Chapter 2 Compound Interest

COMPOUND INTEREST.

EXERCISE - 2.1

Solution - 01.

Principal for the first year = ₹8,000.

Interest for the first year = $\frac{₹8,000 \times 5 \times 1}{100}$

= ₹400

Amount after one year = ₹8,000 + ₹400

= ₹8,400.

Interest for the second year = $\frac{₹8,400 \times 5 \times 1}{100}$

= ₹420.

Amount after second year = ₹8,400 + ₹420

= ₹8,820.

compound Interest after two years = final amount - Principal

= ₹8,820 - ₹8,000

= ₹820.

Solution - 02.

Principal for the first year = ₹46,875.

Rate of interest = 4%.

(i) Interest for the first year = $\frac{₹46,875 \times 4 \times 1}{100}$

= ₹1,875

Amount after one year = ₹46,875 + ₹1,875

= ₹48,750.

(ii) Interest for the second year = $\frac{₹48,750 \times 4 \times 1}{100}$

= ₹1950

the amount standing to his credit at the end of second year = ₹48,750 + ₹1,950

= ₹50,700.

(iii) Interest for the third year = $\frac{₹50,700 \times 4 \times 1}{100}$

= ₹507 × 4

= ₹2,028.

Solution-03.

Principal for the first year = ₹8,000

Rate of Interest = 10%

Interest for the first year = $\frac{₹8,000 \times 10 \times 1}{100}$

= ₹800

Amount after one year = ₹8,000 + ₹800

= ₹8,800

Interest for the second year = $\frac{₹8,800 \times 10 \times 1}{100}$

= ₹880.

Amount after second year = ₹8,800 + ₹880

= ₹9,680

Compound interest for the second year = ₹800 + ₹880

= ₹1,680.

Interest for the third year = $\frac{₹9,680 \times 10 \times 1}{100}$

= ₹968.

Sum due at the end of the third year = ₹9,680 + ₹968

= ₹10,648.

Solution-04:

Principal for the first year = ₹12,800

Rate of Interest = 10%.

Interest for the first year = $\frac{₹12,800 \times 10 \times 1}{100}$

= ₹1,280.

(i) Amount at the end of first year = ₹12,800 + ₹1,280

= ₹14,080.

(ii) Interest for the second year = $\frac{₹14,080 \times 10 \times 1}{100}$

= ₹1,408.

Amount at the end of second year = ₹14,080 + ₹1,408

= ₹15,488.

Interest for the third year = $\frac{₹15,488 \times 10 \times 1}{100}$

= ₹1,548.8.

(iii) the total amount due to him at the end of three years = ₹15,488 + ₹1548.8

= ₹17,036.5.

Solution-05

Interest for 2 years = ₹1380

$\Rightarrow \frac{x \times 2 \times 12}{100} = ₹1380$

$\Rightarrow 24x = ₹138000$

$\Rightarrow$ sum of money = $\frac{₹1,38,000}{24}$

= ₹5,750.

Principal for the first half year = ₹5,750

Interest for the first half year = ₹ $\frac{5,750 \times 6 \times 1}{100}$

= ₹ 57.5 × 6

= ₹345.

Amount after the first half year = ₹5,750 + ₹345

= ₹6,095

Interest for the second half year = ₹ $\frac{6095 \times 6 \times 1}{100}$

= ₹60.95 × 6

= ₹365.7.

∴ Compound Interest on this sum for one year payable half yearly at the same rate = ₹345 + ₹365.7

= ₹710.70

Solution-06:-

Principal for the first year = 10,000.

Amount after one year = ₹ 11,200

Interest for the first year = ₹ 11,200 - ₹ 1000

= ₹ 1200

Rate of Interest for the first year = ?

Interest for the first year = $\frac{10,000 \times r \times 1}{100}$

$\Rightarrow \frac{12\cancel{00} \times 1\cancel{0}r}{1\cancel{0}\cancel{0}\cancel{0}} = 1$

$\Rightarrow r = 12\%$

Interest for the second year = $\frac{11,2\cancel{0}\cancel{0} \times 12 \times 1}{1\cancel{0}\cancel{0}}$

= ₹ 112 × 12

= ₹ 1,344.

Amount at the end of second year = ₹ 11,200 + ₹ 1,344.

= ₹ 12,544.

Solution-07

Principal for the first year = ₹ 5,000.

Amount after one year = ₹ 5,600

Interest for first year = ₹ 5,600 - ₹ 5,000

$\Rightarrow \frac{₹\ 5,0\cancel{0}\cancel{0} \times r \times 1}{1\cancel{0}\cancel{0}} = ₹ 600$

$\Rightarrow \cancel{₹}\ 5\cancel{0}\ r = \cancel{₹}\ 60\cancel{0}$

(1) $\Rightarrow$ Rate of Interest = 12%

(ii) Interest acured in the second year = $\frac{₹5,600 \times 12 \times 1}{100}$

= ₹672.

Amount after second year = ₹5,600 + ₹672

= ₹6,272

(iii) Interest for the third year = $\frac{₹6,272 \times 12 \times 1}{100}$

= ₹62.72 × 12

= ₹752.64

Amount after third year = ₹6272 + ₹752.64

= ₹7,024.64

Solution -08:

Principal for the first year = ₹2,000.

Interest for the ~~first~~ half year = $\frac{₹2,000 \times 10 \times 1}{100}$

= $\frac{₹2,000 \times 2}{20}$

= ₹200

Amount after first half year = ₹2,000 + ₹200

= ₹2,200

Interest for the second ~~half~~ year = $\frac{₹2,200 \times 10 \times 1}{100}$

= ₹220

Amount after second ~~half~~ year = ₹2,200 + ₹220

= ~~₹2,205~~ 2420.

Interest for the second-half $2\frac{1}{2}$ year

$$= \frac{2420 \times 5 \times 1}{10\cancel{0}}$$

$$= ₹ 121.$$

∴ compound interest after $2\frac{1}{2}$ years = ₹200 + ₹220 + ₹121

= ₹541

Amount to be Paid after $2\frac{1}{2}$ years = ₹2,000 + ₹541

= ₹2,541.

Solution-09.

Principal for the first half year = ₹50,000

Interest for the first half year = $\frac{₹50,000 \times 4 \times 1}{100}$

= ₹2,000.

Amount after the first half year = ₹50,000 + ₹2,000

= ₹52,000.

Principal for the second half year = ₹52,000

Interest for the second half year = $\frac{₹52000 \times 4 \times 1}{100}$

= ₹520 × 4

= ₹2080.

Amount after the second half year = ₹52,000 + ₹2080

= ₹54,080.

Principal for third year = ₹54,080.

Solution-10.

Given that $A = 9261$, $n = 3$ & $R = 5$

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

$$9261 = P\left(1 + \frac{5}{100}\right)^3$$

$$9261 = P\left(1 + \frac{1}{20}\right)^3$$

$$9261 = P\left(\frac{21}{20}\right)^3$$

$$\frac{9261 \times 20 \times 20 \times 20}{21 \times 21 \times 21} = P$$

$\therefore P = \frac{9261 \times 8000}{9,261}$

$\therefore$ Principal $= ₹\,8,000$.

Solution-11:

Givent that $A = 7,803$, $n = 2$, $r = 2$

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

$$7803 = P\left(1 + \frac{2}{100}\right)^2$$

$$7803 = P\left(1 + \frac{1}{50}\right)^2$$

$$7803 = P \times \frac{51 \times 51}{50 \times 50}$$

$$P = \frac{19,507.50}{2500}$$

$\therefore P = 7,500$.

Interest for the third half year = $\frac{₹54080 \times 4 \times 1}{10\phi}$

= ₹ 540.8 × 4

= ₹ 2163.2

Amount after third half year = ₹ 54,080 + ₹ 2,163.2

= ₹ 56,243.20.

∴ Compound Interest for 1½ years = ₹ 56,243 - ₹50,00

= ₹ 6,243.

Solution-10:

Principal amount for the first year = ₹5,000

Interest for the first year = $\frac{₹5,000 \times 6 \times 1}{100}$

= ₹ 50 × 6

= ₹ 300.

Amount after first year = ₹ 5,000 + ₹ 300

= ₹ 5,300.

Interest for the second year = $\frac{₹5,300 \times 8 \times 1}{100}$

= ₹ 53 × 8

= ₹ 424.

∴ Amount after second year = ₹ 5,300 + ₹ 424

= ₹ 5,724.

Compound Interest for 2 years = ₹ 5,724 - ₹ 5,000

= ₹ 724

Solution- 11

Principal for the first ~~half~~ year = ₹17,000.

Interest for the first year @10% = $\frac{₹17,000 \times 10 \times 1}{100}$

= ₹1,700.

Amount after first year = ₹17,000 + ₹1,700

= ₹18,700.

Interest for the Second year @10% = $\frac{₹18,700 \times 10 \times 1}{100}$

= ₹1,870

Amount after second year = ₹18,700 + ₹1,870

= ₹20,570.

Interest for the third year @14% = $\frac{₹20,570 \times 14 \times 1}{100}$

= ₹ ~~2,344.98~~ 2879.8

Amount after third year = ₹20,570 + ₹ ~~2879.98~~

= ₹ ~~22,914.98~~ 23,449.8

Compound Interest after three years = ~~22,914.98~~ 23,449.8 - 17,000

= 6,449.80.

Solution- 12.

Principal for the first year = ₹ 9,600.

Interest for the first year = $\frac{₹\ 9,600 \times 10 \times 1}{100}$

= ₹ 960.

(i) Sum due at the end of first year = ₹ 9,600 + ₹ 960

= ₹ 10,560.

Interest for the second year = $\frac{₹\ 10,560 \times 10 \times 1}{100}$

= ₹ 1,056

(ii) Sum due at the end of second year = ₹ 10,560

+ ₹ 1,056

= ₹ 11,626.

(iii) Compound Interest earned in 2 years

= ₹ 11,626 - ₹ 9,600

= ₹ 2,026.

(iv) diff of (ii) and (i) = 11,626 - 10,560

= ₹ 1,056.

Interest for difference of amount for one year = $\frac{₹\ 1,056 \times 10 \times 1}{100}$

= ₹ 105.60 ps.

compound Interest for third year = ₹1056 + ₹105.6

= ₹1161.60.

Solution-13:

Simple interest on certain money for 2 years @ 10% is = 1,600

$$\Rightarrow \frac{x \times 10 \times 2}{100} = 1,600$$

$$\Rightarrow \frac{x}{5} = 1,600$$

$$\Rightarrow x = 8,000.$$

Principal = ₹8,000.

Interest for the first year = $\frac{₹8,000 \times 10 \times 1}{100}$

= ₹800.

Amount to be paid after one year = ₹8,000 + ₹800

= ₹8,800.

Interest for the second year = $\frac{₹8,800 \times 10 \times 1}{100}$

$= \frac{₹8800}{10} = ₹880$

Amount after second year = ₹8800 + ₹880

= ₹9,680.

Interest for the third year = $\frac{₹9,680 \times 10 \times 1}{100}$

= ₹968.

Amount after three year = 9,680 + ₹ 968

= ₹ 10,648.

Compound Interest for three year = ₹ 800 + ₹ 880
+ ₹ 968

= ₹ 2,648.

Solution-14:

Principal for the first year = ₹ 6,000.

Interest for the first year = $\frac{₹\ 6,000 \times 5 \times 1}{100}$

= ₹ 300

Amount after first year = ₹ 6,300

Money repaid = ₹ 1,200.

Principal for the second year = ₹ 6,300 - 1200

= ₹ 5,100.

Interest for the second year = $\frac{₹\ 5,100 \times 5 \times 1}{100}$

= ₹ 255.

Amount after second year = ₹ 5,100 + ₹ 255

= ₹ 5,355

Amount outstanding at the begining of third year

= ₹ 5,355 - 1200

= ₹ 4,155.

Solution-15:

Principal for the first year = ₹100000

Interest for the first year = $\frac{₹1,00000 \times 11 \times 1}{100}$

= ₹11,000

Amount after one years = ₹1,00,000 + ₹11,000

= ₹ 1,11,000

Money repaid after one year = ₹ 41,000

Principal for second year = ₹1,11,000 - ₹41,000

= ₹70,000.

Interest for the second year = $\frac{₹70000 \times 11 \times 1}{100}$

= ₹7700.

Amount after second year = ₹ 70,000 + 7,700

= ₹77,700

Principal for third year = ₹77,700 - ₹47,700

= ₹30,000.

Amount = ₹30,000

Solution -16 :-

Simple Interest = $\frac{PNR}{100}$

$= \frac{₹20,000 \times 2.5 \times 10}{100}$

$= ₹ 200 \times 2.5$

$= ₹ 5,000.$

Compounded for friend

Interest for the first year = $\frac{₹20,000 \times 1 \times 10}{100}$

$= ₹ 2,000.$

Amount after one year = ₹20,000 + ₹2,000

$= ₹ 22,000.$

Interest after the second year = $\frac{₹22,000 \times 10 \times 1}{100}$

$= ₹ 2,200.$

Amount after second year = ₹22,000 + ₹2,200

$= ₹ 24,200.$

Interest for second year 6 months = $\frac{₹24,200 \times 5 \times 1}{100}$

$= ₹ 1210.$

∴ Total amount = 24,200 + 1,210

$= 25,410.$

∴ Gain = 25,410 - 25,000 = ₹ 410

EXERCISE-2.2

Solution-01:

Using the formula, we get

$A = ₹5,000\left(1+\frac{6}{100}\right)^2$ $\qquad A = P\left(1+\frac{r}{100}\right)^n$

$= ₹5,000 \times \left(\frac{106}{100}\right)^2$

$= ₹5,0\cancel{0}\cancel{0} \times \frac{53\times53}{5\cancel{0}\times5\cancel{0}}$

$= ₹2\times53\times53$

$= ₹106\times53$

$= ₹5,618.$

$C.I = ₹5,618 - ₹5,000 = ₹618.$

Solution-02:-

Using formula, we get

$A = ₹8,000\left(1+\frac{1\cancel{0}}{10\cancel{0}}\right)^4$

$= ₹8,000\left(1+\frac{1}{10}\right)^4$

$= ₹8,000\left(\frac{10+1}{10}\right)^4$

$= ₹8,000\left(\frac{11}{10}\right)^4$

$= ₹\overset{4}{\cancel{8}},\cancel{0}\cancel{0}\cancel{0} \times \frac{11\times11\times11\times11}{\overset{5}{\cancel{10}}\times10\times10\times10}$

$= \frac{58,564}{5}$

$= 11,712.8$

$CI = ₹11,712.8 - ₹8,000 = ₹3,712.80$

Solution-03:

Since, rate of interest per annum is 5%, therefore,

rate of interest per conversion (half yearly) = 2.5%

As the money compounded half yearly:

number of conversion periods = 2

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

$$= ₹7,400\left(1 + \frac{2.5}{100}\right)^2$$

$$= ₹7,400\left(1 + \frac{1}{40}\right)^2$$

$$= ₹7,400\left(\frac{40+1}{40}\right)^2$$

$$= ₹\frac{37}{7400} \times \frac{41 \times 41}{40 \times 40}$$

$$= 7774.625$$

∴ Amount = 7774.625Rs

Solution-04.

Since, rate of interest per annum 10%., therefore rate of interest per conversion = 5%.

As the money compounded semi annually,

n(number of conversion periods) = 3

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

$$= 5{,}000\left(1 + \frac{5}{100}\right)^3$$

$$= 5{,}000\left(1 + \frac{1}{20}\right)^3$$

$$= 5{,}000\left(\frac{21}{20}\right)^3$$

$$= \frac{5{,}000 \times 21 \times 21 \times 21}{20 \times 20 \times 20} = \frac{2.5 \times 21 \times 21 \times 21}{4}$$

$$= 5{,}788.125$$

Compound Interest = 5,788.125 - 5,000

= 788.125.

Solution-05:

Since, the rate of interest per 12 months (annum), therefore rate of interest per conversion = $\frac{1}{4} \times 4\%$

= 1%

As the money compounded quarterly

n(number of conversions) = $\frac{9}{3}$

= 3.

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

$$A = 10,000\left(1+\frac{1}{100}\right)^3$$

$$= 10000\left(\frac{100+1}{100}\right)^3$$

$$= 10,000 \times \frac{101\times101\times101}{100\times100\times10}$$

$$= ₹103030.10$$

Compound Interest = 1,03,030.10 − 1,00,000

= ₹ 3,030.10.

Solution-06:

Principal = 4,800, n = 2 & R = 5%.

Simple Interest = $\frac{P\times n\times R}{100}$

$$= \frac{4800\times2\times5}{100}$$

= ₹480.

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

$$= 4,800\left(1+\frac{5}{100}\right)^2$$

$$= 4,800\left(1+\frac{1}{20}\right)^2$$

$$= 4,800\left(\frac{20+1}{20}\right)^2$$

$$= \frac{12}{4800}\times\frac{21\times21}{20\times20}$$

$$= ₹12\times21\times21. = 5,292.$$

CI = 5,292 − 4,800 = 492.

∴ Difference = ₹492 − ₹480 = ₹12 (CI − SI)

Solution-07:

Principal = ₹2,500, n = 2 and R = 4% per annum.

$$\text{Simple Interest} = \frac{P \times N \times R}{100}$$

$$= \frac{2,500 \times 2 \times 4}{100}$$

$$= ₹200$$

Given that compound Interest reckoned semi annually, therefore $n = 4$ & $R = \frac{4}{2} = 2\%$.

$$A = ₹2,500\left(1 + \frac{2}{100}\right)^4 \qquad \left| A = P\left(1 + \frac{r}{100}\right)^n \right.$$

$$= 2,500\left(1 + \frac{1}{50}\right)^4$$

$$= 2,500\left(\frac{51}{50}\right)^4$$

$$= \frac{2500 \times 51 \times 51 \times 51 \times 51}{50 \times 50 \times 50 \times 50}$$

$$= \frac{6,765,201}{2500}$$

$$= 2,706.80$$

Compound Interest = 2,706.80 − 2,500

= ₹206.80.

∴ Difference between simple Interest & compound Interest is

CI − SI = 206.80 − 200

= ₹6.08

Solution-08:-

Given that

Principal for the first year = ₹2,000.

Interest for the first year = $\frac{2,000 \times 1 \times 4}{100}$

= ₹80.

Principal for the second year = ₹2,080.

Interest for the second year = $\frac{2,080 \times 1 \times 3}{100}$

= 62.40.

Compound Interest = ₹80 + ₹62.40

= ₹142.40.

Solution-09

$A = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)\left(1+\frac{r_3}{100}\right)$

$= 3,125\left(1+\frac{4}{100}\right)\left(1+\frac{5}{100}\right)\left(1+\frac{6}{100}\right)$

$= 3,125\left(1+\frac{1}{25}\right)\left(1+\frac{1}{20}\right)\left(1+\frac{3}{50}\right)$

$= \frac{3,125 \times 26 \times 21 \times 53}{25 \times 20 \times 50}$

$= \frac{14,469}{4}$

= 3,617.25.

∴ Compound Interest = 3,617.25 - 3125 = ₹492.25

Solution-12:

Given that $A = 132651$, $n = 3$, $r = 2$

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

$$132651 = P\left(1 + \frac{2}{100}\right)^3$$

$$\Rightarrow P\left(1 + \frac{1}{50}\right)^3 = 132651$$

$$\Rightarrow \frac{P \times 51 \times 51 \times 51}{50 \times 50 \times 50} = 132651$$

$$\Rightarrow P = \frac{132651 \times 50 \times 50 \times 50}{51 \times 51 \times 51}$$

$$\Rightarrow P = \frac{132651 \times 125000}{132651}$$

$$\Rightarrow P = 125000$$

Solution-13

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

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

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

$$= \frac{P \times 26 \times 26}{25 \times 25}$$

$$CI = \frac{26 \times 26}{25 \times 25}(P) - P = \frac{676P - 625P}{625}$$

$$\Rightarrow CI = \frac{51P}{625}$$

$$\Rightarrow 5,712 = \frac{51P}{625}$$

$$\Rightarrow \frac{5,712 \times 625}{51} = P$$

$$\Rightarrow P = 70,000.$$

Solution-14:

$A = 1275,\ P = 1200,\ n = 1$ & $R = ?$

$$1275 = 1200\left(1 + \frac{r}{100}\right)^n$$

$$\frac{1275}{1200} = \frac{100 + r}{100}$$

$$\Rightarrow r = \frac{1275}{12} - 100$$

$$\Rightarrow r = \frac{75}{12}$$

$$\Rightarrow r = 6.25\ \%.$$

CI for second year $= \frac{1275 \times 1 \times 6.25}{100}$

$$= \frac{7968.75}{100}$$

$$= 79.68$$

Compound interest for second year

$= ₹80.$

Solution-15

Given that $A = 2500$, $P = 2304$, $n = 2$ & $R = ?$.

$$2500 = 2304\left(1+\frac{r}{100}\right)^2$$

$$\frac{2500}{2304} = \left(1+\frac{r}{100}\right)^2$$

$$\Rightarrow \frac{100+r}{100} = \sqrt{\frac{2500}{2304}}$$

$$\Rightarrow \frac{100+r}{100} = \sqrt{\left(\frac{50}{48}\right)^2}$$

$$\Rightarrow 100+r = \frac{100\times 50}{48}$$

$$\Rightarrow r = \frac{5000}{48} - 100$$

$$\Rightarrow r = \frac{5000-4800}{4800}$$

$$\Rightarrow r = \frac{200}{4800}$$

$$\Rightarrow r = \frac{1}{24}\%$$

$$\Rightarrow r = 4.16\%$$

$$\Rightarrow r = 4\frac{1}{6}\%$$

Solution-16:

Given that

$$A = \frac{25}{16}P, \quad n = 2 \text{ and } r = ?$$

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

$$\Rightarrow P\left(1+\frac{r}{100}\right)^2 = \frac{25}{16}P$$

$$\Rightarrow \frac{100+r}{100} = \sqrt{\frac{25}{16}}$$

$$\Rightarrow \frac{100+r}{100} = \frac{5}{4}$$

$$\Rightarrow r = 125-100$$

$$\Rightarrow r = 25\%$$

Solution-17:

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

$$\Rightarrow 2315.25 = 2{,}000\left(1+\frac{r}{100}\right)^3$$

$$\Rightarrow \frac{2315.25}{2000} = \left(\frac{100+r}{100}\right)^3$$

$$\Rightarrow \sqrt[3]{\frac{2.31525}{2.000}} = \frac{100+r}{100}$$

$$\Rightarrow \sqrt[3]{(105)^3} = 100+r$$

$$\Rightarrow 2315.25\times100\times5 = (100+r)^3$$

$$\Rightarrow \sqrt[3]{2315.25\times500} = 100+r$$

$$\Rightarrow \sqrt[3]{1157625} = 100+r$$

$$\Rightarrow r = 105-100 = 5\%$$

Solution-18:

$A = 48620.25$, $P = 40,000$, $r = \frac{R}{2}$, $n = 2 \times 2 = 4$

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

$$\Rightarrow 48,620.25 = 40,000\left(1 + \frac{R}{200}\right)^4$$

$$\Rightarrow \left(\frac{200+R}{200}\right)^4 = \frac{48,620.25}{40,000}$$

$$\Rightarrow [(200+R)^2]^2 = \frac{48,620.25 \times 200 \times 200 \times 200 \times 200}{40,000}$$

$$\Rightarrow (200+R)^2 = \sqrt{(220.5)^2(200)^2}$$

$$\Rightarrow 200+R = \sqrt{200 \times 220.5}$$

$$\Rightarrow R = 210 - 200$$

$$\Rightarrow R = 10\%$$

Solution-19:

G/T $A = \frac{216}{125}P$, $n = 3$.

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

$$\Rightarrow \frac{216}{125}P = P\left(1 + \frac{Rr}{200}\right)^3$$

$$\Rightarrow \frac{100+r}{100} = \sqrt[3]{\frac{216}{125}}$$

$$\Rightarrow 100+r = \frac{6 \times 100}{5}$$

$$\Rightarrow r = 120 - 100 = 20\%.$$

∴ Rate of interest = 20×2%

= 40%

Solution-20:

Given that A = 88200, P = 80,000, n = 2

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

$$\Rightarrow \frac{882\cancel{00}}{800\cancel{00}} = \left(\frac{100+r}{100}\right)^2$$

$$\Rightarrow \sqrt[2]{\frac{21\times21\times\cancel{4}}{20\times20\times\cancel{4}}} = \frac{100+r}{100}$$

$$\Rightarrow \frac{21\times\cancel{100}^{5}}{\cancel{20}} = 100+r$$

$$\Rightarrow r = 105-100$$

$$\Rightarrow r = 5\%$$

Principal = 88,200

$$CI = \frac{88,2\cancel{00}\times1\times5}{1\cancel{00}}$$

$$= 882\times5$$

$$= 4,410$$

∴ Amount to be paid after 3 years = P + CI

= 88,200 + 4,410

= 92,610

∴ A = ₹ 92,610.

Solution-21.

Let the rate of compound interest be $r\%$ per annum.

The amount afters will be the principal for the third year

$$\Rightarrow 5556.60 = 5292\left(1+\frac{r}{100}\right)$$

$$\Rightarrow 1+\frac{r}{100} = \frac{5556.60}{5292}$$

$$\Rightarrow \frac{r}{100} = \frac{5556.60-5292}{5292}$$

$$\begin{array}{r} 5556 \\ 5292 \\ \hline 264 \end{array}$$

$$\Rightarrow r = \frac{26460}{5292}$$

$$\Rightarrow r = 5\%$$

$\therefore$ The rate of compound Interest $= 5\%$ per annum

Let the original sum be P.

$$₹5292 = P\left(1+\frac{5}{100}\right)^2$$

$$\Rightarrow P \times \frac{21\times 21}{20\times 20} = 5292$$

$$\Rightarrow P = \frac{5292\times 400}{441}$$

$$\Rightarrow P = 12\times 400$$

$$\Rightarrow P = ₹4800$$

$\therefore$ original sum is ₹ 4,800.

Solution-22:-

Let the rate of compound Interest be r%. Per annum

The amount after 3 years will be the principal for the 4th year

$$\Rightarrow \quad 878.46 = 798.60\left(1+\frac{r}{100}\right)$$

$$\Rightarrow \quad \frac{878.46}{798.60} = \frac{100+r}{100}$$

$$\Rightarrow \quad \frac{r}{100} = \frac{878.46 - 798.60}{798.60}$$

$$\begin{array}{r} 878.46 \\ 798.60 \\ \hline 79.86 \end{array}$$

$$\Rightarrow \quad r = \frac{7986}{798.60}$$

$$\Rightarrow \quad r = 10\%.$$

∴ The rate of compound interest = 10% Per annum

Let the original sum be P.

$$₹\ 798.6 = P\left(1+\frac{10}{100}\right)^3$$

$$\Rightarrow \quad 798.6 = P \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$$

$$\Rightarrow \quad \frac{798.6 \times 1000}{121 \times 11} = P$$

$$\Rightarrow \quad P = \frac{798600}{121 \times 11}$$

$$\Rightarrow \quad P = 600.$$

∴ original amount = ₹600.

Solution-23.

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

$$\Rightarrow 17576 = 15625\left(1+\frac{4}{100}\right)^n$$

$$\Rightarrow \frac{17576}{15625} = \left(\frac{26}{25}\right)^n$$

$$\Rightarrow \left(\frac{26}{25}\right)^3 = \left(\frac{26}{25}\right)^n$$

Bases are equal then Powers should be equal $n=3$.

Solution-24.

$P = ₹12,500$ $CI = ₹3246.40$ rate $= 8\%$

$A = ₹12,500 + 3246.40$

$= ₹15746.40$

Using $15746.40 = 12500\left(1+\frac{8}{100}\right)^n$

$$\Rightarrow \frac{15746.40}{12500} = \left(\frac{27}{25}\right)^n$$

$$\Rightarrow \left(\frac{27}{25}\right)^3 = \left(\frac{27}{25}\right)^n$$

$\therefore$ Bases are equal then Powers should be equal

$\therefore$ number of years $= 3$.

$n = 3$.

Solution-25:

Here, $P = ₹16,000$, $A = ₹18,522$.

As the interest is compounded semi annually,

r (rate of interest per conversion period) $= \frac{1}{2}$ of 10%

$= 5\%$

Let the number of conversion periods be n, then

$$₹18,522 = ₹16,000\left(1+\frac{5}{100}\right)^n$$

$$\Rightarrow \frac{₹18,522}{₹16,000} = \left(\frac{21}{20}\right)^n$$

$$\Rightarrow \left(\frac{21}{20}\right)^4 = \left(\frac{21}{20}\right)^n$$

$\therefore$ Bases are equal then powers should be equal

$$n = 4$$

Solution-26:

Given that $A = 2782.50$, $R_1 = 5$, $R_2 = 6$.

$$2782.50 = P\left(1+\frac{5}{100}\right)\left(1+\frac{6}{100}\right)$$

$$\Rightarrow 2782.50 = P\left(\frac{21}{20}\right)\left(\frac{53}{50}\right)$$

$$\Rightarrow P = \frac{2782.50 \times 20 \times 50}{21 \times 53}$$

$$\Rightarrow P = 10,000.$$

$\therefore$ Sum $= 10,000$.

Solution -27.

$$CI_1 = \frac{P_1 \times 1 \times r}{100}$$

$$\Rightarrow P_1 r = 225 \times 100$$

$$\Rightarrow P_1 r = 22500 \qquad P_1 = \frac{22,500}{r}$$

$$CI_2 = \frac{P_2 \times 1 \times r}{100}$$

$$240 = \frac{\frac{22500}{r} \times 1 \times r}{100} + r \qquad \left[\because P_2 = \frac{22,500}{r} + 2\right.$$

$$r = \frac{240}{225}$$

Solution - 27.

G/T

Compound Interest for the first year $CI_1 = 225$

Compound Interest for the second year $CI_2 = 240$.

$$CI_1 = \frac{P_1 \times N \times R}{100}$$

$$\Rightarrow 225 = \frac{P_1 \times 1 \times R}{100}$$

$$\Rightarrow P_1 R = 22,500.$$

$\therefore$ principal for the second year $= \frac{22,500}{R} + CI_1$

$$= \frac{22,500}{R} + 225$$

$$CI_2 = \frac{P_2 \times N \times R}{100}$$

$$\Rightarrow 24 \times 1000 = P_2 \times 1 \times R$$

$$\Rightarrow 24,000 = \frac{22,500}{R} \times R + 225(R)$$

$$\Rightarrow 225R = 24,000 - 22,500$$

$$\Rightarrow R = \frac{1500}{225} = \frac{60}{9}\frac{20}{3}$$

$\Rightarrow$ (i) Rate of interest $= 6\frac{2}{3}\%$.

(ii) Original Sum.

$$CI_1 = \frac{P_1 \times N \times R}{100}$$

$$\Rightarrow P_1 = \frac{225 \times 100 \times 3}{2} = 225 \times 15$$

∴ original sum = ₹3,375

(iii) compound Interest for the third year CI_3.

Principal = ₹3375+290+240

= ₹3840

$$CI_3 = \frac{₹3840 \times 2 \times 1}{3 \times 100}$$

Compound Interest for the third year = ₹256

Solution-28:

$$\text{Simple Interest} = \frac{P \times N \times R}{100}$$

$$= \frac{P \times 2 \times 5}{100}$$

$$= \frac{P}{10}$$

$$\text{Compound Interest} = P\left[\left(1+\frac{5}{100}\right)^2 - 1\right]$$

$$= P\left[\left(\frac{21}{20}\right)^2 - 1\right]$$

$$= P\left[\frac{441-400}{400}\right]$$

$$= \frac{41P}{400}$$

Given that

$$\frac{41P}{400} - \frac{P}{10} = 25$$

$$\Rightarrow \frac{41P - 40P}{400} = 25$$

$$\Rightarrow 1P = 2500 \times 4$$

$$\Rightarrow P = 2500 \times 4$$

$$\Rightarrow \text{Principal} = 10,000$$

Solution-29:

$$\text{Simple Interest} = \frac{P \times 1 \times 10}{100}$$

$$= \frac{P}{10}$$

$$\text{compound Interest} = P\left[\left(1+\frac{5}{100}\right)^2 - 1\right]$$

$$= P\left[\left(1+\frac{1}{20}\right)^2 - 1\right]$$

$$= P\left[\left(\frac{21}{20}\right)^2 - 1\right]$$

$$= P\left[\frac{441-400}{400}\right]$$

$$= \frac{41P}{400}$$

$$\frac{41P}{400} - \frac{P}{10} = 15$$

$$41P - 40P = 400 \times 15$$

$$\Rightarrow P = 6000$$

Solution-30:

Given that.

$$\text{compound Interest for the first year} = P\left[\left(1+\frac{r}{100}\right)^1 - 1\right]$$

$$\Rightarrow 1250 = P[100 + r - 100]$$

$$\Rightarrow 1250 = Pr$$

$$\Rightarrow P = \frac{1250}{r}$$

$$\text{compound Interest for the Second year} = P\left[\left(1+\frac{r}{100}\right)^2 - 1\right]$$

$$1375 = P\left[\left(1+\frac{1250}{P\times 100}\right)^2 - 1\right]$$

$$1375 = P\left[\frac{(P+12.50)^2}{P^2} - 1\right]$$

$$\Rightarrow 1375 = P\left[\frac{P^2+25P+156.25-P^2}{P^2}\right]$$

Solution- 30°

Compound Interest of 2nd conversion Period -

Compound Interest of 1st conversion = S.I on the Interest of 1st conversion Period.

∴ 1375 - 1250 = S.I on Interest on the Interest of 1st conversion Period

$$125 = \frac{1250 \times 1 \times R}{100}$$

∴ Rate of interest = 10 %.

Solution- 31:-

Simple Interest for three years = ₹225.

$$\Rightarrow \frac{x \times r \times 3}{100} = 225$$

$$\Rightarrow x \times r = \frac{22,500}{3}$$ [∵ x = principal & r = rate of Interest]

Compound Interest for two years = ₹153

$$\Rightarrow P\left[\left(1+\frac{r}{100}\right)^2 - 1\right] = ₹153$$

$$\Rightarrow x\left[\frac{(100+r)^2-(100)^2}{(100)^2}\right] = ₹153.$$

$$\Rightarrow x[100^2 + r^2 + 200r - 100^2] = ₹153 \times 10,000$$

$$\Rightarrow (x)r + 200xr = 15,30,000$$

$$\Rightarrow \frac{22500}{3}[r + 200] = 153000$$

$$\Rightarrow r = 68 \times 3 - 200$$

$$\Rightarrow r = 204 - 200$$

∴ Rate of interest = 4 %.

$\therefore$ Simple Interest on three years = ₹225

$\Rightarrow \frac{P \times 3 \times 4}{100} = 225$

$\Rightarrow P = 25 \times 75$

$\Rightarrow P = ₹1875$

$\therefore$ Principal = ₹1875.

Solution -32:-

Compounded annually:-

First, we fond the amount after one year

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

$$= P\left(1 + \frac{10}{100}\right)^n$$

$$= 8{,}000\left(\frac{110}{100}\right)^1$$

$$= 8{,}000 \times 1.1$$

$$= 8{,}800$$

Principal for the second half year = 8,800

Interest for the next half year = $\frac{₹8,800 \times 10 \times 1}{2}$

= ₹440.

Compounded Annually Interest = ₹9240

As the money Invested for $1\frac{1}{2}$ years, therefore.

n = number of conversion periods = 3.

$$A = P\left(1 + \frac{r}{100}\right)^n = ₹8{,}000\left(1 + \frac{5}{100}\right)^3$$

$$= ₹8{,}000\left(\frac{21}{20}\right)^3 = ₹8{,}000(1.05)^3$$

= ₹9,261.

Interest for $1\frac{1}{2}$ year compounded semi annually = ₹9,261.

difference b/w compounded semi annually and annually

$= ₹9,261 - ₹9,240$

$= ₹21$

Solution-33 :-

Compounded Annually,

Compound Interest for two years $= P\left[\left(1+\frac{r}{100}\right)^n - 1\right]$

$= P\left[\left(1+\frac{20}{100}\right)^n - 1\right]$

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

$= P\left[\left(\frac{6}{5}\right)^2 - 1\right]$

$= P\left[\frac{36-25}{25}\right]$

$= \frac{11P}{25} = 0.44P$

Compounded half yearly,

compound Interest for two years $= P\left[\left(1+\frac{r}{100}\right)^n - 1\right]$

$= P\left[\left(1+\frac{10}{100}\right)^4 - 1\right]$

$= P\left[\left(\frac{11}{10}\right)^4 - 1\right]$

$= P\left[(1.1)^4 - 1\right]$

$= P[1.4641 - 1]$

$= 0.464P$

$\therefore$ Given that $0.464 - 0.44P = ₹482$

$0.024P = 482$

$\Rightarrow \quad P = \frac{482}{0.0241}$

$\Rightarrow \quad P = 20,000.$

$\therefore$ Sum of money Lent out $= 20,000.$

Solution-34:-

Amount after one year $= P\left(1+\frac{r}{100}\right)^1$

$13,230 = P\left(1+\frac{r/2}{100}\right)^2$

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

$13,891.50 = P\left(1+\frac{r/2}{100}\right)^3$

$13,891.50 = \frac{13,230}{P\left(1+\frac{r/2}{100}\right)^2}\left(1+\frac{r/2}{100}\right)^3$

$\Rightarrow \frac{13,891.50}{13,230} = 1+\frac{r}{200}$

$\Rightarrow \frac{10.5}{} \frac{13,891.50}{13,230} = \frac{200+r}{200}$

$\Rightarrow \quad 10.5 \times 20 = 200+r$

$\Rightarrow \quad 210 = 200+r$

$\Rightarrow \quad r = 10$

$\therefore$ Rate of Interest $= 10\%$.

Sum $= \frac{13,230}{(1.1025)} = ₹12,000$

[$\because P = \frac{13,230}{\left(1+\frac{r/2}{100}\right)^2}$

$P = \frac{13,230}{\left(1+\frac{5}{100}\right)^2}$

$= \frac{13,230 \times 20 \times 20}{21 \times 21}$

$= \frac{13,230}{1.1025}$]

$\therefore$ Sum $= ₹12,000.$

Solution-03.

present population = 6,760,000

(i) its population 2 years hence = $6760000\left(1+\frac{4}{100}\right)^2$

$= 6760000\left(1+\frac{1}{25}\right)^2$

$= 6760000\left(\frac{26}{25}\right)^2$

$= \frac{6760000 \times 26 \times 26}{25 \times 25}$

$= 6760000 \times 1.04 \times 1.04$

$= 6760000 \times 1.0816$

$= 7311616$

(ii) its population 2years ago = $6760000\left(1-\frac{4}{100}\right)^2$

$= 676.00,000\left(1-\frac{1}{25}\right)^2$

$= 676.00,000\left(\frac{25-1}{25}\right)^2$

$= 676.00,00\left(\frac{24}{25}\right)^2$

$= 6.76,0,000 \times 0.96 \times 0.96$

$= 67,60,000 \times 0.9216$

$= 62250000$

$= 62,50,000$

Solution-04:-

Refrigerator value after two years = $₹9,000\left(1-\frac{1}{20}\right)^2 = ₹9,000\left(\frac{19}{20}\right)^2$

$= \frac{₹9,000}{2} \times \frac{19 \times 19}{25 \times 25}$

$= \frac{16,254}{2} = 8,122.5$

∴ total depreciation = 9000 − 8,122.5 = 887.5.

Solution-05:-

Purchased cost of scooter = ₹24,000.

Rate of depreciation = 5%

Scooter Value after 3 years $= 24,000\left(1-\frac{5}{100}\right)^3$

$= 24,000\left(1-\frac{1}{20}\right)^3$

$= 24,000\left(\frac{20-1}{20}\right)^3$

$= 24,000\left(\frac{19}{20}\right)^3$

$= \frac{24,000 \times 19 \times 19 \times 19}{20 \times 20 \times 20}$

$= 3 \times 361 \times 19$

$= 57 \times 361$

$= 20,577.$

Solution-06:-

Present Production = 2187 quintals

Wheat Production 2 years ago $= 2187\left(1-\frac{\overset{12.5}{\cancel{8}}}{\cancel{100}}\right)^2$

$= 2187\left(\frac{12.5-1}{12.5}\right)^2$

$= 2187\left(\frac{11.5}{12.5}\right)^2$

$= 2187\,(0.92)^2$

$= 2187 \times 0.8464$

$= 1851.$

∴ Wheat Production two years ago = 1851

Exercise -2.3.

Solution-01

Present Population = 2,00,000

Population after one year = Present Population $\left(1+\frac{10}{100}\right)$

$= 2,00,000 \times 1.1$

$= 2,20,000$

Population after second year = $2,20,000 \times \left(1+\frac{15}{100}\right)$

$= 2,20,000(1+0.15)$

$= 2,20,000(1.15)$

$= 2,53,000.$

∴ Population of the town at the end of the two years = 2,53,000.

Solution-02:-

Present Population = 15,625.

Population after 3 years = Present Population $\times \left(1+\frac{4}{100}\right)^3$

$= 15,625\left(1+\frac{1}{25}\right)^3$

$= 15,625\left(\frac{25+1}{25}\right)^3$

$= 15,625\left(\frac{26}{25}\right)^3$

$= 15\,625 \times \frac{26\times26\times26}{25\times25\times25}$

$= 26\times26\times26$

$= 17,576.$

∴ Increase in Population = 17,576 − 15,625

= 1951.

Solution -03

Present population = 6,760,000.

(i) its population 2 years hence $= 6760000\left(1+\frac{4}{100}\right)^2$

$= 6760000\left(1+\frac{1}{25}\right)^2$

$= 6760000\left(\frac{26}{25}\right)^2$

$= \frac{6760000\times 26\times 26}{25\times 25}$

$= 6760000\times 1.04\times 1.04$

$= 7311616.$

(ii) its population 2 years Ago = V_0

$$6,76,000 = V_0\left(1-\frac{r}{100}\right)^n$$

$$6,76,000 = V_0\left(1-\frac{4}{100}\right)^n$$

$$6,76,000 = V_0\left(1-\frac{1}{25}\right)^2$$

$$6,76,000 = V_0\left(\frac{24}{25}\right)^2$$

$$\frac{6,76,000}{0.96\times 0.96} = V_0$$

$$\Rightarrow \quad V_0 = 7250000.$$

Solution-04:

Refrigerator value after two years $= ₹9,000\left(1-\frac{5}{100}\right)^2$

$= ₹9,000\times\frac{19\times 19}{20\times 20}$

$= 16,254/2 = 8,122.50$

∴ Total depreciation $= 9,000 - 8,122.5$

$= 887.5.$

Solution-05:-

Purchased cost of scooter = ₹24,000

Rate of depreciation = 5%

Scooter value after 3 years $= 24{,}000\left(1-\frac{5}{100}\right)^3$

$= 24{,}000\left(1-\frac{1}{20}\right)^3$

$= 24{,}000\left(\frac{19}{20}\right)^3$

$= 3\times 19\times 361$

$= 57\times 361$

$= ₹20{,}577$

∴ Scooter value after three years = ₹20,577

Solution-06:-

Present production = 2187 quintals

Wheat production 2 years ago = V_0

$2187 = V_0\left(1+\frac{8}{100}\right)^2$

$\Rightarrow 2187 = V_0\left(1+\frac{2}{25}\right)^2$

$\Rightarrow 2187 = V_0\left(\frac{25+2}{25}\right)^2$

$\Rightarrow 2187 = V_0\left(\frac{27}{25}\right)^2$

$\Rightarrow \frac{2187\times 25\times 25}{27\times 27} = V_0$

$\Rightarrow \frac{2187\times 25\times 25}{27\times 27} = V_0$

$\Rightarrow \frac{1366875}{729} = V_0$

$\Rightarrow V_0 = 1{,}875$

Solution-07:-

Rate of depreciation = 5%.

Present value of property = 411540.

Property value 3 years ago = V_0

$$\Rightarrow 411540 = V_0\left(1-\frac{5}{100}\right)^3$$

$$\Rightarrow 411540 = V_0\left(1-\frac{1}{20}\right)^3$$

$$\Rightarrow \frac{411540 \times 8000}{19 \times 361} = V_0$$

$$\Rightarrow \frac{4,11,540 \times 8000}{6,859} = V_0$$

$$\Rightarrow V_0 = 4,80,000.$$

∴ Property value 3 years ago = 4,80,000.

Solution-08:-

pres purchased cost = 16,000

Rate of scooter After 2 years = 14,400.

$$\Rightarrow 16,000 = 14,400\left(1+\frac{r}{100}\right)^2$$

$$\Rightarrow \frac{16,000}{14,400} = \left(1+\frac{r}{100}\right)^2$$

$$\Rightarrow \sqrt{\frac{10}{9}} = \frac{100+r}{100}$$

$$\Rightarrow \frac{\sqrt{10}}{3} = \frac{100+r}{100}$$

$$\Rightarrow 300-3r = 316 \qquad \Rightarrow 3r = 15$$

$$\Rightarrow r = 5.$$

Solution-09:-

Here, production of cars 2011-2012 - 80,000
2014-2015 - 92,160

$$V = V_0\left(1+\frac{r}{100}\right)^n$$

$$\Rightarrow 92,160 = 80,000\left(1+\frac{r}{100}\right)^3$$

$$\Rightarrow \frac{92,160}{80,000} = \left(1+\frac{r}{100}\right)^3$$

$$\Rightarrow \left(\frac{21}{20}\right)^3 = \left(1+\frac{r}{100}\right)^3$$

$$\Rightarrow \frac{21}{20} = 1+\frac{r}{100}$$

$$\Rightarrow 100 + r = 105$$

$$\Rightarrow r = 5\%$$ p.a.

Solution-10:-

Here, present value of Machine = 5,00,000

n years after machine cost = 3,64,500.

$$\Rightarrow 5,00,000 = 3,64,500\left(1-\frac{10}{100}\right)^n$$

$$\Rightarrow \frac{5,000}{3645} = (0.9)^n$$

$$3,64,500 = 5,00,000(1-0.1)^n$$

$$\Rightarrow \frac{364500}{500000} = (0.9)^n$$

$$\Rightarrow 0.729 = (0.9)^n$$

$$\Rightarrow (0.9)^3 = (0.9)^n$$

$\therefore$ number of years = 3.