11. Compound Interest

Exercise 11A

1. Question

Answer

Present value = Rs.2500

Interest rate = 10% per annum

Time = 2 years

Amount (A) = $P(1 + R/100)^n$

[Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 2500(1 + 10/100)^2$

$\Rightarrow A = 2500(11/10)^2$

$\Rightarrow A = 2500 \times 121/100$

$\Rightarrow A = 25 \times 121$

$\Rightarrow A = 3025$

$\therefore$ Amount = Rs.3025

$\therefore$ Compound interest = Rs.(3025 – 2500)

= Rs.525

2. Question

Answer

Present value = Rs.15625

Interest rate = 12% per annum

Time = 3 years

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 15625(1 + 12/100)^3$

$\Rightarrow A = 15625(112/100)^3$

$\Rightarrow A = 15625(28/25)^3$

$\Rightarrow A = 15625 \times 21952/15625$

$\Rightarrow A = 21952$

$\therefore$ Amount = Rs.21952

∴ Compound interest = Rs.(21952 – 15625)

= Rs.6327

3. Question

Answer

Present value = Rs.5000

Interest rate = 9% per annum

Time = 2 years

Simple interest (SI) = PRT/100 [where, P = Present value

R = Interest rate, T = Time]

∴ SI = (5000 × 9 × 2)/100

⇒ SI = 50 × 9 × 2

⇒ SI = 900

Now,

Compound interest (CI),

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ $A = 5000(1 + 9/100)^2$

⇒ $A = 5000(109/100)^2$

⇒ $A = 5000(1.09)^2$

⇒ A = 5000 × 1.1881

⇒ A = 5940.5

∴ Amount = Rs.5940.5

∴ Compound interest = Rs.(5940.5 – 5000)

= Rs.940.5

Now,

Difference between the simple interest and the compound interest = (CI – SI)

= (940.5 – 900)

= 40.5

4. Question

Answer

Present value = Rs.25000

Interest rate = 8% per annum

Time = 2 years

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 25000 (1 + 8/100)^2$

$\Rightarrow A = 25000 (108/100)^2$

$\Rightarrow A = 25000 (1.08)^2$

$\Rightarrow A = 25000 \times 1.1664$

$\Rightarrow A = 29160$

$\therefore$ Amount = Rs.29160

5. Question

Answer

Present value = Rs.20000

Interest rate = 12% per annum

Time = 2 years

Simple interest (SI) = PRT/100 [where, P = Present value

R = Interest rate, T = Time]

$\therefore SI = (20000 \times 12 \times 2)/100$

$\Rightarrow SI = 200 \times 12 \times 2$

$\Rightarrow SI = 4800$

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 20000 (1 + 12/100)^2$

$\Rightarrow A = 20000 (112/100)^2$

$\Rightarrow A = 20000 (1.12)^2$

$\Rightarrow A = 20000 \times 1.2544$

$\Rightarrow A = 25088$

$\therefore$ Amount = Rs.25088

$\therefore$ Compound interest = Rs.(25088 – 20000)

= Rs.5088

Now,

(CI – SI) = 5088 –4800

= Rs.288

$\therefore$ The amount of money Harpreet will gain after two years = Rs.288

6. Question

Answer

Present value = Rs.64000

Interest rate = (15/2) % per annum

Time = 3 years

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 64000 [1 + (15/2 \times 1/100)]^3$

$\Rightarrow A = 64000 [1 + 3/40]^3$

$\Rightarrow A = 64000 (43/40)^3$

$\Rightarrow A = 64000 \times \frac{43}{40} \times \frac{43}{40} \times \frac{43}{40}$

$\Rightarrow A = 1 \times 43 \times 43 \times 43$

$\Rightarrow A = 79507$

$\therefore$ Manoj will get an amount of Rs.79507 after 3 years.

7. Question

Answer

Present value = Rs.6250

Interest rate = 8 % per annum

Time = 1 years

$\because$ Interest is compounded half-yearly.

$\therefore$ Amount (A) = $P [1 + (R/2)/100]^{2n}$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 6250 [1 + (8/2)/100]^2$

$\Rightarrow A = 6250 [1 + 4/100]^2$

$\Rightarrow A = 6250 [26/25]^2$

$\Rightarrow A = 6250 \times 26/25 \times 26/25$

$\Rightarrow A = 10 \times 26 \times 26$

$\Rightarrow A = 6760$

$\therefore$ Amount = Rs.6760

$\therefore$ Compound interest = Rs.(6760 - 6250)

= Rs.510

∴ Divakaran gets a CI of Rs.510.

8. Question

Answer

Present value = Rs.16000

Interest rate = 10% per annum

Time = (3/2) years

∵ Interest is compounded half-yearly.

∴ Amount (A) = $P\,[1 + (R/2)/100]^{2n}$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ $A = 16000\,[1 + (10/2)/100]^3$

⇒ $A = 16000\,[1 + 5/100]^3$

⇒ $A = 16000\,[1 + 1/20]^3$

⇒ $A = 16000\,[21/20]^3$

⇒ $A = 16000 \times 21/20 \times 21/20 \times 21/20$

⇒ $A = 2 \times 21 \times 21 \times 21$

⇒ A = 18522

∴ Amount = Rs.18522

Exercise 11B

1. Question

Answer

Present value = Rs.6000

Interest rate = 9% per annum

Time = 2 years

Amount (A) = $P\,(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ $A = 6000\,(1 + 9/100)^2$

⇒ $A = 6000\,(109/100)^2$

⇒ $A = 6000 \times 109/100 \times 109/100$

⇒ $A = 6 \times 109 \times 109/10$

⇒ A = 7128.6

∴ Amount = Rs.7128.6

∴ Compound interest = Rs.(7128.6 – 6000)

= Rs.1128.6

2. Question

Answer

Present value = Rs.10000

Interest rate = 11% per annum

Time = 2 years

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ $A = 10000(1 + 11/100)^2$

⇒ $A = 10000(111/100)^2$

⇒ $A = 10000 \times 111/100 \times 111/100$

⇒ $A = 1 \times 111 \times 111$

⇒ A = 12321

∴ Amount = Rs.12321

∴ Compound interest = Rs.(12321 – 10000)

= Rs.2321

3. Question

Answer

Present value = Rs.31250

Interest rate = 8% per annum

Time = 3 years

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ $A = 31250(1 + 8/100)^3$

⇒ $A = 31250(1 + 2/25)^3$

⇒ $A = 31250(27/25)^3$

⇒ $A = 31250 \times 27/25 \times 27/25 \times 27/25$

⇒ $A = 31250 \times 19683/15625$

⇒ $A = 2 \times 19683$

⇒ A = 39366

∴ Amount = Rs.39366

∴ Compound interest = Rs.(39366 – 31250)

= Rs.8116

4. Question

Answer

Present value = Rs.10240

Interest rate = (25/2) % per annum

Time = 3 years

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 10240 [1 + (25/2)/100]^3$

$\Rightarrow A = 10240 [1 + 1/8]^3$

$\Rightarrow A = 10240 [9/8]^3$

$\Rightarrow A = 10240 \times 9/8 \times 9/8 \times 9/8$

$\Rightarrow A = 10240 \times 729/512$

$\Rightarrow A = 20 \times 729$

$\Rightarrow A = 14580$

$\therefore$ Amount = Rs.14580

$\therefore$ Compound interest = Rs.(14580 - 10240)

= Rs.4340

5. Question

Answer

Present value = Rs.62500

Interest rate = 12 % per annum

Time = 2 years 6 month = (2 + 1/2) years = (5/2) years

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 62500 (1 + 12/100)^2 \times [1 + (1/2 \times 12)/100]$

$\Rightarrow A = 62500 (1 + 3/25)^2 \times [1 + 6/100]$

$\Rightarrow A = 62500 (28/25)^2 \times [106/100]$

$\Rightarrow A = 62500 \times 28/25 \times 28/25 \times 106/100$

$\Rightarrow A = 625 \times 784/625 \times 106$

$\Rightarrow A = 1 \times 784 \times 106$

$\Rightarrow A = 83104$

∴ Amount = Rs.83104

∴ Compound interest = Rs.(83104 – 62500)

= Rs.20604

6. Question

Answer

Present value = Rs.9000

Interest rate = 10 % per annum

Time = 2 years 4 month = (2 + 1/3) years = (7/2) years

Amount (A) = $P(1 + R/100)^n \times [1 + (1/3 \times R)/100]$

[Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ $A = 9000(1 + 10/100)^2 \times [1 + (1/3 \times 10)/100]$

⇒ $A = 9000(1 + 1/10)^2 \times [1 + 1/30]$

⇒ $A = 9000(11/10)^2 \times [31/30]$

⇒ $A = 9000 \times 121/100 \times 31/30$

⇒ $A = 9 \times 121 \times 31/3$

⇒ $A = 3 \times 121 \times 31$

⇒ A = 11253

∴ Amount = Rs.11253

∴ Compound interest = Rs.(11253 – 9000)

= Rs.2253

7. Question

Answer

Present value = Rs.8000

Interest rate for 1st year, p = 9 % per annum

Interest rate for 2nd year, q = 10 % per annum

Time = 2 years

Amount (A) = $P \times (1 + p/100) \times (1 + q/100)$

$A = 8000 \times (1 + 9/100) \times (1 + 10/100)$

$= 8000 \times (109/100) \times (1 + 1/10)$

$= 8000 \times 109/100 \times 11/10$

$= 8 \times 109 \times 11$

= 9592

∴ Amount = Rs.9592

8. Question

Answer

Present value = Rs.125000

Interest rate = 8% per annum

Time = 3 years

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ $A = 125000(1 + 8/100)^3$

⇒ $A = 125000(108/100)^3$

⇒ $A = 125000 \times 108/100 \times 108/100 \times 108/100$

⇒ $A = 125000 \times 1259712/1000000$

⇒ $A = 125 \times 1259712/1000$

⇒ $A = 1259712/8$

⇒ $A = 157464$

∴ Amount = Rs.157464

∴ Anand has to pay Rs.157464 after 3 years to clear the debt.

9. Question

Answer

Present value = Rs.11000

Interest rate = 10% per annum

Time = 3 years

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ $A = 11000(1 + 10/100)^3$

⇒ $A = 11000(1 + 1/10)^3$

⇒ $A = 11000(11/10)^3$

⇒ $A = 11000 \times 11/10 \times 11/10 \times 11/10$

⇒ $A = 11000 \times 1331/1000$

⇒ $A = 11 \times 1331$

⇒ $A = 14641$

∴ Amount = Rs.14641

∴ Beeru has to pay Rs.14641 to clear the debt.

10. Question

Answer

Present value = Rs.18000

Interest rate for 1st year, p = 12 % per annum

Interest rate for 2nd year, q = (25/2) % per annum

Time = 2 years

Amount (A) = P × (1 + p/100) × (1 + q/100)

A = 18000 × (1 + 12/100) × [1 + (25/2)/100]

= 18000 × (112/100) × [1 + 25/200]

= 18000 × (112/100) × [1 + 1/8]

= 18000 × 112/100 × 9/8

= 180 × 112 × 9/8

= 180 × 14 × 9

= 22680

∴ Amount = Rs.22680

∴ Shubhlaxmi has to pay Rs.157464 after 2 years.

11. Question

Answer

Present value = Rs.24000

Interest rate = 10 % per annum

Time = 2 years 3 month = (2 + 1/4) years = $2\frac{1}{4}$ years.

Amount (A) = P (1 + R/100)^n × [1 + (1/4 × R)/100]

[Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ A = 24000 (1 + 10/100)^2 × [1 + (1/4 × 10)/100]

⇒ A = 24000 (1 + 1/10)^2 × [1 + 1/40]

⇒ A = 24000 (11/10)^2 × [41/40]

⇒ A = 24000 × 121/100 × 41/40

⇒ A = 24 × 121 × 41/4

$\Rightarrow A = 6 \times 121 \times 41$

$\Rightarrow A = 29766$

$\therefore$ Amount = Rs.29766

$\therefore$ Neha should pay Rs. 29766 to the bank after 2 years 3 months.

12. Question

Answer

Present value = Rs.16000

Interest rate = $7\frac{1}{2}\% = (15/2)\%$ per annum

Time = 2 years

Simple interest (SI) = PRT/100 [where, P = Present value

R = Interest rate, T = Time]

$\therefore$ SI = (16000 × (15/2) × 2)/100

$\Rightarrow$ SI = 160 × 15

$\Rightarrow$ SI = 2400

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 16000\,[1 + (15/2)/100]^2$

$\Rightarrow A = 16000\,[1 + 3/40]^2$

$\Rightarrow A = 16000\,[43/40]^2$

$\Rightarrow A = 16000 \times 1849/1600$

$\Rightarrow A = 10 \times 1849$

$\Rightarrow A = 18490$

$\therefore$ Amount = Rs.18490

$\therefore$ Compound interest = Rs.(18490 – 16000)

= Rs.2490

Now,

(CI – SI) = 2490 –2400

= Rs.90

$\therefore$ Abhay gains Rs.90 at the end of 2 years.

13. Question

Answer

Simple interest = Rs.2400

Interest rate = 8% per annum

Time = 2 years

Simple interest (SI) = PRT/100 [where, P = Present value

R = Interest rate

∴ 2400 = (P × 8 × 2)/100 T = Time]

⇒ 2400 = P × 16/100

⇒ 2400 = P × 4/25

⇒ P = 2400 × 25/4

⇒ P = 600 × 25

⇒ P = 15000

∴ Sum = Rs.15000

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ $A = 15000 [1 + 8/100]^2$

⇒ $A = 15000 [1 + 2/25]^2$

⇒ $A = 15000 [27/25]^2$

⇒ A = 15000 × 27/25 × 27/25

⇒ A = 600 × 27 × 27/25

⇒ A = 24 × 27 × 27

⇒ A = 17496

∴ Amount = Rs.17496

∴ Compound interest = Rs.(17496 - 15000)

= Rs.2496

14. Question

Find the sum.

Answer

Let sum = P

Interest rate = 6% per annum

Time = 2 years

Simple interest (SI) = PRT/100 [Where, P = Present value

R = Annual interest rate

T = Time in years]

$\therefore SI = (P \times 6 \times 2)/100$

$\Rightarrow SI = 3P/25$_____(i)

Compound interest (CI) = $P(1 + R/100)^n - P$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore CI = P(1 + 6/100)^2 - P$

$\Rightarrow CI = P(1 + 3/50)^2 - P$

$\Rightarrow CI = P(53/50)^2 - P$

$\Rightarrow CI = (2809P/2500) - P$

$\Rightarrow CI = (2809P - 2500P)/2500$

$\Rightarrow CI = 309P/2500$_____(ii)

Now,

$CI - SI = (309P/2500) - (3P/25)$

$\Rightarrow 90 = (309P/2500) - (3P/25)$ [Given, CI – SI = 90]

$\Rightarrow 90 = (309P - 300P)/2500$

$\Rightarrow 90 = 9P/2500$

$\Rightarrow P = 90 \times 2500/9$

$\Rightarrow P = 10 \times 2500$

$\Rightarrow P = 25000$

$\therefore$ Sum = Rs.25000

15. Question

Answer

Let sum = P

Interest rate = 10% per annum

Time = 3 years

Simple interest (SI) = PRT/100 [Where, P = Present value

R = Annual interest rate

T = Time in years]

$\therefore SI = (P \times 10 \times 3)/100$

$\Rightarrow SI = 3P/10$_____(i)

Compound interest (CI) = $P(1 + R/100)^n - P$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore CI = P(1 + 10/100)^3 - P$

$\Rightarrow CI = P(1 + 1/10)^3 - P$

⇒ CI = P (11/10)³ - P

⇒ CI = (1331P/1000)– P

⇒ CI = (1331P – 1000P)/1000

⇒ CI = 331P/1000_____(ii)

Now,

CI – SI = (331P/1000) – (3P/10)

⇒ 93 = (331P/1000) – (3P/10) [Given, CI – SI = 93]

⇒ 93 = (331P – 300P)/1000

⇒ 93 = 31P/1000

⇒ P = 93 × 1000/31

⇒ P = 3 × 1000

⇒ P = 3000

∴ Sum = Rs.3000

16. Question

Answer

Let sum = P

Interest rate = $6\frac{2}{3}\%$ = (20/3) % per annum

Time = 2 years

Now,

Amount (A) = P (1 + R/100)^n [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ A = P[1 + (20/3)/100]²

⇒ 10240 = P [1 + 1/15]²

⇒ 10240 = P [16/15]²

⇒ 10240 = P × 256/225

⇒ P = 10240 × 225/256

⇒ P = 40 × 225

⇒ P = 9000

∴ Sum = Rs.9000

17. Question

Answer

Let sum = P

Interest rate = 10% per annum

Time = 3 years

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = P(1 + 10/100)^3$

$\Rightarrow 21296 = P(1 + 1/10)^3$

$\Rightarrow 21296 = P(11/10)^3$

$\Rightarrow 21296 = P \times 1331/1000$

$\Rightarrow P = 21296 \times 1000/1331$

$\Rightarrow P = 16 \times 1000$

$\Rightarrow P = 16000$

$\therefore$ Sum = Rs.16000

18. Question

Answer

Let rate = R% per annum

P = Rs.4000

A = Rs.4410

Time = 2 years

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = P(1 + R/100)^2$

$\Rightarrow 4410 = 4000(1 + R/100)^2$

$\Rightarrow (1 + R/100)^2 = 4410/4000$

$\Rightarrow (1 + R/100)^2 = 441/400$

$\Rightarrow (1 + R/100) = \sqrt{(441/400)}$

$\Rightarrow R/100 = (21/20) - 1$

$\Rightarrow R/100 = (21 - 20)/20$

$\Rightarrow R/100 = 1/20$

$\Rightarrow R = 100/20$

$\Rightarrow R = 5$

$\therefore$ Rate = 5% per annuam.

19. Question

Answer

Let rate = R % per annum

P = Rs.640

A = Rs.774.40

Time = 2 years

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = P(1 + R/100)^2$

$\Rightarrow 774.40 = 640(1 + R/100)^2$

$\Rightarrow (1 + R/100)^2 = 774.40/640$

$\Rightarrow (1 + R/100)^2 = 1.21$

$\Rightarrow (1 + R/100) = \sqrt{(1.21)}$

$\Rightarrow R/100 = (1.1) - 1$

$\Rightarrow R/100 = 0.1$

$\Rightarrow R = 0.1 \times 100$

$\Rightarrow R = 10$

$\therefore$ Rate = 10% per annuam.

20. Question

Answer

Let time = n years

P = Rs.1800

A = Rs.2178

R = 10% per annum

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = P(1 + R/100)^n$

$\Rightarrow 2178 = 1800(1 + 10/100)^n$

$\Rightarrow (1 + 1/10)^n = 2178/1800$

$\Rightarrow (11/10)^n = 121/100$

$\Rightarrow (11/10)^n = (11/10)^2$

$\Rightarrow n = 2$

$\therefore$ Time = 2 years.

21. Question

Answer

Let time = n years

P = Rs.6250

A = Rs.7290

R = 8% per annum

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = P(1 + R/100)^n$

$\Rightarrow 7290 = 6250(1 + 8/100)^n$

$\Rightarrow (1 + 2/25)^n = 7290/6250$

$\Rightarrow (27/25)^n = 729/625$

$\Rightarrow (27/25)^n = (27/25)^2$

$\Rightarrow n = 2$

$\therefore$ Time = 2 years.

22. Question

Answer

Population of a town, P = 125000

Time, n = 3 years

Increasing rate, R = 2% per annum

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

$\therefore$ Population = $P(1 + R/100)^n$

$= 125000(1 + 2/100)^3$

$= 125000 (1 + 1/50)^3$

$= 125000 (51/50)^3$

$= 125000 \times 51/50 \times 51/50 \times 51/50$

$= 1 \times 51 \times 51 \times 51$

$= 132651$

∴ Population of a town after 3 years is 132651.

23. Question

Answer

Population of a town, P = 50000

Interest rate for 1st year, p = 5%

Interest rate for 2nd year, q = 4%

Interest rate for 3rd year, r = 3%

Time, n = 3 years

Now,

Present population $= P \times (1 + p/100) \times (1 + q/100) \times (1 + r/100)$

$= 50000 \times (1 + 5/100) \times (1 + 4/100) \times (1 + 3/100)$

$= 50000 \times (1 + 1/20) \times (1 + 1/25) \times (1 + 3/100)$

$= 50000 \times 21/20 \times 26/25 \times 103/100$

$= 50 \times 21/2 \times 26/25 \times 103$

$= 1 \times 21 \times 26 \times 103$

$= 56238$

∴ Present population of a town is 56238.

24. Question

Answer

Population of a city in 2013, P = 120000

Time, n = 3 years

Increasing rate, R = 6% per annum

Now,

Amount (A) $= P (1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

∴Population of the city in the year 2014,

∴ Population $= P (1 + R/100)^n$

$= 120000 (1 + 6/100)^1$

$= 120000 (1 + 3/50)$

$= 120000 (53/50)$

$= 120000 \times 53/50$

$= 2400 \times 53$

$= 127200$

∴ Population of a city in 2014 is 127200.

Now,

Decreasing rate = 8%

∴Population of the city in the year 2015,

∴ Population $= P (1 - R/100)^n$

$= 127200 (1 - 5/100)^1$

$= 127200 (1 - 1/20)$

$= 127200 (19/20)$

$= 127200 \times 19/20$

$= 6360 \times 19$

$= 120840$

∴ Population of a city in 2015 is 120840.

25. Question

Answer

Count of bacteria, P = 500000

Time, n = 2 hours

Increasing rate, R = 2% per hour

Now,

Amount (A) $= P (1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time]

∴ Count of bacteria $= P (1 + R/100)^n$

$= 500000 (1 + 2/100)^2$

$= 500000 (102/100)^2$

$= 500000 \times 102/100 \times 102/100$

$= 50 \times 102 \times 102$

$= 520200$

∴ Count of bacteria at the end of 2 hours is 520200.

26. Question

Answer

Initial count of bacteria, P = 20000

Time, n = 3 hours

Increasing rate, R = 10% per hour

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time]

∴Count of bacteria at the end of 1^{st} hour,

∴ Count of bacteria = $P(1 + R/100)^n$

$= 20000(1 + 10/100)^1$

$= 20000(1 + 1/10)$

$= 20000(11/10)$

$= 20000 \times 11/10$

$= 2000 \times 11$

$= 22000$

∴ Count of bacteria at the end of 1^{st} hour is 22000.

Now,

Decreasing rate = 10%

∴Count of bacteria at the end of 2^{nd} hour,

∴ Count of bacteria = $P(1 + R/100)^n$

$= 22000(1 - 10/100)^1$

$= 22000(1 - 1/10)$

$= 22000 \times 9/10$

$= 2200 \times 9$

$= 19800$

∴ Count of bacteria at the end of 2^{nd} hours is 19800.

Now,

Increasing rate = 10%

∴Count of bacteria at the end of 3^{rd} hour,

∴ Count of bacteria = $P(1 + R/100)^n$

$= 19800(1 + 10/100)^1$

$= 19800(1 + 1/10)$

= 19800 (11/10)

= 19800 × 11/10

= 1980 × 11

= 21780

∴ Count of bacteria at the end of 3^{rd} hours is 21780.

27. Question

Answer

Present value of machine, P = Rs.625000

Time, n = 2 years

Rate of depreciates, R = 8% per annum

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

∴ Value = $P(1 - R/100)^n$ [∵ Rate decreases]

= $625000 (1 - 8/100)^2$

= $625000 (1 - 2/25)^2$

= $625000 (23/25)^2$

= 625000 × 729/625

= 1000 × 529

= 529000

∴ Value of machine after 2 years will be Rs.529000.

28. Question

Answer

Present value of scooter, P = Rs.56000

Time, n = 3 years

Rate of depreciates, R = 10% per annum

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

∴ Value = $P(1 - R/100)^n$ [∵ Rate decreases]

$= 56000 (1 - 10/100)^3$

$= 56000 (1 - 1/10)^3$

$= 56000 (9/10)^3$

$= 56000 \times 729/1000$

$= 56 \times 729$

$= 40824$

$\therefore$ Value of scooter after 3 years will be Rs.40824.

29. Question

Answer

Present value of car, P = Rs.348000

Rate of depreciates for 1^{st} year, p = 10%

Rate of depreciates for 2^{nd} year, q = 20%

Time, n = 2 years

Now,

$\text{Value} = P \times (1 - p/100) \times (1 - q/100)$

$= 348000 \times (1 - 10/100) \times (1 - 20/100)$

$= 348000 \times (1 - 1/10) \times (1 - 1/5)$

$= 348000 \times 9/10 \times 4/5$

$= 34800 \times 9 \times 4/5$

$= 6960 \times 9 \times 4$

$= 25056$

$\therefore$ Value of the car after 2 years is Rs.25056.

30. Question

Answer

Let the 3 years ago machine value = P

Rate of depreciates, R = 10%

Time, n = 3 years

Now,

$\text{Value} = P (1 + R/100)^n$ [Where,

P = Present value

R = Annual interest rate

n = Time in years]

$\therefore$ Value $= P (1 - 10/100)^n$ [$\because$ Rate decreases]

$\Rightarrow 291600 = P (1 - 1/10)^3$

$\Rightarrow 291600 = P(9/10)^3$

$\Rightarrow 291600 = P \times 729/1000$

$\Rightarrow P = 291600 \times 1000/729$

$\Rightarrow P = 400 \times 1000$

$\Rightarrow P = 400000$

$\therefore$ Initial value of machine is Rs.400000.

Exercise 11C

1. Question

Answer

Present value, P = Rs.8000

Interest rate, R = 10% per annum

Time, n = 1 years

$\because$ Compounded half-yearly.

$\therefore$ Amount (A) = $P[1 + (R/2)/100]^{2n}$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 8000[1 + (10/2)/100]^2$

$\Rightarrow A = 8000[1 + 5/100]^2$

$\Rightarrow A = 8000[1 + 1/20]^2$

$\Rightarrow A = 8000[21/20]^2$

$\Rightarrow A = 8000 \times 441/400$

$\Rightarrow A = 20 \times 441$

$\Rightarrow A = 8820$

$\therefore$ Amount = Rs.8820

$\therefore$ Compound interest = Rs.(8820 - 8000) [$\because$CI = A - P]

= Rs.820

2. Question

Answer

Present value, P = Rs.31250

Interest rate, R = 8% per annum

Time, n = (3/2) years

$\because$ Compounded half-yearly.

$\therefore$ Amount (A) = $P[1 + (R/2)/100]^{2n}$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 31250 [1 + (8/2)/100]^3$ [2n = 2 × 3/2]

$\Rightarrow A = 31250 [1 + 4/100]^3$

$\Rightarrow A = 31250 [1 + 1/25]^3$

$\Rightarrow A = 31250 [26/25]^3$

$\Rightarrow A = 31250 \times 17576/15625$

$\Rightarrow A = 2 \times 17576$

$\Rightarrow A = 35152$

∴ Amount = Rs.35152

∴ Compound interest = Rs.(35152 – 31250) [∵CI = A – P]

= Rs.3902

3. Question

Answer

Present value, P = Rs.12800

Interest rate, R = (15/2)% per annum

Time, n = 1 years

∵ Compounded half-yearly.

$\therefore$ Amount (A) = $P [1 + (R/2)/100]^{2n}$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 12800 [1 + (15/4)/100]^2$

$\Rightarrow A = 12800 [1 + 3/80]^2$

$\Rightarrow A = 12800 [83/80]^2$

$\Rightarrow A = 12800 \times 6889/6400$

$\Rightarrow A = 128 \times 6889/64$

$\Rightarrow A = 2 \times 6889$

$\Rightarrow A = 13778$

∴ Amount = Rs.13778

∴ Compound interest = Rs.(13778 – 12800) [∵CI = A – P]

= Rs.978

4. Question

Answer

Present value, P = Rs.160000

Interest rate, R = 10% per annum

Time, n = 2 years

∵ Compounded half-yearly.

∴ Amount (A) = $P[1 + (R/2)/100]^{2n}$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ $A = 160000[1 + (10/2)/100]^4$

⇒ $A = 160000[1 + 5/100]^4$

⇒ $A = 160000[1 + 1/20]^4$

⇒ $A = 160000[21/20]^4$

⇒ $A = 160000 \times 21/20 \times 21/20 \times 21/20 \times 21/20$

⇒ $A = 160000 \times 194481/160000$

⇒ $A = 1 \times 194481$

⇒ $A = 194481$

∴ Amount = Rs.8820

∴ Compound interest = Rs.(194481 − 160000) [∵CI = A − P]

= Rs.34481

5. Question

Answer

Present value, P = Rs.40960

Interest rate, R = (25/2)% per annum

Time, n = 3/2 years

∵ Compounded half-yearly.

∴ Amount (A) = $P[1 + (R/2)/100]^{2n}$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ $A = 40960[1 + (25/4)/100]^3$ [R = 25/2 and n = 3/2 years]

⇒ $A = 40960[1 + 1/16]^3$

⇒ $A = 40960[17/16]^3$

⇒ $A = 40960 \times 4913/4096$

⇒ $A = 10 \times 4913$

⇒ $A = 49130$

∴ Amount = Rs.49130

∴ Compound interest = Rs.(49130 – 40960) [∵CI = A – P]

= Rs.8170

6. Question

Answer

Initial value, P = Rs.125000

Interest rate, R = 12% per annum

Time, n = (1 + 1/2) years = 3/2 years

∵ Compounded half-yearly.

∴ Amount (A) = $P [1 + (R/2)/100]^{2n}$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ $A = 125000 [1 + (12/2)/100]^3$ [n = 3/2 years]

⇒ $A = 125000 [1 + 6/100]^3$

⇒ $A = 125000 [1 + 3/50]^3$

⇒ $A = 125000 [53/50]^3$

⇒ $A = 125000 \times 53/50 \times 53/50 \times 53/50$

⇒ $A = 125000 \times 148877/125000$

⇒ $A = 1 \times 148877$

⇒ A = 148877

∴ Amount = Rs.148877

∴ Compound interest = Rs.(148877 – 125000) [∵CI = A – P]

= Rs.23877

∴ Rs.23877 interest paid by Aslam after (3/2) years.

7. Question

Answer

Present value, P = Rs.20000

Interest rate, R = 6% per annum

Time, n = 1 years

∵ Compounded half-yearly.

∴ Amount (A) = $P [1 + (R/2)/100]^{2n}$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 20000\ [1 + (6/2)/100]^2$

$\Rightarrow A = 20000\ [1 + 3/100]^2$

$\Rightarrow A = 20000\ [103/100]^2$

$\Rightarrow A = 20000 \times 103/100 \times 103/100$

$\Rightarrow A = 2 \times 103 \times 103$

$\Rightarrow A = 21218$

$\therefore$ Amount = Rs.21218

$\therefore$ Shella gets Rs.21218 after 1 year.

8. Question

Answer

Initial value, P = Rs.65536

Interest rate, R = (25/2)% per annum

Time, n = 2 years

$\because$ Compounded annually.

$\therefore$ Amount (A) = $P\ [1 + R/100]^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 65536\ [1 + (25/2)/100]^2$

$\Rightarrow A = 65536\ [1 + 1/8]^2$

$\Rightarrow A = 65536\ [9/8]^2$

$\Rightarrow A = 65536 \times 9/8 \times 9/8$

$\Rightarrow A = 65536 \times 81/64$

$\Rightarrow A = 1024 \times 81$

$\Rightarrow A = 82944$

$\therefore$ Amount = Rs.82944

$\therefore$ Compound interest = Rs.(82944 – 65536) [$\because$CI = A – P]

= Rs.17408

Now,

$\because$ Compounded half–yearly.

$\therefore$ Amount (A) = $P\ [1 + (R/2)/100]^{2n}$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 65536\ [1 + (25/4)/100]^4$ [R = (25/2)% and n = 2 years]

$\Rightarrow A = 65536\ [1 + 1/16]^4$

$\Rightarrow A = 65536\ [17/16]^4$

$\Rightarrow A = 65536 \times 17/16 \times 17/16 \times 17/16 \times 17/16$

$\Rightarrow A = 65536 \times 83521/65536$

$\Rightarrow A = 1 \times 83521$

$\Rightarrow A = 83521$

$\therefore$ Amount = Rs.83521

$\therefore$ Compound interest = Rs.(83521 - 65536) [$\because$CI = A - P]

= Rs.17985

Now,

Difference between interests compound half-yearly and yearly,

= Rs.(17985 - 17408)

= Rs.577

9. Question

Answer

Present value, P = Rs.32000

Interest rate, R = 5% per annum

Time, n = 6 months = (1/2) years

$\because$ Compounded quarterly,

$\therefore$ Amount (A) = $P\ [1 + (R/4)/100]^{4n}$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 362000\ [1 + (5/4)/100]^2$ [4n = 4 × 1/2]

$\Rightarrow A = 32000\ [1 + 1/80]^2$

$\Rightarrow A = 32000\ [81/80]^2$

$\Rightarrow A = 32000 \times 81/80 \times 81/80$

$\Rightarrow A = 400 \times 81 \times 81/80$

$\Rightarrow A = 5 \times 81 \times 81$

$\Rightarrow A = 32805$

$\therefore$ Amount = Rs.32805

$\therefore$ Sudershan will receive amount of Rs.32805 after 6 months.

10. Question

Answer

Present value, P = Rs.390625

Interest rate, R = 16% per annum

Time, n = 1 year

∵ Compounded quarterly,

∴ Amount (A) = P [1 + (R/4)/100]^{4n} [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ A = 390625 [1 + (16/4)/100]^4

⇒ A = 390625 [1 + 4/100]^4

⇒ A = 390625 [1 + 1/25]^4

⇒ A = 390625 [26/25]^4

⇒ A = 390625 × 26/25 × 26/25 × 26/25 × 26/25

⇒ A = 390625 × 456976/390625

⇒ A = 1 × 456976

⇒ A = 456976

∴ Amount = Rs.456976

∴ Arun has to pay Rs.45976 after 1 year.

CCE Test Paper-11

1. Question

Answer

Present value = Rs.3000

Interest rate = 10% per annum

Time = 2 years

Amount (A) = P (1 + R/100)^n [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ A = 3000 (1 + 10/100)^2

⇒ A = 3000 (1 + 1/10)^2

⇒ A = 3000 (11/10)^2

⇒ A = 3000 × 11/10 × 11/10

⇒ A = 3000 × 121/100

⇒ A = 30 × 121

⇒ A = 3630

∴ Amount = Rs.3630

∴ Compound interest = Rs.(3630 – 3000)

= Rs.630

2. Question

Answer

Present value = Rs.10000

Interest rate for 1^{st} year, p = 10 % per annum

Interest rate for 2^{nd} year, q = 12 % per annum

Time = 2 years

Amount (A) = $P \times (1 + p/100) \times (1 + q/100)$

$A = 10000 \times (1 + 10/100) \times (1 + 12/100)$

$= 10000 \times (1 + 1/10) \times (112/100)$

$= 10000 \times 11/10 \times 112/100$

$= 10 \times 11 \times 112$

$= 12320$

∴ Amount = Rs.12320

∴ Compound interest = Rs.(12320 – 10000)

= Rs.2320

3. Question

Answer

Present value = Rs.6000

Interest rate = 10 % per annum

Time = 1 years

∵ Interest is compounded half-yearly.

∴ Amount (A) = $P [1 + (R/2)/100]^{2n}$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ $A = 6000 [1 + (10/2)/100]^2$

⇒ $A = 6000 [1 + 5/100]^2$

⇒ $A = 6000 [1 + 1/20]^2$

⇒ $A = 6000 [21/20]^2$

⇒ $A = 6000 \times 21/20 \times 21/20$

⇒ $A = 300 \times 21 \times 21/20$

⇒ $A = 15 \times 21 \times 21$

⇒ $A = 6615$

∴ Amount = Rs.6615

∴ Compound interest = Rs.(6615 – 6000)

= Rs.615

4. Question

Answer

Let sum = P

Amount (A) = Rs.23762

Interest rate = 9 % per annum

Time = 2 years

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = P(1 + 9/100)^{2\ 2}$

$\Rightarrow 23762 = P(109/100)^2$

$\Rightarrow 23762 = P \times 11881/10000$

$\Rightarrow P = 23762 \times 10000/11881$

$\Rightarrow P = 2 \times 10000$

$\Rightarrow P = 20000$

$\therefore$ Sum = Rs.20000

5. Question

Answer

Present value, P = Rs.32000

Time, n = 2 years

Rate of depreciates, R = 10% per annum

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

$\therefore$ Value = $P(1 - R/100)^n$ [$\because$ Rate decreases]

$= 32000(1 - 10/100)^2$

$= 32000(1 - 1/10)^2$

$= 32000(9/10)^2$

$= 32000 \times 9/10 \times 9/10$

$= 320 \times 9 \times 9$

$= 25920$

∴ Value of scooter will be Rs.25920 after 2 years.

6. Question

Answer

Present value = Rs.5000

Interest rate = 10% per annum

Time = 2 years

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ $A = 5000(1 + 10/100)^2$

⇒ $A = 5000(1 + 1/10)^2$

⇒ $A = 5000(11/10)^2$

⇒ $A = 5000 \times 11/10 \times 11/10$

⇒ $A = 5000 \times 121/100$

⇒ $A = 50 \times 121$

⇒ $A = 6050$

∴ Amount = Rs.6050

∴ Compound interest = Rs.(6050 – 5000)

= Rs.1050

7. Question

Answer

Population of a town, P = 4000

Time, n = 2 years

Increasing rate, R = 5% per annum

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

∴ Population = $P(1 + R/100)^n$

= $4000(1 + 5/100)^2$

= $4000(1 + 1/20)^2$

= $4000(21/20)^2$

= $4000 \times 21/20 \times 21/20$

= $200 \times 21 \times 21/20$

= $10 \times 21 \times 21$

= 4410

∴ Population of a town after 2 years is 4410.

8. Question

Answer

Present value, P = Rs.5000

Amount, A = Rs.5832

Time, n = 2 years

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

∴ Amount (A) = $P(1 + R/100)^n$

⇒ $5832 = 5000(1 + R/100)^2$

⇒ $(1 + R/100)^2 = 5832/5000$

⇒ $(1 + R/100)^2 = 2916/2500$

⇒ $(1 + R/100)^2 = (54/50)^2$

⇒ $1 + R/100 = 54/50$

⇒ $R/100 = (54/50) - 1$

⇒ $R/100 = (54 - 50)/50$

⇒ $R/100 = 4/50$

⇒ R = 400/50

⇒ R = 8

∴ Rate = 8 %.

9. Question

Answer

Simple interest = Rs.1500

Interest rate = 10% per annum

Time = 3 years

Simple interest (SI) = PRT/100 [where, P = Present value

R = Interest rate

∴ 1500 = (P × 10 × 3)/100 T = Time]

⇒ 1500 = P × 30/100

⇒ 1500 = P × 3/10

⇒ P = 1500 × 10/3

⇒ P = 500 × 10

⇒ P = 5000

∴ Sum = Rs.5000

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ $A = 5000 [1 + 10/100]^3$

⇒ $A = 5000 [1 + 1/10]^3$

⇒ $A = 5000 [11/10]^3$

⇒ A = 5000 × 11/10 × 11/10 × 11/10

⇒ A = 5000 × 1331/1000

⇒ A = 5 × 1331

⇒ A = 6655

∴ Amount = Rs.6655

∴ Compound interest = Rs.(6655 – 5000)

= Rs.1655

10. Question

Answer

Compound interest, CI = Rs.1050

Interest rate, R = 10% per annum

Time = 2 years

$\therefore CI = P(1 + R/100)^n - P$

$\Rightarrow 1050 = P(1 + 10/100)^2 - P$

$\Rightarrow 1050 = P(1 + 1/10)^2 - P$

$\Rightarrow 1050 = P(11/10)^2 - P$

$\Rightarrow 1050 = 121P/100 - P$

$\Rightarrow 1050 = (121P - 100P)/100$

$\Rightarrow 1050 = 21P/100$

$\Rightarrow P = 1050 \times 100/21$

$\Rightarrow P = 50 \times 100$

$\Rightarrow P = 5000$

$\therefore$ Sum = Rs.5000

11. Question

Answer

(i) R

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

(ii) Compound interest

Amount (A) = $P(1 + R/100)^n$

And Compound interest = $P(1 + R/100)^n - P$

(iii) Rs. $P\left(1-\frac{R}{100}\right)^2$

$\because$ Rate decreases.

$\therefore$ Value = $P(1 - R/100)^n$

Present value of machine = Rs.P

Interest rate = R% per annum

Time, n = 2

$\therefore$ Value = Rs. $P\left(1-\frac{R}{100}\right)^2$

(iv) $P\left(1+\frac{R}{100}\right)^5$

Present population of a town = P

Increases rate = R% per annum

Time, n = 5 years

∴ Population = P (1 + R/100)^n [Where,

P = Present value

R = Annual interest rate

n = Time in years]

∴ Population after 5 years = $P\left(1+\frac{R}{100}\right)^5$

Exercise 11D

1. Question

Answer

Present value, P = Rs.5000

Interest rate, R = 8% per annum

Time, n = 2 years

∴ Amount (A) = P (1 + R/100)^n [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ A = 5000 (1 + 8/100)^2

⇒ A = 5000 (1 + 2/25)^2

⇒ A = 5000 (27/25)^2

$\Rightarrow A = 5000 \times 27/25 \times 27/25$

$\Rightarrow A = 200 \times 27 \times 27/25$

$\Rightarrow A = 8 \times 27 \times 27$

$\Rightarrow A = 5832$

$\therefore$ Amount = Rs.5832

$\therefore$ Compound interest = Rs.(5832 - 5000) [$\because$CI = A - P]

= Rs.832

2. Question

Answer

Present value, P = Rs.10000

Interest rate, R = 8% per annum

Time, n = 3 years

$\therefore$ Amount (A) = $P(1 + R/100)^n$ [Where, P = Present value

R = Annual interest rate

n = Time in years]

$\therefore A = 10000 (1 + 10/100)^3$

$\Rightarrow A = 10000 (1 + 1/10)^3$

$\Rightarrow A = 10000 (11/10)^3$

$\Rightarrow A = 10000 \times 11/10 \times 11/10 \times 11/10$

$\Rightarrow A = 10 \times 11 \times 11 \times 11$

$\Rightarrow A = 13310$

$\therefore$ Amount = Rs.13310

$\therefore$ Compound interest = Rs.(13310 - 10000) [$\because$CI = A - P]

= Rs.3310

3. Question

Answer

Present value, P = Rs.10000

Interest rate, R = 12% per annum

Time, n = $1\frac{1}{2}$ years

∴ Amount (A) = P (1 + R/100)^n × [1 + (R/2)/100] [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ A = 10000 (1 + 12/100)^1 × [1 + (12/2)/100]

⇒ A = 10000 (1 + 12/100) × [1 + 6/100]

⇒ A = 10000 (112/100) × [106/100]

⇒ A = 10000 × 112/100 × 106/100

⇒ A = 1 × 112 × 106

⇒ A = 11872

∴ Amount = Rs.11872

∴ Compound interest = Rs.(11872 – 10000) [∵CI = A – P]

= Rs.1872

4. Question

Answer

Present value, P = Rs.4000

Interest rate, R = 10% per annum

Time, n =2 years 3 months = (2 + 1/4) years

∴ Amount (A) = P (1 + R/100)^n × [1 + (R/4)/100] [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ A = 4000 (1 + 10/100)^2 × [1 + (10/4)/100]

⇒ A = 4000 (1 + 1/10)^2 × [1 + 1/40]

⇒ A = 4000 (11/10)^2 × [41/40]

⇒ A = 4000 × 121/100 × 41/40

⇒ A = 40 × 121 × 41/40

⇒ A = 121 × 41

⇒ A = 4961

∴ Amount = Rs.4961

∴ Compound interest = Rs.(4961 − 4000) [∵CI = A − P]

= Rs.961

5. Question

Answer

Sum, P = 25000

Interest rate for 1st year, p = 5%

Interest rate for 2nd year, q = 6%

Interest rate for 3rd year, r = 8%

Time, n = 3 years

Now,

Amount (A) = $P \times (1 + p/100) \times (1 + q/100) \times (1 + r/100)$

$= 25000 \times (1 + 5/100) \times (1 + 6/100) \times (1 + 8/100)$

$= 25000 \times (1 + 1/20) \times (1 + 3/50) \times (1 + 2/25)$

$= 25000 \times 21/20 \times 53/50 \times 27/25$

$= 250 \times 21/2 \times 53/5 \times 27/25$

$= 10 \times 21/2 \times 53/5 \times 27$

$= 1 \times 21 \times 53 \times 27$

= 30051

∴ Compound interest = Rs.(30051 − 25000) [∵CI = A − P]

= Rs.50051

6. Question

Answer

Initial value, P = Rs.6250

Interest rate, R = 8% per annum

Time, n = 1 years

∵ Compounded half-yearly.

∴ Amount (A) = P [1 + (R/2)/100]^{2n} [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ A = 6250 [1 +(8/2) /100]^2

⇒ A = 6250 [1 + 4/100]^2

⇒ A = 6250 [1 + 1/25]^2

⇒ A = 6250 [26/25]^2

⇒ A = 6250 × 26/25 × 26/25

⇒ A = 6250 × 26/25 × 26/25

⇒ A = 250 × 26 × 26/25

⇒ A = 10 × 26 × 26

⇒ A = 6760

∴ Amount = Rs.6760

∴ Compound interest = Rs.(6760 – 6250) [∵CI = A – P]

= Rs.510

7. Question

Answer

Present value, P = Rs.40000

Interest rate, R = 6% per annum

Time, n =6 months = 1/2 years

∵ Compounded quarterly.

∴ Amount (A) = P [1 + (R/4)/100]^{4n} [Where, P = Present value

R = Annual interest rate

n = Time in years]

∴ A = 40000 [1 +(6/4) /100]^2 [4n = 4 × 1/2]

⇒ A = 40000 [1 + 3/200]^2

⇒ A = 40000 [1 + 3/200]^2

⇒ A = 40000 [203/200]^2

⇒ A = 40000 × 203/200 × 203/200

⇒ A = 40000 × 203/200 × 203/200

⇒ A = 200 × 203 × 203/200

$\Rightarrow A = 1 \times 203 \times 203$

$\Rightarrow A = 41209$

$\therefore$ Amount = Rs.41209

$\therefore$ Compound interest = Rs.(41209 – 40000) [$\because$CI = A – P]

= Rs.1209

8. Question

Answer

Population of a town, P = 24000

Time, n = 2 years

Increasing rate, R = 5% per annum

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

$\therefore$ Population = $P(1 + R/100)^n$

$= 24000(1 + 5/100)^2$

$= 24000(1 + 1/20)^2$

$= 24000(21/20)^2$

$= 24000 \times 21/20 \times 21/20$

$= 240 \times 21/2 \times 21/2$

$= 60 \times 21 \times 21$

= 26460

$\therefore$ Population of a town is 26460 after 2 years.

9. Question

Answer

Value of a machine 3 years ago, P = Rs.60000

Time, n = 3 years

Rate of depreciates, R = 10% per annum

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

$\therefore$ Value = $P(1 - R/100)^n$ [$\because$ Rate decreases]

$= 60000(1 - 10/100)^3$

$= 60000(1 - 1/10)^3$

$= 60000(9/10)^3$

$= 60000 \times 9/10 \times 9/10 \times 9/10$

$= 60 \times 9 \times 9 \times 9$

$= 43740$

$\therefore$ Present value of the machine is Rs.43740.

10. Question

Answer

Let value of a machine 2 years ago, = P

Present value of machine = Rs.40000

Time, n = 2 years

Rate of depreciates, R = 20% per annum

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

$\therefore$ Value = $P(1 - R/100)^n$ [$\because$ Rate decreases]

$\Rightarrow 40000 = P(1 - 20/100)^2$

$\Rightarrow 40000 = P(1 - 1/5)^2$

$\Rightarrow 40000 = P(4/5)^2$

$\Rightarrow 40000 = P \times 16/25$

$\Rightarrow P = 40000 \times 25/16$

$\Rightarrow P = 2500 \times 25$

$\Rightarrow P = 62500$

$\therefore$ Value of a machine 2 years ago is Rs.62500.

11. Question

Answer

Let 3 years ago population = P

Present population = 33275

Time, n = 3 years

Increases rate, R = 10% per annum

Now,

Amount (A) = $P(1 + R/100)^n$ [Where, A = Amount with compound interest

P = Present value

R = Annual interest rate

n = Time in years]

$\therefore$ Population = $P(1 + R/100)^n$

$\Rightarrow 33275 = P(1 + 10/100)^3$

$\Rightarrow 33275 = P(1 + 1/10)^3$

$\Rightarrow 33275 = P(11/10)^3$

$\Rightarrow 33275 = P \times 1331/1000$

$\Rightarrow P = 33275 \times 1000/1331$

$\Rightarrow P = 25 \times 1000$

$\Rightarrow P = 25000$

$\therefore$ 3 years ago population is 25000.

12. Question

Answer

Interest rate, R = 5% per annum

Time = 3 years

Simple interest = Rs.1200

Simple interest = PRT/100

⇒ 1200 = (P × 5 × 3)/100

⇒ 1200 = P × 15/100

⇒ P = 1200 × 100/15

⇒ P = 8000

Now,

Amount (A) = $P(1 + R/100)^n$

= $8000(1 + 5/100)^3$

= $8000(1 + 1/20)^3$

= $8000(21/20)^3$

= 8000 × 9261/8000

= 9261

∴ Amount = 9261

∴ Compound interest = Rs.(9261 − 8000) [∵CI = A − P]

= Rs.1261

13. Question

Answer

Compound interest, CI = Rs.510

Interest rate, R = $12\frac{1}{2}\%$ = 25/2% per annum

Time = 2 years

CI = $P(1 + R/100)^n - P$

⇒ 510 = $P(1 + (25/2)/100)^2 - P$

⇒ 510 = $P(1 + 1/8)^2 - P$

⇒ 510 = $P(9/8)^2 - P$

⇒ 510 = 81P/64 − P

⇒ 510 = (81P − 64P)/64

⇒ 510 = 17P/64

$\Rightarrow P = 510 \times 64/17$

$\Rightarrow P = 30 \times 64$

$\Rightarrow P = 1920$

Now,

$SI = PRT/100$

$= (1920 \times 25/2 \times 2)/100$

$= (1920 \times 25)/100$

$= 480$

$\therefore$ Simple interest = Rs.480

14. Question

Answer

Amount, A = Rs.4913

Interest rate, R = (25/4)% per annum

Time = 3 years

Amount $(A) = P(1 + R/100)^n$

$\Rightarrow 4913 = P(1 + (25/4)/100)^3$

$\Rightarrow 4913 = P(1 + 1/16)^3$

$\Rightarrow 4913 = P(17/16)^3$

$\Rightarrow 4913 = P \times 4913/4096$

$\Rightarrow P = 4913 \times 4096/4913$

$\Rightarrow P = 4096$

$\therefore$ Sum = Rs.4096

15. Question

Answer

Present value, P = Rs.7500

Amount, A = Rs.8427

Time, n = 2 years

Now,

Amount (A) = $P(1 + R/100)^n$

$\Rightarrow 8427 = 7500(1 + R/100)^2$

$\Rightarrow (1 + R/100)^2 = 8427/7500$

$\Rightarrow (1 + R/100)^2 = (53/50)^2$

$\Rightarrow (1 + R/100) = (53/50)$

$\Rightarrow R/100 = 53/50 - 1$

$\Rightarrow R/100 = (53 - 50)/50$

$\Rightarrow R = 3/50 \times 100$

$\Rightarrow R = 6$

$\therefore$ Rate = 6%