23. What annual payment will discharge a debt of ₹ 1025 due in 2 years at the rate of 5% compound interest?
(a) ₹ 550 (b) ₹ 551.25
(c) ₹ 560 (d) ₹ 560.75
(e) None of these

24. The simple interest on a sum of money for 3 years is ₹ 240 and the compound interest on the sum at same rate for 2 years in ₹ 170. The rate % p.a. is
(a) 16% (b) 8%
(c) $12\frac{1}{2}\%$ (d) $8\frac{1}{3}\%$
(e) None of these

25. What annual payment will discharge a debt of ₹ 50,440 due in 3 years at 5% per annum compounded annually?
(a) ₹ 18,522 (b) ₹ 20,570
(c) ₹ 20,800 (d) ₹ 16,576

ANSWERS & EXPLANATIONS

EXERCISE 1

1. (d) $S.I. = \frac{P \times R \times T}{100}$

$\Rightarrow P = \frac{810 \times 100}{9 \times 6} = Rs1500$

2. (b) S. I. = 81 – 72 = ₹ 9

$\therefore T = \frac{9 \times 100 \times 4}{72 \times 25} = 2$ years

3. (e) Let the principal be = ₹x
$\therefore$ Interest = (19050 – x)
Now,

$Principal = \frac{Interest \quad 100}{Time \quad Rate}$

$\Rightarrow \quad x = \frac{(19050 \quad x) \quad 100}{3 \quad 9}$

$\Rightarrow 27x = 1905000 - 100x$
$\Rightarrow 127x = 1905000$

$\Rightarrow x = \frac{1905000}{127} = ₹15000$

4. (a) Interest on ₹ 1 in 4 years = ₹ 0.4
$\therefore$ Interest on ₹ 100 in 4 years = ₹ 40
$\therefore$ Interest on ₹ 100 in 1 year = ₹ 10

$\therefore \quad Interest = \frac{Principal \times Time \times Rate}{100}$

$= \frac{450 \quad 2 \quad 10}{100} = ₹ 90$

5. (b) Simple Interest = $\frac{P \times R \times T}{100}$

$\frac{31400 \times 8 \times 12}{100} = ₹30144$
$\therefore$ Required amount = ₹ (31400 + 30144)
= ₹ 61544

6. (e) Rate = $\frac{(26350 - 21250) \times 100}{21250 \times 6}$

$= \frac{510000}{127500} = 4\%$

7. (a) SI = ₹ (12710 – 10250)= ₹ 2460

$time = \frac{S.I. \times 100}{Principal \times Rate} = \frac{2460 \times 100}{10250 \times 4} = 6$ years

8. (a) Required Amount = $15000\left(1+\frac{5}{100}\right)^2$ = ₹ 16537.50

9. (a) Required Simple Interest = $\frac{5760 \times 3 \times 6}{100}$ = ₹ 1036.80

10. (e) Simple interest = $\frac{6420 \times 7 \times 4}{100} = 1797.60$

11. (c) Let the required time = t years
Simple interest = (11442 – 9535) = ₹1907

$Simple = \frac{P \times T \times R}{100}$

$1907 = \frac{9535 \times 4 \times t}{100}$

$\therefore t = \frac{1907 \times 100}{9535 \times 4} = 5$ years

12. (d) Interest = (25451 – 16420) = ₹9031

$Rate \quad \frac{Interest \quad 100}{Principal \times Time}$

$\frac{9031 \times 100}{16420 \times 5} = 11\%$

13. (b) Simple interest = $\frac{3460 \times 6 \times 8.5}{100}$ = ₹1764.60

14. (b) Let the principal be = ₹100
$\therefore$ Simple interest

$= \frac{100 \times 8 \times 6}{100} = ₹48$

$\therefore$ Amount (100 + 48) = ₹148
$\therefore$ When the amount is = ₹148, the principal = ₹100
$\therefore$ When amount = ₹28046, the principal

$= \frac{100}{48} \times 28046 = ₹18950$

$\therefore$ Simple interest = (₹28046 – 18950) = ₹9096

15. (d) Rate of Interest = $\frac{(31684 - 17800) \times 100}{17800 \times 6}\%$

$= \frac{1388400}{106800} = 13\%$

16. (b) Required interest = ₹$\frac{5580 \times 5 \times 6.5}{100}$ = ₹1813.5

17. (c) Simple interest = $\frac{P\times R\times T}{100}$

$= ₹\frac{56500\times 3\times 12}{100} = 20340$

$\therefore$ Required amount = ₹ (56500 + 20340) = ₹76840

18. (d) Amount invested = $\frac{8376\times 100}{8\times 6}$

= ₹ 17450

19. (c) Compound interest

$= 8000\left(1+\frac{15}{100}\right)^2 - 8000$

$= 8000\left(\frac{23}{20}\right)^3 - 8000$

= 12167 – 8000

= ₹ 4167

20. (e) Amount = Principal $\left(1+\frac{\text{Rate}}{100}\right)^{\text{Time}}$

$=5000\left(1+\frac{8}{100}\right)^2$

$=5000\left(1+\frac{2}{25}\right)^2$

$=5000\times\frac{27}{25}\times\frac{27}{25} = 5832₹$

$\therefore$ CI = ₹ (5832 – 5000) = 832 ₹

21. (b) Compount Interest = P $\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= 1250\left[\left(1+\frac{8}{100}\right)^2 - 1\right]$

= 1250 × [$(1.08)^2$ – 1)]

=1250 × (1.1664 –1)

= ₹ (1250 × 0.1664)

= ₹ 208

22. (c) Compound Interest = P $\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= 15800\left[\left(1+\frac{6}{100}\right)^2 - 1\right]$

= 15800 × [$(1.06)^2$ –1)]

= 15800 × (1.1236 – 1)

= 15800 × 0.1236

= ₹ 1952.88

23. (b) Compound Interest

$= 3080\left[\left(1+\frac{7}{100}\right)^3 - 1\right]$

$= 3080\left[\left(\frac{107}{100}\right)^3 - 1\right]$

$= 3080\times\left[\frac{1225043-1000000}{1000000}\right]$

$= 3080\times\frac{225043}{1000000}$

= ₹ 693 (approximate)

24. (d) Compound Interest

$= p\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$=8560\left[\left(1+\frac{4}{100}\right)^2 - 1\right]$

$=8560[(1.04)^2 - 1] \quad =8560(1.0816-1)$

= 8560 × 0.0816 = ₹698.496 ≈ ₹698

25. (b) Required Compound Interest = $P\left(1+\frac{R}{100}\right)^T - 1$

$= 3000\left[\left(1+\frac{8}{100}\right)^2 - 1\right]$

$= 3000\left[\left(\frac{27}{25}\right)^2 - 1\right]$

$= 3000\left[\frac{729-625}{625}\right]$

$= \frac{3000\times 104}{625} = ₹499.20$

26. (c) Required Amount $= 24000\left(1+\frac{14\times 8}{100}\right)$

$= 24000\times\frac{212}{100} = ₹50880$

27. (b) Amount = Principal $\left(1+\frac{\text{Rate}}{100}\right)^{\text{Time}}$

$=1250\left[\left(1+\frac{8}{100}\right)^2 - 1\right]$

$=1250\times\left(\frac{108\times 108-100\times 100}{100\times 100}\right)$

$= \frac{1250 \times 1664}{10000} = ₹208$

28. (e) Amount = Principal $\left(1 + \frac{\text{Rate}}{100}\right)^{\text{Time}}$

$= 5690\left(1+\frac{5}{100}\right)^3$

$= 5690 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} = ₹6586.90$

$\therefore$ Compound interest = ₹(6586.9 – 5690) = ₹896.9 ≈ 897

29. (c) Compound Interest = Principal $\left(1 + \frac{\text{Rate}}{100}\right)^2 - 1$

$= 4500\left[\left(1+\frac{4}{100}\right)^2 - 1\right] = 4500\left[\frac{26}{25} \times \frac{26}{25} - 1\right]$

$= 4500\left[\frac{676-625}{625}\right] = 4500 \times \frac{51}{625} = ₹367.20$

30. (e) $\text{Rate} = \frac{30240 \times 100}{84000 \times 3} = 12\%$

Compound interest

$= 84000\left(1+\frac{12}{100}\right)^3 - 84000$

= 118013.95 – 84000

= ₹ 34013.95

31. (a) Simple interest

$= \frac{4000 \quad 5 \quad 2}{100} = ₹400$

Compound interest

$= 4000 \quad 1 \quad \frac{5}{100}^{\,2} \quad 4000$

$= \frac{4000 \quad 105 \quad 105}{100 \quad 100} \quad 4000$

= 4410 – 4000 = ₹ 410

$\therefore$ Difference = 410 – 400

= ₹ 10

32. (c) $14500\left(1+\frac{r}{100}\right)^2$

= 14500 + 4676.25

$\Rightarrow \left(1+\frac{r}{100}\right)^2 = \frac{19176.25}{14500} = \frac{529}{400}$

$\Rightarrow \left(1+\frac{r}{100}\right)^2 = \left(\frac{23}{20}\right)^2$

$\Rightarrow 1 + \frac{r}{100} = \frac{23}{20}$

$\Rightarrow \frac{r}{100} = \frac{23}{20} - 1 = \frac{3}{20}$

$\Rightarrow r = \frac{100 \times 3}{20} = 15$

33. (c) Compound interest

$= 8400\left(1+\frac{12.5}{100}\right)^3 - 8400$

= 11960.1562 – 8400

= ₹ 3560.1562

34 (d) $25500\left(1+\frac{r}{100}\right)^3 - 25500$

= 8440.5

$\Rightarrow 25500\left(1+\frac{r}{100}\right)^3$

= 8440.5 + 25500

$\Rightarrow \left(1+\frac{r}{100}\right)^3 = \frac{33940.5}{25500}$

$= \frac{1331}{1000} = \left(\frac{11}{10}\right)^3$

$\Rightarrow \left(1+\frac{r}{100}\right) = \left(\frac{11}{10}\right)$

$\Rightarrow 1 + \frac{r}{100} = \frac{11}{10}$

$\Rightarrow \frac{r}{100} = \frac{11}{10} - 1 = \frac{1}{10}$

$\Rightarrow r = \frac{100}{10} = 10$

$\therefore$ Simple interest

$= \frac{25500 \times 10 \times 3}{100}$

= ₹ 7650

35 (e) Rate = $\frac{15300 \quad 100}{45000 \quad 4} = 8.5\%$

Compound interest

$= 45000 \quad 1 \quad \frac{8.5}{100}^{\,4} - 45000$

$= 45000 \quad \frac{108.5}{100}^{\,4} \quad 1$

= 45000 × 0.3858 = ₹ 17364 (approx)

36. (a) Principal

$= \frac{1200 \times 100}{4 \times 8}$

= ₹ 3750

Simple interest on thrice that principal

$= \frac{3750 \times 3 \times 6 \times 3}{100}$

= ₹ 2025

37. (a) Compound interest

$= 35000\left(1+\frac{5}{100}\right)^2 - 35000$

= 38587.50 – 35000

= ₹ 3587.50

EXERCISE 2

1. (b) Rest part $= 1-\left(\frac{1}{3}+\frac{1}{6}\right)=\frac{1}{2}$

Rate % per annum on total sum

$$=\left(\frac{1}{3}\times 3\right)+\left(\frac{1}{6}\times 6\right)+\left(\frac{1}{2}\times 8\right)=6\%$$

$\therefore$ $P = \frac{600\times 100}{6\times 2} = \text{Rs}\,5,000$

2. (c) S.I. in I case = 2P – P = ₹ P

$\therefore$ $R = \frac{P\times 100}{P\times 10} = 10\%$

Now, S.I. in II case = 3P – P = ₹ 2P

$\therefore$ $T = \frac{2P\times 100}{P\times 10} = 20\,\text{years}$

3. (d) $R = \frac{4P\times 100\times 2}{5\times P\times 5} = 32\%$

4. (b) Here $\text{S.I.} = \frac{1}{9}P$ and R = T

$$R = \frac{P}{9}\times\frac{100}{P\times R}$$

$$\Rightarrow R^2 = \frac{100}{9} \Rightarrow R = \frac{10}{3} = 3\frac{1}{3}\%$$

5. (a) S.I. for 1½ years = ₹ (1164 – 1008) = ₹ 156

S. I. for 2 years = ₹ $\left(\frac{156\times 2\times 2}{3}\right) = \text{Rs}\,208$

$\therefore$ Principal = ₹ (1008 – 208) = ₹ 800

Now , P = 800, T= 2, S.I. = 208

$\therefore$ Rate $= \left(\frac{100\times 208}{800\times 2}\right)\% = 13\%$

6. (b) S.I. for 5 years = ₹ (1020 –720) = ₹ 300

SI. for 2 years = $\text{Rs}\frac{300}{5}\times 2 = \text{Rs}\,120$

$\therefore$ Principal = ₹ (720 – 120) = ₹ 600

Now, P = 600, T = 2, S.I. = 120

$\therefore$ $R = \frac{120\times 100}{600\times 2} = 10\%$

7. (c) Difference in S.I. $= \frac{P\times T}{100}(R_1 - R_2)$

$$\Rightarrow 56 = \frac{P\times 4\times 2}{100} \quad (\because R_1 - R_2 = 2)$$

$$\Rightarrow P = \frac{56\times 100}{4\times 2} = \text{Rs}\,700$$

8. (a) $\frac{16}{25}P = \frac{P\times R\times R}{100}$

$$\Rightarrow R^2 = \frac{1600}{25} \Rightarrow R = \frac{40}{5} = 8\%$$

Also, time = 8 years

9. (a) $\because$ Rate = 5 paise per rupee = 5%

$\therefore$ $\text{S.I.} = \frac{200\times 5\times 7}{100}$ = ₹ 70

10. (c) Shortcut method :

If borrowed amount be ₹ M and it is to be paid in equal instalments, then

$$M = na + \frac{ra}{100\times Y}\times\frac{n(n-1)}{2}$$

where Y = no. of instalments per annum

a = annual instalment

Here, M = 4200, y = 1, r = 10, n = 5, a = ?

$$4200 = 5a + \frac{10a}{100}\times\frac{5(5-1)}{2}$$

$$\Rightarrow 4200 = a[5+1] \Rightarrow 6a = 4200$$

$\Rightarrow$ a = ₹ 700

11. (b) Let the sum borrowed be x. Then,

$$\left(\frac{x\times 6\times 2}{100}\right)+\left(\frac{x\times 9\times 3}{100}\right)+\left(\frac{x\times 14\times 4}{100}\right)=11400$$

$$\Rightarrow\left(\frac{3x}{25}+\frac{27x}{100}+\frac{14x}{25}\right)=11400 \Rightarrow \frac{95x}{100}=11400$$

$$\Rightarrow x = \left(\frac{11400\times 100}{95}\right) = 12000.$$

Hence, sum borrowed = ₹ 12,000.

12. (a) Gain in 2 years

$= \text{Rs.}\left[\left(5000\times\frac{25}{4}\times\frac{2}{100}\right)-\left(\frac{5000\times 4\times 2}{100}\right)\right]$

= ₹ (625 – 400) = ₹ 225.

$\therefore$ Gain in 1 year = $\text{Rs.}\left(\frac{225}{2}\right)$ = ₹ 112.50

13. (d) We need to know the S.I., principal and time to find the rate. Since the principal is not given, so data is inadequate.

14. (c) Let the principal be P and rate of interest be R%.

$$\text{Required ratio} = \left[\frac{\left(\frac{P\times R\times 6}{100}\right)}{\left(\frac{P\times R\times 9}{100}\right)}\right] = \frac{6PR}{9PR} = \frac{6}{9} = 2:3.$$

15. (d) Difference of S.I. = $\text{Rs}\sqrt{31.50}$

Let each sum be ₹ x. Then

$$\frac{x\times 4\frac{1}{2}\times 7}{100} - \frac{x\times 4\times 7}{100} = 31.50$$

or $\frac{7x}{100}\times\frac{1}{2} = \frac{63}{2}$

or x = ₹ 900

16. (d) Let the rate be R% p.a. Then,

$$\left(\frac{5000\times R\times 2}{100}\right)+\left(\frac{3000\times R\times 4}{100}\right) = 2200$$

$$\Rightarrow 100R + 120R = 2200 \Rightarrow R = \left(\frac{2200}{220}\right) = 10.$$

17. (d) Let the original rate be R%.

Then, new rate = (2R)%.

$$\therefore \left(\frac{725\times R\times 1}{100}\right)+\left(\frac{362.50\times 2R\times 1}{100\times 3}\right) = 33.50$$

$$\Rightarrow (2175+725)R = 33.50\times 100\times 3 = 10050$$

$$\Rightarrow R = \frac{10050}{2900} = 3.46\%$$

18. (c) $\left(\frac{1500\times R_1\times 3}{100}\right)-\left(\frac{1500\times R_2\times 3}{100}\right) = 13.50$

$$\Rightarrow 4500(R_1 - R_2) = 1350 \Rightarrow R_1 - R_2 = \frac{1350}{4500} = 0.3\%$$

19. (c) Here S.I. = ₹ 9, P = Re 1

$$\therefore R = \frac{9\times 100}{1\times 60} = 15\%$$

20. (d) $\frac{9}{16}P = \frac{P\times T\times T}{100}$

$$\Rightarrow T^2 = \frac{900}{16} \Rightarrow T = \frac{30}{4} = 7\frac{1}{2}\text{ years}$$

21. (a) Let the second amount be ₹ x. Then,

$$\frac{12,000\times 10\times 1}{100} + \frac{x\times 20\times 1}{100} = \frac{(12000+x)\times 14\times 1}{100}$$

$\Rightarrow$ 120000 + 20 x = (12000 + x) 14

$\Rightarrow$ 6x = 168000 – 120000

$\Rightarrow$ x = ₹ 8000

$\therefore$ Total investment = 12,000 + 8000 = ₹ 20,000

22. (b) Let sum be ₹ P. Then,

$$4P = P\left(1+\frac{r}{100}\right)^2$$

$$\Rightarrow 1+\frac{r}{100} = 2 \Rightarrow r = 100\%$$

23. (c) $A = P\left(1+\frac{r}{100}\right)^n$; A = Amount

P = Principal

r = rate of interest

n = time

$$\text{Required amount} = 1000\left(\frac{105}{100}\right)^3$$

$$= 1000\times\frac{21}{20}\times\frac{21}{20}\times\frac{21}{20}$$

= ₹ 1000 × 1.157 = ₹ 1157

24. (b) Here, n = 2 for interest is reckoned half-yearly.

$$A = 8,000\left[1+\frac{10}{2\times 100}\right]^{\frac{3}{2}\times 2}$$

$$A = 8,000\left[\frac{21}{20}\right]^3 = \text{Rs } 9261 \approx \text{Rs}9200$$

25. (a) $P\left(1+\frac{R}{100}\right)^5 = 2P \Rightarrow \left(1+\frac{R}{100}\right)^5 = 2$ … (i)

Let $P\left(1+\frac{R}{100}\right)^n = 8P$

$$\Rightarrow \left(1+\frac{R}{100}\right)^n = 2^3 = \left\{\left(1+\frac{R}{100}\right)^5\right\}^3 \text{ [By (i)]}$$

$$\Rightarrow \left(1+\frac{R}{100}\right)^n = \left(1+\frac{R}{100}\right)^{15}$$

$\Rightarrow$ n = 15 years

26. (b) P becomes 2P in 6 years at r% p.a.

$$2P \quad P\ 1 \quad \frac{r}{100}^{6}$$

$$\therefore \left(1+\frac{r}{100}\right)^6 = 2$$

$$\Rightarrow 2^4 = \left(1+\frac{r}{100}\right)^{6\times 4} = \left(1+\frac{r}{100}\right)^{24}$$

$\therefore$ P becomes 16 P in 24 years

27. (b) $P\left(1+\frac{R}{100}\right)^{15} = 2P \Rightarrow \left(1+\frac{R}{100}\right)^{15} = \frac{2P}{P}2$ ..... (i)

Let $P\left(1+\frac{R}{100}\right)^{n} = 8P$

$$\Rightarrow \left(1+\frac{R}{100}\right)^{n} = 8 = 2^3 = \left\{\left(1+\frac{R}{100}\right)^{15}\right\}^3$$ [using (i)]

$$\Rightarrow \left(1+\frac{R}{100}\right)^{n} = \left(1+\frac{R}{100}\right)^{45} \Rightarrow n = 45.$$

Thus, the required time = 45 years

28. (b) Let sum be ₹ P

$$3P = P\left(1+\frac{r}{100}\right)^3 \Rightarrow \left(1+\frac{r}{100}\right)^3 = 3 \quad \ldots (i)$$

Now, let $P\left(1+\frac{r}{100}\right)^{n} = 9P$

$$\Rightarrow \left(1+\frac{r}{100}\right)^{n} = 9 = 3^2 = \left\{\left(1+\frac{r}{100}\right)^3\right\}^2$$ [By (i)]

$$\Rightarrow \left(1+\frac{r}{100}\right)^{n} = \left(1+\frac{r}{100}\right)^6$$

$\Rightarrow n = 6$

29. (b) Principal
= (Present worth of ₹ 882 due 1 year hence) + (Present worth of ₹ 882 due to 2 years hence)

$$= \left[\frac{882}{\left(1+\frac{5}{100}\right)} + \frac{882}{\left(1+\frac{5}{100}\right)^2}\right]$$

$$= \left(\frac{882\times 20}{21} + \frac{882\times 400}{441}\right) = \text{Rs. } 1640.$$

30. (b) For, T = 2 years

$$\text{Required difference} = P\left(\frac{R}{100}\right)^2 = 2000\left(\frac{10}{100}\right)^2$$

= ₹ 20

31. (d) For T = 2 years

$$\text{Difference} = P\left(\frac{R}{100}\right)^2$$

$$144 = P\left(\frac{15}{100}\right)^2$$

$$\Rightarrow P = \frac{144\times 20\times 20}{3\times 3} = \text{Rs } 6400$$

32. (b) For T = 2 years,

$$\text{C. I.} - \text{S. I.} = \frac{R\times \text{S.I.}}{2\times 100}$$

$$41 - 40 = \frac{R\times 40}{2\times 100}$$

$$\Rightarrow R = \frac{2\times 100}{40} = 5\%$$

= ₹ [21600 – (2880 + 2400 + 2000)] = ₹ 14320.

33. (a) For T = 2 years,

$$\text{C. I.} - \text{S. I.} = \frac{R\times \text{S.I.}}{2\times 100}$$

$$408 - \text{S.I.} = \frac{4\times \text{S.I.}}{2\times 100}$$

$$\Rightarrow 204\ \text{S.I.} = 81600$$

$$\Rightarrow \text{S.I.} = \frac{81600}{204} = \text{Rs}400$$

34. (b) Since, each year the profit is on the previous year's capital,
$\therefore$ it is similar to Compound Profit.
$\therefore$ Compound Profit

$$= 40,000\left\{\left(1+\frac{5}{100}\right)\left(1+\frac{10}{100}\right)\left(1+\frac{15}{100}\right)-1\right\}$$

$$= 40,000\left[\frac{21}{20}\times\frac{11}{10}\times\frac{23}{20}-1\right]$$

$= 40,000\ [1.328 - 1] = ₹\ 13,130$

35. (a) For first year, S.I. = C.I.
Now, ₹ 10 is S.I. on ₹ 100.

$\therefore$ Rs. 16 is S.I. on Rs. $\left(\frac{100}{10}\times 16\right) = \text{Rs. } 160.$

So, S.I. on principal for 1 year at 10% is ₹ 160

$\therefore$ Principal = Rs. $\left(\frac{100\times 160}{10\times 1}\right) = \text{Rs. } 1600.$

Amount for 2 years compounded half yearly

$= \text{Rs. } \left[1600\times\left(1+\frac{5}{100}\right)^4\right] = \text{Rs. } 1944.81.$

$\therefore$ C.I. = ₹ (1944.81 – 1600) = ₹ 24.81.

S.I. = Rs. $\left(\frac{1600\times 10\times 2}{100}\right) = \text{Rs. } 320.$

$\therefore$ (C.I.) – (S.I.) = ₹ (344.81 – 320) = ₹ 24.81.

36. (d) Let the principal be ₹ P and rate of interest be R% per annum.
Differecne of C.I. and S.I. for 3 years

$$= \left[P\times\left(1+\frac{R}{100}\right)^3 - P\right] - \left(\frac{P\times R\times 3}{100}\right) = \frac{PR^2}{10^4}\left(\frac{300+R}{100}\right).$$

Difference of C.I. and S.I. for 2 years = $P\left(\frac{R}{100}\right)^2$

$$\therefore \quad \frac{\frac{PR^2}{10^4}\left(\frac{300+R}{100}\right)}{\frac{PR^2}{10^4}} = \frac{25}{8} \Rightarrow \left(\frac{300+R}{100}\right) = \frac{25}{8}$$

$$\Rightarrow R = \frac{100}{8} = 12\frac{1}{2}\%.$$

37. (b) $P\left(1+\frac{20}{100}\right)^n > 2P$ or $\left(\frac{6}{5}\right)^n > 2$

Now, $\left(\frac{6}{5}\times\frac{6}{5}\times\frac{6}{5}\times\frac{6}{5}\right) > 2$. So, n = 4 years

38. (d) Let the money borrowed be ₹ x and the rate of interest charged = r%
Time = 2 years

Now, $4000 = \frac{x\times r\times 2}{100}$

$\Rightarrow$ r x = 200000 ... (i)

Again, $x\left(1+\frac{r}{100}\right)^2 = x + 4200$

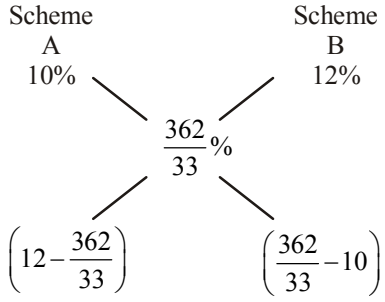
$$\Rightarrow \frac{xr^2}{10000} + \frac{2xr}{100} = 4200$$

$\Rightarrow$ 20r + 4000 = 4200 [from (i)]
$\Rightarrow$ r = 10%

39. (a) % interest on total amount per annum

$$= \frac{3620\times 100}{16500\times 2} = \frac{362}{33}\%$$

Now, use Alligation method.



Hence, ratio of amount invested in schemes A and B

$$= 12 - \frac{362}{33} : \frac{362}{33} - 10 \quad 17:16$$

Hence, amount invested in B $= \frac{16}{17}\ \frac{16500}{16} = ₹\ 8000$

40. (c) Let the amount invested at 20% rate be ₹ x.
According to the question,

$$12000\times\frac{10}{100} + x\times\frac{20}{100} = (12000+x)\times\frac{14}{100}$$

or, $1200 + \frac{x}{5} = 1680 + \frac{7}{50}x$

or, $\frac{x}{5} - \frac{7}{50}x = 480$

or, $\frac{3}{50}x = 480$

$\therefore$ x = ₹ 8000

$\therefore$ Total amount invested ₹ = (12000 + 8000)
= ₹ 20000

41. (c) Let one gets = ₹ x
then, second gets = ₹ (68,000 – x)
Given : $A_1 = A_2$

$$x + \frac{x\times 10\times 8}{100} = (68,000 - x) + \frac{(68000-x)\times 10\times 6}{100}$$

$\Rightarrow x[100+80] = (68,000-x)[100+60]$

$\Rightarrow \frac{180x}{160} = 68,000 - x$

$\Rightarrow 34x = 68000 \times 16 \Rightarrow x = ₹32,000$

$\therefore$ second gets = ₹ 36,000

42. (d) Let the parts be x, y and [2379 – (x + y)].

$$x + \left(x \times 2 \times \frac{5}{100}\right) = y + \left(y \times 3 \times \frac{5}{100}\right)$$

$$= z + \left(z \times 4 \times \frac{5}{100}\right)$$

$\Rightarrow \frac{11x}{10} = \frac{23y}{20} = \frac{6z}{5} = k \Rightarrow x = \frac{10k}{11}, y = \frac{20k}{23}, z = \frac{5k}{6}$ 3.

But x + y +z = 2379.

$\Rightarrow \frac{10k}{11} + \frac{20k}{23} + \frac{5k}{6} = 2379$

$\Rightarrow 1380\,k + 1320\,k + 1256\,k = 2379 \times 11 \times 23 \times 6$

$\Rightarrow k = \frac{2379 \times 11 \times 23 \times 6}{3965} = \frac{3 \times 11 \times 23 \times 6}{5}$

$\therefore\ x = \left(\frac{10}{11} \times \frac{3 \times 11 \times 23 \times 6}{5}\right) = 828.$

Hence, the first part is ₹ 828.

EXERCISE 3

1. (d) Population after 1st year = $\frac{110}{100}$ 10,000

= 11000

Population after 2nd year

= 11000 $\frac{120}{100}$ 13200

Population after 3rd year

= 13200 $\frac{95}{100}$ 12,540

Hence, population after 3rd year = 12, 540.

2. (b) Let $I_1 = \frac{P \times r \times t}{100}$

and $I_2 = P\,(1+i)^t - P = P[(1+i)^t - 1]$

According to the question,

$20 = P\,[(1+i)^2 - 1 - 2i]$ and 61

$= P\,[(1+i)^3 - 1 - 3i]$

On dividing, we get

$\frac{20}{61} = \frac{P[(1+i)^2 - 1 - 2i]}{P[(1+i)^3 - 1 - 3i]} = \frac{P(i)^2}{P(i^3 + 3i^2)}$

$= \frac{i^2}{i^3 + 3i^2} = \frac{1}{3+i}$

$\Rightarrow 60 + 20i = 61 \Rightarrow 20i = 1 \Rightarrow i = \frac{1}{20}$

As we know, $\frac{r}{100} = i \Rightarrow \frac{1}{20} = \frac{r}{100} \Rightarrow r = 5$

Hence, $P = 20 \times \frac{1}{i} \times \frac{1}{i} = 20 \times 20 \times 20 = 8000.$

3. (a) Let A lent ₹ x and B lent ₹ y

Since, A and B together lent out ₹ 81600

$\therefore$ x + y = 81,600

Now, given (r) Rate = 4%

$\therefore$ 1 r 1 $\frac{4}{100}$ $\frac{26}{25}$

According to the question, we have

$\frac{x}{y}$ $\frac{26}{25}^{3-2}$ $\frac{26}{25}$

$\therefore$ Investment made by B = 81600 $\frac{25}{51}$ 40,000

4. (c) Let the sum invested at 5% be ₹ x.

According to the question,

$\frac{x \quad 5 \quad 4}{100}$ $\frac{(12000-x) \quad 4 \quad 6}{100}$ = 2580

20x 288000 24x 258000

$\Rightarrow 288000 - 258000 = 24x - 20x$

$\Rightarrow 4x = 30000 \Rightarrow x =$ ₹ 7500.

5. (c) Let the sum be ₹ x and rate % be R.

$\frac{x \quad R \quad 2}{100}$ 720 x .....(1)

$\frac{x \quad R \quad 7}{100}$ 1020 x ..... (2)

$\Rightarrow$ x + $\frac{2Rx}{100}$ 720 and x + $\frac{7Rx}{100}$ 1020

$\Rightarrow$ $\frac{5Rx}{100}$ 300 (Subtracting)

$\Rightarrow$ 5Rx = 30000 $\Rightarrow$ Rx = 6000

$\therefore$ (1) $\Rightarrow \frac{6000 \quad 2}{100} \quad 720 \quad x$

$\Rightarrow$ x = ₹ 600, R = 10 %

Alternatively:

Interest for 5 yrs. = 1020 – 720 = ₹ 300

$\therefore$ Interest for 2 yrs. = 120

$\therefore$ Sum = 720 – 120 = ₹ 600

Rate % = $\frac{120 \quad 100}{600 \quad 2} \quad 10$

6. (d) Let the Rate % be *R* and *P* be principle.

Given :

$\frac{\text{(C.I. S.I.) for 3 years}}{\text{(C.I. S.I) for 2 years}} \quad \frac{25}{8}$

$\Rightarrow$ 25 [(C.I. – S.I.) for 2 years]

= 8 [(C.I. – S.I.) for 3 years] ...(i)

$\therefore$ (C.I. – S.I.) for 2 years

$$P \ 1 \ \frac{R}{100}^{2} \quad P \quad \frac{P \quad R \quad 2}{100}$$

$$P \ 1 \ \frac{R^2}{10000} \quad \frac{2R}{100} \quad P \quad \frac{2PR}{100}$$

$$P \quad \frac{\mathrm{P}\,R^2}{10000} \quad P \quad \frac{PR^2}{10000} \qquad ...(ii)$$

(C.I. – S.I.) for 3 years

$$P \ 1 \ \frac{R}{100}^{3} \quad P \quad \frac{P \quad R \quad 3}{100}$$

$$P \ 1 \ \frac{R^3}{(100)^3} \quad \frac{3R}{100} \ 1 \ \frac{R}{100} \quad P \quad \frac{3RP}{100}$$

$$\frac{PR^3}{1000000} \quad \frac{3PR^2}{10000} \qquad ...(iii)$$

From (i), (ii) and (iii),

$$25 \quad \frac{PR^2}{10000} \quad 8 \quad PR^2 \quad \frac{R}{1000000} \quad \frac{3}{10000}$$

$$\Rightarrow \frac{25}{10000} \quad 8 \quad \frac{R}{1000000} \quad \frac{300}{1000000}$$

$\Rightarrow 8(R + 300) = 2500 \Rightarrow R = 12\frac{1}{2}\%$.

7. (c) Let one gets = ₹ x

then, second gets = ₹ (68,000 – x)

Given : $A_1 = A_2$

$$x + \frac{x \times 10 \times 8}{100} = (68,000 - x) + \frac{(68000 - x) \times 10 \times 6}{100}$$

$$\Rightarrow x[100 + 80] = (68,000 - x)[100 + 60]$$

$$\Rightarrow \frac{180x}{160} = 68,000 - x$$

$\Rightarrow 34x = 68000 \times 16 \Rightarrow x = \text{Rs}\,32,000$

$\therefore$ second gets = ₹ 36,000

8. (b) $P = \frac{Q \times r \times t}{100}$ and $Q = \frac{R \times r \times t}{100}$

$$\Rightarrow \frac{P}{Q} = \frac{Q}{R} = \frac{r \times t}{100}$$

$\therefore \quad Q^2 = PR.$

9. (b) Interest for one year

$$= \text{Rs. } 212.50 \times \frac{3}{100} \times 1 = \text{Rs. } \frac{51}{8}$$

Thus in 8 years, the interest is ₹ 51.

10. (b) Let he borrowed at 5% = ₹ x

$\therefore$ He borrowed at 7% = ₹ (2500 – x)

Now $I_1 + I_2 = 275$

$$\frac{x \times 5 \times 2}{100} + \frac{(2500 - x) \times 7 \times 2}{100} = 275$$

$\Rightarrow$ 10x + 14 (2500 – x) = 27500

$\Rightarrow$ 4x = 35000 – 27500 = 7500

$\Rightarrow$ x = ₹ 1875

$\therefore$ Sum borrowed at 7% rate

= 2500 – 1875 = ₹ 625

11. (a) Let the sum be ₹ x. Then,

$$\left(\frac{x \times 6 \times 3}{100}\right) + \left(\frac{x \times 9 \times 5}{100}\right) + \left(\frac{x \times 13 \times 3}{100}\right) = 8160$$

$\Rightarrow$ 18 x + 45x + 39x = (8160 × 100)

$\Rightarrow$102x = 816000

$\Rightarrow$x = 8000.

12. (a) Let the sum invested in Scheme A be ₹ x and that in Scheme B be ₹ (13900 – x).

Then, $\left(\frac{x \times 14 \times 2}{100}\right) + \left[\frac{(13900 - x) \times 11 \times 2}{100}\right] = 3508$

$\Rightarrow$ 28x – 22x = 350800 – (13900 × 22)

$\Rightarrow$6x = 45000

$\Rightarrow$x = 7500.

So, sum invested in Scheme B = ₹ (13900 – 7500)

= ₹ 6400.

13. (b) Let the sum invested at 9% be ₹ x and that invested at 11% be ₹ (100000 – x).

Then,

$$\left(\frac{x \times 9 \times 1}{100}\right) + \left[\frac{(100000 - x) \times 11 \times 1}{100}\right]$$

$$= \left(100000 \times \frac{39}{4} \times \frac{1}{100}\right)$$

$$\Rightarrow \frac{9x + 1100000 - 11x}{100} = \frac{39000}{4} = 9750$$

$\Rightarrow 2x = (1100000 - 975000) = 125000$

$\Rightarrow x = 62500.$

$\therefore$ Sum invested at 9% = ₹ 62500.

Sum invested at 11%

= ₹ (100000 – 62500) = ₹ 37500.

14. (a) Let x, y and z be the amounts invested in schemes A, B and C respectively. Then,

$$\left(\frac{x \times 10 \times 1}{100}\right) + \left(\frac{y \times 12 \times 1}{100}\right) + \left(\frac{z \times 15 \times 1}{100}\right) = 3200$$

$\Rightarrow 10x + 12y + 15z = 320000$ ..... (i)

Now, z = 240% of y = $\frac{12}{5}y$ ..... (ii)

And, z = 150% of x = $\frac{3}{2}x$

$$\Rightarrow x = \frac{2}{3}z = \left(\frac{2}{3} \times \frac{12}{5}\right)y = \frac{8}{5}y \quad \text{..... (iii)}$$

From (i), (ii) and (iii), we have :

$16y + 12y + 36y = 320000 \Rightarrow 64y = 320000$

$\Rightarrow y = 5000.$

$\therefore$ Sum invested in Scheme B = ₹ 5000.

15. (d) Let the parts be x, y and [2600 – (x + y)]. Then,

$$\frac{x \times 4 \times 1}{100} = \frac{y \times 6 \times 1}{100} = \frac{[2600 - (x + y)] \times 8 \times 1}{100}$$

$$\therefore \frac{y}{x} = \frac{4}{6} = \frac{2}{3} \text{ or } y = \frac{2}{3}x.$$

$$\text{So, } \frac{x \times 4 \times 1}{100} = \frac{\left(2600 - \frac{5}{3}x\right) \times 8}{100}$$

$$\Rightarrow 4x = \frac{(7800 - 5x) \times 8}{3} \Rightarrow 52x = (7800 \times 8)$$

$$\Rightarrow x = \left(\frac{7800 \times 8}{52}\right) = 1200.$$

$\therefore$ Money invested at 4% = ₹ 1200.

16. (a) Let the amount of the loss at 4% per annum be ₹ x.

Amount given at 5% per annum = ₹ (1200 – x)

$$\text{Now, } \frac{x \times 4 \times 2}{100} + \frac{(1200 - x) \times 5 \times 2}{100} = 110$$

$\Rightarrow$ x = ₹ 500

And, (1200 – x) = 1200 – 500 = ₹ 700

17. (c) $968 = P\left[1 + \frac{10}{100}\right]^2 \Rightarrow P = \frac{968 \times 10 \times 10}{11 \times 11} = \text{Rs}\,800$

18. (a) If 'x' be the interest of third year, then 108% of x= 486

$$\therefore x = 486 \times \frac{100}{108} = 450$$

19. (c) Let Principal P = ₹ x

R = r%

C.I. = 200 at the end of Ist year

or 200 + 220 at the end of IInd year

We know that

C.I. P 1 $\frac{r}{100}$ n 1

At the end of Ist year

200 x 1 $\frac{r}{100}$ 1

200 $\frac{x\,r}{100}$ …(1)

At the end of IInd year

420 x 1 $\frac{r}{100}$ 2 1

x $\frac{r}{100}$ 2 $\frac{r}{100}$ …(2)

On dividing (2) by (1) we get

$\frac{420}{200}$ 2 $\frac{r}{100}$

2.1 2 $\frac{r}{100}$

$\frac{r}{100}$ 2.1 2

$\Rightarrow$ r = 0.10 × 100 $\Rightarrow$ r = 10%

20. (c) Let sum be ₹ P. Then,

$$A = P\left(1 + \frac{20}{100}\right)^2 = P\left(\frac{6}{5}\right)^2 = \frac{36}{25}P \quad \text{... (i)}$$

$$\text{and } A + 482 = P\left(1 + \frac{20}{2 \times 100}\right)^{2 \times 2} = P\left(\frac{11}{10}\right)^4$$

$$\therefore \text{By (i), } \frac{36P}{25} + 482 = P\left(\frac{11}{10}\right)^4$$

$$\Rightarrow P\left(\left\{\frac{11}{10}\right\}^4 - \frac{36}{25}\right) = 482$$

$$\Rightarrow P\left[\frac{14641}{10000}-\frac{36}{25}\right]=482$$

$$\Rightarrow P\left[\frac{14641-14400}{10000}\right]=482$$

$$\Rightarrow P=\frac{482\times10000}{241}=20,000$$

21. (c) Increment $=\frac{1}{8}\times100=12\frac{1}{2}\%$

$$\therefore H=10\left\{1+\frac{25}{100\times2}\right\}^{5/2}$$

$$=10\left[1+\frac{1}{8}\right]^{5/2}=10\left[1+\frac{1}{8}\right]^{2}\left[1+\frac{1}{8}\right]^{1/2}$$

$$=10\left(\frac{9}{8}\right)^{2}\left(1+\frac{1}{2\times8}\right)$$

$$=\frac{10\times81}{64}\times\frac{17}{16}=13.44\text{ft}$$

$\therefore$ Increment in height = 13.44 – 10 = 3.44 ft

22. (c) Let the value of each instalment be ₹ x. Then, (present worth of ₹ x due 1 year hence) + (present worth of ₹ x due 2 years hence) = ₹ 2550

$$\Rightarrow \frac{x}{\left(1+\frac{4}{100}\right)}+\frac{x}{\left(1+\frac{4}{100}\right)^{2}}=2550$$

$$\Rightarrow \frac{25x}{26}+\frac{625x}{676}=2550$$

$$\Rightarrow 1275x=2550\times676\Leftrightarrow\left(\frac{2550\times676}{1275}\right)=1352.$$

$\therefore$ value of each instalment = ₹ 1352.

23. (b) Let each instalment be ₹ x. Then,
(Present worth of ₹ x due 1 year hence) + (Present worth of ₹ x due 2 years hence)
= ₹ 1025

$$\frac{x}{\left(1+\frac{5}{100}\right)}+\frac{x}{\left(1+\frac{5}{100}\right)^{2}}=1025$$

$$\Rightarrow \frac{20x}{21}+\frac{400x}{441}=1025$$

$$\Rightarrow 820x=1025\times441\Rightarrow\left(\frac{1025\times441}{820}\right)=551.25$$

So, value of each instalment = ₹ 551.25.

24. (c) S. I. for I year $=\frac{240}{3}=\text{Rs}\,80=$ C.I. for I year

C. I for 2 years = ₹ 170 = C. I. for I year + C. I. for II year
Now, C. I. for II year = 170 – 80 = ₹ 90
$\therefore$ Interest on ₹ 80 for 1 year = 90 – 80 = ₹ 10

$\therefore$ Rate of interest $=\frac{10}{80}\times100=12\frac{1}{2}\%$

25. (a) Let each instalment be ₹ x. Then,
(Present worth of ₹ x due 1 year hence) + Present worth of ₹ x due 2 years hence) + (Present worth of ₹ x due 3 years hence) = 50440

$$\therefore \frac{x}{\left(1+\frac{5}{100}\right)}+\frac{x}{\left(1+\frac{5}{100}\right)^{2}}+\frac{x}{\left(1+\frac{5}{100}\right)^{3}}=50440$$

$$\Rightarrow \frac{20x}{21}+\frac{400x}{441}+\left(\frac{20}{21}\right)^{3}x=50440$$

$$\Rightarrow x=\frac{50440}{25220}\times9261=\text{Rs}\,18,522$$