
(A) Rs. 472 (B) Rs. 476
(C) Rs. 528 (D) Rs. 532

Q.41 Peter purchased a machine for Rs. 80,000 and spent Rs. 5000 on repair and Rs. 1000 on transport and sold it with 25% profit. At what price did he sell the machine ?
(A) Rs. 1,05,100 (B) Rs. 1,06,250
(C) Rs. 1,07,500 (D) Rs. 1,17, 500

Q.42 By selling an article for Rs. 100, a man gains Rs. 15. Then, his gain% is:

(A) 15% (B) $12\frac{2}{3}\%$ (C)$17\frac{11}{17}\%$ D) $17\frac{1}{4}\%$

Q.43 When a commodity is sold for Rs. 34.80, there is a loss of 2%. What is the cost price of the commodity ?

(A) Rs. 26.10 (B) Rs. 43
(C) Rs. 43.20 (D) Rs. 46.40

Q.44 A shopkeeper expects a gain of $22\frac{1}{2}\%$ on his cost price. If in a week, his sale was of Rs. 392, what was his profit ?

(A) Rs. 18.20 (B) Rs. 70
(C) Rs. 72 (D) Rs. 88.25

Q.45 The sale price 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) Rs. 500 (B) Rs. 515
(C) Rs 550 (D) Rs. 600

Q.46 Saransh purchased 120 reams of paper at Rs. 80 per ream. He spent Rs. 280 on transportation, paid octroi at 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) Rs. 86 (B) Rs. 87.48
(C) Rs. 89 (D) Rs. 90

Q.47 A person bought 20 litres of milk at the rate of Rs. 8 per litre. He got it churned after spending Rs. 10 and 5 kg of cream and 20 litres of toned milk were obtained. If he sold the cream at Rs. 30 per kg and toned milk at Rs. 4 per litre, his profit in the transation is:

(A) 25% (B) 35.3%
(C) 37.5% (D) 42.5%

Q.48 Find S.P. if

(i) M.P. = Rs 650 and Discount = 10%
(ii) M.P. = Rs 5450 and Discount = 5%

Q.49 Find the M.P. if

(i) S.P. = Rs 3430 and Discount = 2%

(ii) S.P. = Rs 9250 and Discount = $7\frac{1}{2}\%$

Q.50 Find discount in percent when

(i) M.P. = Rs 625 and S.P. = Rs 562.50
(ii) M.P. = Rs 1600 and S.P. = Rs 1180

Q.51 At a clearance sale, all goods are on sale at 45% discount. If I buy a skirt marked Rs 600, how much would I need to pay ?

Q.52 A shopkeeper offers his customers 10% discount and still makes a profit of 26%. What is the actual cost to him of an article marked Rs 280 ?

Q.53 A shopkeeper marks his goods at such a price that after allowing a discount of 12.5% for cash payment, he still makes a profit of 10%. Find the marked price of an article which costs him Rs 245.

Q.54 A dealer buys an article for Rs 380. At what price must he mark it so that after allowing a discount of 5%, he still makes a profit of 25% ?

Q.55 A tradesman allows a discount of 15% on the written price. How much above the cost price must he mark his goods to make a profit of 19% ?

Q.56 I mark up the computers I am selling by 20% and sell them at a discount of 15%. What is my net gain percent ?

Q.57 Articles are marked at a price which gives a profit of 25%. After allowing a certain discount, the profit reduces to $12\frac{1}{2}\%$. Find the discount percent.

Q.58 A cycle merchant allows 25% commission on his advertised price and still makes a profit of 20%. If he gains Rs 60 over the sale of one cycle, find his advertised price.

Q.59 How much percent more than the C.P. should a manufacturer mark his goods so that after allowing a discount of 20% on the marked price, he gains 10% ?

Q.60 A shopkeeper allows a discount of 10% to his customers and still gains 20%. Find the marked price of an article which costs Rs 450 to the shopkeeper.

Q.61 A dealer of scientific instruments allows 20% discount on the marked price of the instruments and still makes a profit of 25%. If his gain over the sale of an instrument is Rs 150, find the marked price of the instrument.

Q.62 Find the compound interest on Rs 1000 for two years at 4% per annum.

Q.63 Find the compound interest on Rs 8000 for $1\frac{1}{2}$ years at 10% per annum, interest being payable half-yearly.

Q.64 Vijay obtains a loan of Rs 64000 against his fixed deposits. if the rate of interest be 2.5 paise per rupee per annum, calculate the compound interest payable after 3 years.

Q.65 Simple interest on a sum of money for 3 years at $6\frac{1}{4}\%$ per annum is Rs 2400. What will be the compound interest on that sum at the same rate for the same period ?

Q.66 Compute the compound interest on Rs 12000 for 2 years at 20% per annum when compounded half-yearly.

Q.67 Find the compound interest on Rs 1000 at the rate of 10% per annum for 18 months when interest is compounded half-yearly.

Q.68 Find the compound interest on Rs 320000 for one year at the rate of 20% per annum, if the interest is compounded quarterly.

Q.69 Ramesh deposited Rs 7500 in a bank which pays him 12% interest per annum compounded quarterly. What is the amount which he receives after 9 months ?

Q.70 Ram Singh buys a refrigerator for Rs 4000 on credit. The rate of interest for the first year is 5% and of the second year is 15%. How much will it cost him if he pays the amount after two years ?

Q.71 Find the compound interest on Rs 24000 at 15% per annum for $2\frac{1}{3}$ years.

Q.72 Find the principal, if the compound interest compounded annually at the rate of 10% per annum for three years is Rs 331.

Q.73 The difference between the compound interest and simple interest on a certain sum of money at 10% per annum for 2 years is Rs 500. Find the sum when the interest is compounded annually.

Q.74 In what time will Rs 800 amount to Rs 882 at 5% per annum compounded annually ?

Q.75 At what rate percent per annum, compound interest will Rs 10000 amount to Rs 13310 in three years ?

Q.76 Reena borrowed from kamal certain sum for two years at simple interest. Reena lent this sum to Hamid at the same rate for two years compound interest. At the end of two years she received Rs 110 as compound interest but paid Rs 100 as simple interest. Find the sum and rate of interest.

Q.77 The population of a town is increasing at the rate of 5% per annum. What will be the population of the town on this basis after two years, if the present population is 16000 ?

Q.78 The population of a village is 20000. If the annual birth rate is 4% and the annual death rate 2%, calculate the population after two years.

Q.79 The population of a town was 160000 three years ago. If it had increased by 3%, 2.5% and 5% in the last three years, find the present population of the town.

Q.80 The present population of a city is 9261000. if it has been increasing at the rate of 5% per annum, find its population 3 years ago.

Q.81 In a factory the production of scooters rose to 48400 from 40000 in 2 years. Find the rate of growth per annum.

Q.82 The bacteria in a culture grows by 10% in the first hour, decreases by 10% in the second hour and again increases by 10% in the third hour. If the original count of the bacteria in a sample is 10000, find the bacterial count at the end of 3 hours.

Q.83 10000 workers were employed to construct a river bridge in four years. At the end of first year, 10% workers were retrenched. At the end of the second year, 5% of the workers at that time were retrenched. However to complete the project in time, the number of workers was increased by 10% at the end of

the third year. How many workers were working during the fourth year ?

Q.84 A factory increased its production of three wheelers from 80000 in 1999 to 92610 in 2002. Find the annual rate of growth of production of three wheelers.

Q.85 Given that Carbon – 14(C_{14}) decays at a constant rate in such a way that it reduces to 50% in 5568 years. Find the age of an old wooden piece in which the carbon is only 12.5% of the original.

Q.86 A new car costs Rs 360000. Its price depreciates at the rate of 10% a year during the first two years and at the rate of 20% a year thereafter. What will be the price of the car after 3 years ?

Q.87 The value of a property increases every year at the rate of 5%. If its value at the end of 3 years be Rs 411540, what was its original value at the beginning of these years ?

Q.88 Afridi purchased an old scooter for Rs 16000. If the cost of scooter after 2 years depreciates to Rs 14440, find the rate of depreciation.

ANSWER KEY

EXERCISE # 2

Q.No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	A	B	C	B	B	B	D	B	A	B	D	B	B	B	C	C	D	D	D	B
Q.No	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	B	B	D	A	C	B	C	C	D	A	B	D	D	C	B	C	D	A	C	C
Q.No	41	42	43	44	45	46	47													
Ans.	C	C	D	C	A	D	B													

48. (i) 585 Rs, (ii) 5177.5 Rs

49. (i) 3500 Rs; (ii) 10,000 Rs

50. (i) 10% ; (ii) 26.25%

51. 330 **52.** 200 **53.** 308

54. 500 **55.** 40% **56.** 2% **57.** 10% **58.** 480

59.37.5% **60.** 600 **61.** 937.5 **62.** 81.6 **63.** 1261

64.2155.06 **65.** 2553.13 **66.** 5569.20 **67.** 157.63 **68.** 68962

69.8195.45 **70.** 4830 **71.** 9327 **72.** 1000 **73.** 50000

74.2 years **75.** 10% **76.** 250 & 20% **77.** 17640 **78.** 20808

79.177366 **80.** 8000000 **81.** 10% **82.** 10890 **83.** 9405

84. 5% **85.** 16704 **86.** 233280 **87.** 355503.72 **88.** 5%