Simple Interest

In profit and loss chapter, we have taken that a merchant is doing business with us so that he makes profit on his investment.

In Simple interest problems, we ourselves do business with a bank. i.e., we keep our money in the bank so that bank gives us interest (Profit) at certain interest rate (Profit %), which is profit for us. So all the formulas in profit and loss are useful in this chapter too.

We know that Profit = CP x (profit %)

Profit %= $\dfrac{\text{Profit}}{\text{Costprice}} \times 100$

In simple interest problems

Simple interest = Principal x (interest %) = P X (R%)

If simple interest for more than 1 year the Simple interest = $P \times R\% \times T = SI$

Interest % = $\dfrac{\text{Interest}}{\text{Principal}} \times 100 = \dfrac{SI}{P} \times 100$

Simple interest is directly proportional to the principal, rate of interest, and time.(To know more above Direct proportion Click here)

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Practice Problems

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1. The interest earned by Rs.4800 in 2 years and 3 months at the rate of $8\frac{1}{2}\%$p.a. simple interest is

Formula = P X R% X T = $\dfrac{4800 \times 8\frac{1}{2} \times 2\frac{3}{12}}{100} = \dfrac{4800 \times \frac{17}{2} \times \frac{9}{4}}{100} = \dfrac{4800 \times 17 \times 9}{800}$ =918

Alternate method:

First we calculate the simple interet for 1 year at $8\frac{1}{2}\%$.

We know that 8.5% (principal) = (10% - 1.5%) principal

10% (4800) = 480

1% (4800) = 48

0.5% (4800) = 24

Therefore 8.5% (4800) = [10% - (1+0.5)%] (4800) = 480 - 48 - 24 = 408

Now 2 years interest = 408 X 2 = 816

3 months interest = 1/4 rd of one year interest = 408/4 = 102

So total interest for 3 years and 4 months = Rs.918

2. What sum of money will amount of Rs. 1768 in 3 years at simple interest if the rates of interest for the three years are $2\frac{1}{4}\%, 3\frac{1}{2}\%, 4\frac{3}{4}\%$ respectively

Amount = Principal + Simple interest

As simple interest is independent of each year, we can add all these percentages and calculate directly on the principal.

$$\Rightarrow 2\frac{1}{4}\% + 3\frac{1}{2}\% + 4\frac{3}{4}\% = 10\frac{1}{2}\%$$

Given 1768 = P + 10.5% (P) = P + $\frac{21}{200}$ P

$$\Rightarrow 1768 = \frac{221}{200}P \Rightarrow P = 1600$$

3. Murali deposited a certain sum of money at S.I, which amounts to Rs. 720 after 2 years and to Rs. 1020 after a further period of 5 years. The sum is

We can observer here that the amount grew upto Rs.1020 after a further period of 5 years. This implies that interest is being added to the principal every year for the next 5 years. So Rs.300 has been added in 5 years. That is for every year the bank must have added Rs.60 to the account. Now for the first two years bank has added Rs.120. So the money deposited by Murali = Rs.720 - 120 = Rs.600

4. The simple interest on a sum of money will be Rs. 600 after 10 years. If the principle is trebled after 5 years, what will be the total interest at the end of the tenth year?

We know that interest is directly proportional to time and principal. If the total interest for 10 years is Rs.600, It is Rs.300 for the first 5 years. Now the principal trebled after 5 years. So we get 3 times more interest for the next 5 years. So instead of Rs.300 we get Rs.900. So total interest = Rs.300 + Rs.900 = Rs.1200

5. An amount becomes 4 times in 7 years when invested under SI at a certain rate. In how many years will the amount become 16 times of the original amount at the same rate ?

If we invest Rs.100 in bank it becomes Rs.400 in 7 years. Interest earned on the principal is equal to Rs.300. In other words in 7 years bank gives Rs.300 if we invest Rs.100.

Now if we want to earn 16 times of the investment, then bank has to give 1500 interest for Rs.100. As we know that bank gives Rs.300 for 7 years, We must keep our money in bank for 35 years to get an interest of Rs.1500.

So answer is 35 years.

6. A sum was put at simple interest at a certain rate for 2 years. Had it been put at 4% higher rate, it would have fetched Rs. 400 more. Find the sum.

For two years we got Rs.400 more so for 1 year, we must get Rs.200 extra.

Assume we invested Rs.100 in bank. If bank gives us 4% higher rate it gives Rs.4 extra. To get Rs.200 extra we need to invest 200/4 = 50 times of Rs.100. i.e., Rs.5000

7. Rs. 600 amounts to Rs. 735 in 5 years at a certain rate of Simple interest. If the rate of interest is increased by 2%, what will be the amount then? There is no need of calculating original rate of interest in this case. We can just caluculate the difference generated by the increment of 2% interest rate.

Increase in simple interest = 2% on Rs. 600 for 5 years

$= \frac{600 \times 2 \times 5}{100}$ = 6 x 2 x 5 = Rs. 60

Therefore Amount = Original amount + Extra interest

= Rs. 735 + Rs. 60 = Rs. 795

8. A man lent Rs. 2000 - partly at 5% and the balance at 4%. If he receives Rs. 92 towards annual interest, find the amount lent at 5%.

Let the whole amount is invested at 4% p.a. Then, Simple interest $= \frac{2000 \times 4 \times 1}{100}$ = Rs. 80. This interest is short from actual interest by Rs. 92 - Rs. 80 = Rs. 12

The difference is because the amount is also invested at 5% p.a. Difference in two rates of interest = 5% - 4% = 1% p.a. Here, difference in rate is 1%, and difference in interest = Rs. 12

Therefore, Amount invested at 5% = 12 x $\frac{100}{1}$ = Rs. 1200

Alternative Method:

Simple interest on Rs. 2000 at 5% p.a. = $\frac{2000 \times 5 \times 1}{100}$ = Rs. 100

Simple interest on Rs. 2000 at 4% p.a. = $\frac{2000 \times 4 \times 1}{100}$ = Rs. 80

Now, by Alligation Method:

Therefore, Ratio between amounts lent at 5% and 4% = 12 : 8 = 3 : 2

Therefore, Sum lent at 5% = $\frac{3}{5}$ x 2000 = Rs. 1200

MCQ's

1. The rate of interest on a sum of money is 4% per annum for the first 2 years, 6% per annum for the next 4 years and 8% per annum for the period beyond 6 years. If the simple interest occured by the sum for a total period of 9 years is Rs.1120, what is the sum?

a. Rs.1500

b. Rs.2000

c. Rs.2500

d. Rs.4000

Correct Option: B

Explanation:

Let, sum = Rs.x. Then

$$\frac{x \times 4 \times 2}{100} + \frac{x \times 6 \times 4}{100} + \frac{x \times 8 \times 3}{100} = 1120$$

56x = 112000 or x = $\frac{112000}{56}$ = 2000

2. Two equal amounts of money are deposited in two banks, each at 15% per annum, for $3\frac{1}{2}$ and 5 years. If the difference between their interest is Rs.144, each sum is :

a. Rs.460

b. Rs.500

c. Rs.640

d. Rs.720

Correct Option: C

Explanation:

Let each sum be Rs.P. Then,

$$\frac{P \times 15 \times 5}{100} - \frac{P \times 15 \times 7}{100 \times 2} = 144$$

$$\frac{3P}{4} - \frac{21P}{40} \Rightarrow \frac{9P}{40} = 144$$

P= $\frac{144 \times 40}{9}$ = 640

3. The difference between the interests received from two different banks on Rs.500 for 2 years, is Rs.2.50.The difference between their rates is :

a. 1%

b. 0.5%

c. 2.5%

d. 0.25%

Correct Option: D

Explanation:

Let the rates be x% and y% . Then,

$$\frac{500 \times x \times 2}{100} - \frac{500 \times y \times 2}{100} = 2.5$$

⇒ 10(x-y)=2.5 or x-y = 0.25

4. A certain sum of money at simple interest amounts to Rs.1012 in $2\frac{1}{2}$ years and to Rs.1067.20 in 4 years. The rate of interest per annum is :

a. 2.5%

b. 3%

c. 4%

d. 5%

Correct Option: C

Explanation:

S.I for $1\frac{1}{2}$ years = Rs.(1067.20-1012) = Rs.55.20

S.I for $\frac{5}{2}$ years = Rs. $(55.20 \times \frac{2}{3} \times \frac{5}{2})$ = Rs.92

Sum = Rs. (1012-92) = Rs.920

Hence, Rate = $\dfrac{100 \times 92 \times 2}{920 \times 5} = 4\%$

5. At simple interest, a sum doubles after 20 years. The rate of interest per annum is :

a. 5%

b. 10%

c. 12%

d. data inadequate

Correct Option: A

Explanation:

Let, sum = P. Then, to make the money double, we have to get simple interest P on Principal P and time = T years

$SI = \dfrac{P\,T\,R}{100}$

$\Rightarrow 2P = \dfrac{P \times 20 \times R}{100}$

$\Rightarrow R = 5$

6. The simple interest on a sum of money at 8% per annum for 6 years is half the sum. The sum is :

a. Rs.4800

b. Rs.6000

c. Rs.8000

d. Data inadequate

Correct Option: D

Explanation:

Let, sum = P. Then, S.I = $\frac{1}{2}P$, Rate = 8% and time = 6 years

$\dfrac{P}{2} = \dfrac{P \times 8 \times 6}{100}$

Thus, data is inadequate.

7. A sum of money becomes $\frac{8}{5}$ of itself in 5 years at a certain rate of interest. The rate percent per annum is :

a. 5%

b. 8%

c. 10%

d. 12%

Correct Option: D

Explanation:

Let, sum = Rs.x.

Then, amount = Rs.$(\frac{8x}{5})$

S.I = Rs.$(\frac{8x}{5} - x)$ = Rs. $(\frac{3x}{5})$

Rate = $\frac{100 \times SI}{P \times T}$ = $\frac{100 \times \frac{3x}{5}}{x \times 5}$ % = 12

8. In how many years will sum of money double itself at 12% per annum?

a. 6 years 9 months

b. 8 years 3 months

c. 7 years 6 months

d. 8 years 4 months

Correct Option: D

Explanation:

Let, principal = Rs.P. Then S.I = Rs. P, Rate - 12%

Time = $\frac{100 \times SI}{P \times R}$ = $(\frac{100 \times P}{P \times 12})$ years = 8 years 4 months.

9. The simple interest on a sum of money will be Rs.600 after 10 years. If the principal is tripled after 5 years, what will be the total interest at the end of the tenth year?

a. Rs.600

b. Rs.900

c. Rs.1200

d. Data inadequate

Correct Option: C

Explanation:

Let, sum = Rs.x, Time = 10 years Then S.I = Rs.600,

Rate = $(\frac{100 \times 600}{x \times 10})$ = $(\frac{6000}{x})$ %   per annum

S.I. on Rs.x for Ist five years

= Rs. $(x \times \frac{6000}{x} \times 5 \times \frac{1}{100})$ = Rs.300

S.I on Rs.3x for next 5 years

= Rs.$(3x \times \frac{6000}{x} \times 5 \times \frac{1}{100})$ = Rs.900

Total interest = Rs.(300+900)=Rs.1200

Alternatively:

Simple interest is linear with time. So If the SI is 600 for 10 years, then for 5 years, we get 300. Now if principal is trebled after 5 years, we get 3 times of actual interest for the last 5 years. i.e., 900. So total interest is Rs.1200

10. A lent Rs.600 to B for 2 years and Rs.150 to C for 4 years and received all together from both Rs.90 as simple interest. The total interest is :

a. 4%

b. 5%

c. 10%

d. 12%

Correct Option: B

Explanation:

Let, rate = x% per annum. Then,

$$\frac{600 \times x \times 2}{100} + \frac{150 \times x \times 4}{100} = 90$$

or 18x = 90 or x = 5

11. A certain sum of money at simple interest amounts to Rs.1260 in 2 years and to Rs.1350 in 5 years. The rate percent per annum is :

a. 2.5%

b. 3.75%

c. 5%

d. 7.5%

Correct Option: A

Explanation :

S.I for 3 years = Rs.(1350-1260)=Rs.90

S.I for 2 years = Rs.$(\frac{90}{3} \times 2)$ = Rs.60

Sum = Rs.(1260-60) = Rs.1200

Rate = $\frac{100 \times 60}{1200 \times 2} = 2.5\%$

12. A sum of money at simple interest amounts to Rs.2240 in 2 years and Rs.2600 in 5 years. The sum is :

a. Rs.1880

b. Rs.2000

c. Rs.2120

d. Data inadequate

Correct Option: B

Explanation:

S.I for 3 years = Rs.(2600-2240)=Rs.360

S.I for 2 years = Rs.$(\frac{360}{3} \times 2)$ =Rs.240

Sum = Rs.(2240-240)=Rs.2000

13.Rs.800 amounts to Rs.920 in 3 years at simple interest. If the interest rate is increased by 3% , it would amount to how much ?

a. Rs.1056

b. Rs.1112

c. Rs.1182

d. Rs.992

Correct Option: D

Explanation:

Principal = Rs.800, S.I = Rs.(920-800) = Rs.120 and Time = 3 years

Original rate = $\dfrac{100 \times 120}{800 \times 3} = 5\%$

New rate = 8%

Now, S.I = Rs. ($\dfrac{800 \times 8 \times 3}{100}$) =Rs.192

Amount = Rs.992

14. At a certain rate of simple interest, a certain sum doubles itself in 10 years. It will triple itself in :

a. 15 years

b. 20 years

c. 30 years

d. 12 years

Correct Option: B

Explanation:

Let principal = P, We got P interest on Principal P for 10 years.

Now to make it triple, we have to get 2P interest on P. So after 20 years we get the money tripled. *Alternatively,*

Principal = P, S.I = P and Time = 10 years

$\Rightarrow SI = \dfrac{P \times T \times R}{100}$

$\Rightarrow P = \dfrac{P \times 10 \times R}{100}$

$\Rightarrow R = 10$

Now to make it triple, we have to get 2P interest.

$\Rightarrow 2P = \dfrac{P \times T \times 10}{100} \quad \Rightarrow T = 20$

15. A sum of money will double itself in 6 years at simple interest with yearly rate of :

a. 10%

b. $16\dfrac{2}{3}\%$

c. 8%

d. 16%

Correct Option: B

Explanation:

Let Principal = P, Then S.I = P

Rate = $\dfrac{100 \times SI}{P \times R}$ = $\dfrac{100 \times P}{P \times 6}$ = $\dfrac{100}{6} = 16\dfrac{2}{3}\%$

16.The simple interest on a sum of money is $\dfrac{1}{9}$ of the principal and the number of years is equal to the rate percent per annum. The rate percent per annum is :

a. 3

b. $\dfrac{1}{3}$

c. $3\dfrac{1}{3}$

d. $\dfrac{3}{10}$

Correct Option: C

Explanation:

Let principal = P, Then, S.I = $\dfrac{P}{9}$

Let Rate = R% per annum and

Time = R years

Then, $\dfrac{P}{9} = \dfrac{P \times R \times R}{100}$ or

$R^2 = \dfrac{100}{9}$ or Rs. $\dfrac{10}{3} = 3\dfrac{1}{3}$% per annum

17. A sum of Rs.2540 is lent out into two parts, one at 12% and another one at $12\dfrac{1}{2}$ %. If the total annual income is Rs.311.60, the money lent at 12% is:

a. Rs.1180

b. Rs.1360

c. Rs.1240

d. Rs.1340

Correct Option: A

Explanation:

Let money lent at 12% = Rs.x

Then, money lent at $12\dfrac{1}{2}$% = Rs.(2540-x)

$\dfrac{x \times 12 \times 1}{100} + (2540 - x) \times \dfrac{25}{2} \times \dfrac{1}{100} = 311.60$

or $\dfrac{3x}{25} + \dfrac{2540 - x}{8} = 311.60$

or 24x + 25 (2540-x) = 200×311.60

x=63500-62320=1180

18.A money lender finds that due to a fall in the rate of interest from 13% to $12\dfrac{1}{2}$ %, his yearly income diminishes by Rs.104. His capital is :

a. Rs.21400

b. Rs.20800

c. Rs.22300

d. Rs.24000

Correct Option: B

Explanation:

Let capital = Rs. x. Then,

$$(\frac{x \times 13 \times 1}{100}) - (x \times \frac{25}{2} \times \frac{1}{100}) = 104$$

or $\frac{13x}{100} - \frac{x}{8} = 104$ or 26x-25x

$= 104 \times 200$

or x = 20800

Capital = Rs.20800

19. A sum of money amounts to Rs.850 in 3 years and Rs.925 in 4 years. The sum is :

a. Rs.600

b. Rs.575

c. Rs.625

d. Data inadequate

Correct Option: C

Explanation:

S.I for 1 year = Rs.(925-850)= Rs.75

S.I for 2 years = Rs.(75×3) =Rs.225

Sum = Rs.(850-225)=Rs.625

20. The simple interest on a certain sum for 3 years at 14% per annum is Rs.235.20. The sum is :

a. Rs.480

b. Rs.560

c. Rs.650

d. Rs.720

Correct Option: B

Explanation:

Sum = Rs.$(\frac{100 \times 235.20}{3 \times 14}) = Rs.560$

21. Rs.2189 are divided into three parts such that their amounts after 1, 2 and 3 years respectively may be equal, the rate of simple interest being 4% p.a.in all cases. The smallest part is :

a. Rs.702

b. Rs.398

c. Rs.756

d. Rs.1093

Correct Option: B

Explanation:

(*Here there is slight problem I think. Instead of amounts it should be interests*)

Let the three parts be, p, q ,r. Now interests on these three parts are

$$\frac{p \times 1 \times 4}{100} = \frac{q \times 2 \times 4}{100} = \frac{r \times 3 \times 4}{100}$$

$\Rightarrow 4p = 8q = 12r \quad \Rightarrow p = 2q = 3r$

Let the above values are equal to k

Then $p = k$, $q = \dfrac{k}{2}$, $r = \dfrac{k}{3}$

$p : q : r = 6 : 3 : 2$

Smallest part = $r = \dfrac{2}{6+3+2} \times 2189 = 398$

Modification:

Suppose if the question really means **amounts**, then we have to equal the amounts after the respective years.

$$p + \frac{p \times 1 \times 4}{100} = q + \frac{q \times 2 \times 4}{100} = r + \frac{r \times 3 \times 4}{100}$$

Now $26p = 27q = 28r$

$p : q : r = \dfrac{1}{26} : \dfrac{1}{27} : \dfrac{1}{28}$

Smallest part = $\dfrac{\frac{1}{28}}{\frac{1}{26} + \frac{1}{27} + \frac{1}{28}} \times 2189 = 702\dfrac{1053}{1093} = 702.96$

22. A man lends Rs.10000 in four parts. If he gets 8% on Rs.2000; $7\frac{1}{2}$% on Rs.4000 and $8\frac{1}{2}$% on Rs.1400, what percent must he get for the remainder, if his average annual interest is 8.13% ?

a. $10\frac{1}{2}$%

b. $9\frac{1}{4}$%

c. 9%

d. 7%

Correct Option: C

Explanation:

$$[\frac{2000 \times 8 \times 1}{100}] + [4000 \times \frac{15}{2} \times \frac{1}{100}] + [1400 \times \frac{17}{2} \times \frac{1}{100}] + [2600 \times R \times \frac{1}{100}]$$

$$= \frac{8.13}{100} \times 10000 = \frac{813}{10000} \times 10000$$

$\Rightarrow 160 + 300 + 119 + 26R = 813 \Rightarrow R = 9$

23. A man invests an amount of Rs.15860 in the names of his three sons A,B and C in such a way that they get the same amount after 2,3 and 4 years respectively. If the rate of simple interest is 5%, then the ratio of amounts invested among A,B and C will be:

a. 10:15:20

b. 22:23:24

c. 6 :4 :3

d. 2 :3 :4

Correct Option: C

Explanation:

The amounts invested be p,q, r respectively

Then, $\dfrac{p \times 2 \times 5}{100} = \dfrac{q \times 3 \times 5}{100} = \dfrac{r \times 4 \times 5}{100} = x$

$p = 10x;\ q = \dfrac{20}{3}x;\ r = 5x$

$p : q : r = 10x : \dfrac{20}{3}x : 5x = 6 : 4 : 3$

24. A man invested $\dfrac{1}{3}$ of his capital at 7%, $\dfrac{1}{4}$ at 8% and the remainder at 10%. If his annual income is Rs.561, the capital is :

a. Rs.5400

b. Rs.6000

c. Rs.6600

d. Rs.7200

Correct Option: C

Explanation:

Let the total capital be "C", then

$$\left(\dfrac{C}{3} \times \dfrac{7}{100} \times 1\right) + \left(\dfrac{C}{4} \times \dfrac{8}{100} \times 1\right) \qquad + \left(\dfrac{5C}{12} \times \dfrac{10}{100} \times 1\right) = 561$$

$$\Rightarrow \dfrac{7C}{100} + \dfrac{C}{50} + \dfrac{C}{24} = 561$$

$$\Rightarrow 5C = (561 \times 600) \quad \text{or } C = 6600$$

25. What should be the least number of years in which the simple interest on R.2600 at $6\dfrac{2}{3}$ % will be an exact number of rupees ?

a. 2

b. 3

c. 4

d. 5

Correct Option: B

Explanation:

Simple interest = Rs.