Conceptual Questions on Profit, Loss & Discount

(1) Principal = ₹30000

Rate = 7%

Let time period = t

Compound Interest = ₹4347

$$P\left[\left(1+\frac{R}{100}\right)^{t}-1\right] = 4347$$

$$\Rightarrow 30000\left[\left(1+\frac{7}{100}\right)^{t}-1\right] = 4347$$

$$\Rightarrow 30000\left[\left(\frac{107}{100}\right)^{t}-1\right] = 4347$$

$$\Rightarrow 30000\left(\frac{107}{100}\right)^{t} - 30000 = 4347$$

$$\Rightarrow \left(\frac{107}{100}\right)^{t} = \frac{34347}{30000} = \frac{11449}{10000} \Rightarrow \left(\frac{107}{100}\right)^{t} = \left(\frac{107}{100}\right)^{2}$$

$$\Rightarrow t = 2 \text{ yrs}$$

Hence, time is 2 yrs

(2) Principal = ₹16000 Time = 9 months Rate = 20% per ann

So, quarter time $= \frac{9}{12} \times 4 = 3$ months

Quarter Rate $= \frac{20}{4} = 5\%$

$$C.I = 16000\left[\left(1+\frac{5}{100}\right)^{3}-1\right] = 16000\left[\left(\frac{21}{20}\times\frac{21}{20}\times\frac{21}{20}\right)-1\right]$$

$$= 16000\left[\frac{9261-8000}{8000}\right] = 2\times 1261$$

$$= ₹2522$$

(3) Principal = ₹5000 Rate = 4% per annum

Time = 1 yr So, rate for $\frac{1}{2}$ yr = 2%

Amount $= 5000 \times \left(1+\frac{R}{100}\right)\left(1+\frac{R}{100}\right)$

$= 5000\left(1+\frac{4}{100}\right)\left(+\frac{2}{100}\right) = 5000 \times \frac{104}{100} \times \frac{102}{100} = ₹5304$

C.I = 5304 − 5000 = ₹304

Time quarterly $= \frac{1.5}{0.5} = 3$ quarters

Amount $= 5000 \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50} = ₹300.24$

Difference = 304 − 300.04 = ₹3.96

(4) Let Principal = P Time = 2 yrs Rate = 8% per annum

So, difference between C.I and S.I = 16

$P\left[\left(1+\frac{R}{100}\right)^2 - 1\right] - \frac{PRT}{100} = 16$

$\Rightarrow P\left[\left(1+\frac{8}{100}\right)^2 - 1\right] - \frac{16P}{100} = 16$

$\Rightarrow P\left[\left(\frac{108}{100} \times \frac{108}{100}\right) - 1\right] - \frac{4P}{25} = 16$

$\Rightarrow P\left[\frac{729-625}{625}\right] - \frac{4P}{25} = 16 \Rightarrow \frac{104P}{625} - \frac{4P}{25} = 16$

$\Rightarrow \frac{104P - 100P}{625} = 16$

$\Rightarrow 4P = 16 \times 625$

$\Rightarrow P = \frac{16 \times 625}{4}$

$\Rightarrow P = ₹2500$

(5) Principal = ₹1200 Time = 3 yrs Rate = 5%

$S.I = \frac{1200 \times 3 \times 5}{100} =$

(5) Let Principal = x Time = 3 yrs Rate = 8%

$S.I = ₹1200$ $\quad \frac{3 \times 8x}{100} = 1200$

$\Rightarrow 24x = 1200 \times 100 \Rightarrow x = \frac{1200 \times 100}{24} = ₹5000$

Compound Interest $= 5000\left[\left(1 + \frac{8}{100}\right)^3 - 1\right]$

$= 5000\left[\left(\frac{54}{50} \times \frac{54}{50} \times \frac{54}{50}\right) - 1\right]$

$= 5000\left[\frac{157464 - 62500}{62500}\right] = \frac{5000 \times 94964}{62500}$

$= 50 \times \frac{94964}{625} = \frac{189928 \times 4}{25 \times 4} = \frac{759712}{100} = ₹7597.12$

(6) $P + \frac{PRT}{100} = ₹7350 \Rightarrow P + \frac{2PR}{100} = 7350 \Rightarrow \frac{50P + PR}{50} = 7350$

$\Rightarrow 50P + PR = ₹367500 \rightarrow$ Eq^n 1

$P + \frac{PRT}{100} = ₹8575 \Rightarrow P + \frac{3PR}{100} = 8575$

$\Rightarrow 100P + 3PR = 857500 \rightarrow$ Eq^n 2

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On dividing Eqn 1 and 2, $= \frac{100P+3PR}{100P+50+PR} = \frac{857500}{367500}$

$\Rightarrow 4900P+147PR = 3450P+69PR$

$\Rightarrow 450P = 78PR \Rightarrow \frac{450P}{78P} = R \Rightarrow \frac{75}{13}\% = R$

So, Principal $= 50P + \frac{75}{13}P = 367500$

$\Rightarrow \frac{650P+75P}{13} = 367500 \Rightarrow P = \frac{367500 \times 13}{725} = ₹\frac{10700}{29}$

(7) Let Principal $= P$ Rate $= 10\%$ Time $= 2$ yrs

$S.I = \frac{P \times 10 \times 2}{100} = \frac{2P}{10} = \frac{P}{5}$

$C.I = P\left[\left(1+\frac{10}{100}\right)^2 - 1\right] = P\left[\left(\frac{110}{100} \times \frac{110}{100}\right) - 1\right]$

$= x\left[\frac{121-100}{100}\right] = \frac{21P}{100}$

$C.I - S.I = 631 \Rightarrow \frac{21P}{100} - \frac{P}{5} = 631 \Rightarrow \frac{21P-20P}{100} = 631$

$\Rightarrow P = 63100$

Hence, principal is ₹63,100.