Compound Interest Ex 14.1

14. COMPOUND INTREST

Exercise 14.1

1. Find the compound intrest when principle = Rs. 3000, rate = 5% per annum and time = 2 years

Sol:- Principle for the first year = Rs. 3000.

Intrest for the first year = Rs $\left[\frac{3000 \times 5 \times 1}{100}\right]$

= Rs. 150.

Amount at the end of first year = Rs. 3000 + 150

= 3150/-

Intrest for the second year = Rs. $\left[\frac{3150 \times 5 \times 1}{100}\right]$

= Rs 157.50

Principle for the second year = Rs. 3150

Amount at the end of the second year = 3150 + 157.50

= 3307.50

Compound Intrest = Rs. 3307.50 - 3000

= 307.50

2.) What will be the compound intrest on Rs. 4000 for two years when rate of intrest is 5% per annum

Sol:- Principle for the first year = Rs. 4000

Intrest for the first year = Rs. $\left[\frac{4000 \times 5 \times 1}{100}\right]$

= Rs. 200.

Amount at the end of first year = Rs.4000 + Rs.200

= 4200.

Intrest for the second year = Rs. $\left[\frac{4200 \times 5 \times 1}{100}\right]$

= Rs. 210.

Principle for the second year = 4200.

Amount at the end of the second year = 4200 + 210.

= Rs 4410.

Compound intrest = 4410 - 4000

= Rs. 410

3) Rohit deposited Rs. 8000 with a finance company for 3 years at an intrest of 15% per annum. What is the compound intrest that Rohit gets after 3 years?

Sol:- Principal for the first year = Rs. 8000.

Intrest for the first year = Rs. $\left[\frac{8000 \times 15 \times 1}{100}\right]$

= Rs. 1200.

Amount at the end of the first year = 8000 + 1200

= Rs 9200.

Intrest for the second year = Rs. $\left[\frac{9200 \times 15 \times 1}{100}\right]$

= Rs. 1380.

Principal for the second year = 9200 + 1380

= 10580.

Amount at the end of Second year = 10580 + 1380

= 10580.

Interest for the third year = Rs. $\left[\frac{10580 \times 15 \times 1}{100}\right]$

= Rs. 1587.

Amount at the end of the third year = 10580 + 1587

= Rs 12167

Compound interest = 12167 − 8000

= Rs. 4167.00.

b). Find the Compound interest on Rs. 1000 at the rate of 8% per annum for $1\frac{1}{2}$ years when interest is Compounded half yearly ?.

Sol:- We have,

Rate of interest = 8% per annum = 4% per half year

Time = $1\frac{1}{2}$ years = 3 half-years.

original principal = Rs. 1000

Interest for the first half year = Rs $\left[\frac{1000 \times 4 \times 1}{100}\right]$

= Rs. 40

Amount at the end of first half year = 1000 + 40

= 1040

Principal for the second half year = Rs. 1040

Interest for the second half year = Rs. $\left[\frac{1040 \times 4 \times 1}{100}\right]$

= 41.6

Amount at the end of the second half year

$= 1040 + 41.6$

$= Rs.\ 1081.6$

Principal for the third half year $= Rs.\ 1081.6$

Interest for third half year $= Rs.\left[\frac{1081.6 \times 4 \times 1}{100}\right]$

$= 43.264$

Amount at the end of the third year $= 1081.6 + 43.264$

$= 1124.864$

Compound interest = Amount − principal

$= 1124.864 - 1000$

$= 124.864$

5.) Find the compound interest on Rs. 160000 for one year at the rate of 20% per annum, if the interest is compounded quarterly.

Sol: Rate of interest $= \frac{20}{4} = 5\%$ per quarter.

Time = 1 year = 4 quarters.

Principal for the first quarter $= 160000$

Interest for the first quarter $= Rs.\left[\frac{160000 \times 5 \times 1}{100}\right]$

$= 8000.$

Amount at the end of the first quarter

$= 8000 + 160000$

6.) Swati took loans = Rs. 16000.

rate = $12\frac{1}{2}\%$ = $\frac{25}{2}\%$.

Interest for the first year = Rs. $\left[\frac{16000 \times \frac{25}{2} \times 1}{100}\right]$

= Rs. 2000

Amount at the end of the first year = 16000 + 2000

= Rs. 18000.

Interest for the second year = Rs $\left[\frac{18000 \times \frac{25}{2} \times 1}{100}\right]$

= Rs 2250/-

Amount at the end of the second year

= 2250 + 18000

= Rs. 20250.

Principal for the third year = Rs. 20250

Interest for the third year = Rs. $\left[\frac{20250 \times \frac{25}{2} \times 1}{100}\right]$

= 2531.25

Amount at the end of the third year

= 2531.25 + 20250

= 22781.25

Compound interest = Amount − principal

= 22781.25 − 16000

= 6781.25

= 168000

Principal for the second quarter = Rs. 168000.

Intrest for the second quarter = Rs. $\left[\frac{168000 \times 5 \times 1}{100}\right]$

= Rs. 8400.

Amount at the end of the second quarter

= 8400 + 168000

= Rs 176400

Principal for the third quarter = Rs. 176400.

Intrest for the third quarter = Rs. $\left[\frac{176400 \times 5 \times 1}{100}\right]$

= Rs. 8820

Amount at the end of the third quarter

= 176400 + 8820

= 185220.

Principal for the ~~third~~ fourth quarter = Rs. 185220.

Intrest for the fourth quarter = Rs. $\left[\frac{185220 \times 5 \times 1}{100}\right]$

= Rs 9261

Amount at the end of fourth quarter

= 185220 + 9261

= Rs 194481

Compound Intrest = Amount - principal

= 194481 - 160000

= Rs. 34481

7).

Roma borrowed a money (P) = Rs. 64000.

Time (I) = $1\frac{1}{2}$ years = 3 half years

rate (R) = 10% = $\frac{10}{2}$% = 5% per half year

Principal for the first half year = Rs. 64000.

Simple Interest for first half year = Rs. $\left[\frac{64000 \times 5 \times 1}{100}\right]$

= Rs. 3200

Amount at the end of the first half year

= 3200 + 64000

= 67200.

Interest for the second half year = Rs. $\left[\frac{67200 \times 5 \times 1}{100}\right]$

= 3360.

Amount at the end of the second year

= 3360 + 67200

= 70560.

Interest for the third half year = Rs. $\left[\frac{70560 \times 5 \times 1}{100}\right]$

= 3528.

Amount at the end of third half year

= 3528 + 70560

= Rs 74088

Compound interest = 74088 - 64000

= 10088.

8) Mewa lal borrowed (p) = Rs. 20000.

rate (R) = 18%. , T = 2 years

As per Simple Interest (S.I) = $\frac{PTR}{100}$

$= \frac{20000 \times 2 \times 18}{100}$

= ~~Rs~~ 7200

As per compound Interest.

for first year = p.s. $\left[\frac{20000 \times 1 \times 18}{100}\right]$

= Rs. 3600

Amount at the end of the year = 3600 + 20000

= 23600

Interest at the second year = Rs. $\left[\frac{23600 \times 1 \times 18}{100}\right]$

= 4248/-

Sum of the interest in both the years = 4248 + 3600

= Rs 7848

Gain after 2 years = 7848 - 7200

= Rs 648

9) principal (p) = 8000/-

time = 9 months = 3 quarters.

Rate (R) = 20% = $\frac{20}{4}$ /= 5%.

Simple intrest for the first quarter year $= Rs\left[\frac{8000 \times 1 \times 5}{100}\right]$

$= Rs.\ 400/-$

Amount at the end of the first quarter year

$= 400 + 8000$

$= Rs.\ 8400$

Intrest for the second quarter year

$= Rs.\left[\frac{8400 \times 5 \times 1}{100}\right]$

$= Rs.\ 420.$

Amount at the end of the 2nd quarter year

$= 420 + 8400$

$= Rs.\ 8820/-$

Intrest for the third quarter $= Rs\left[\frac{8820 \times 5 \times 1}{100}\right]$

$= Rs.\ 441/-$

Amount at the end of 3rd quarter year

$= Rs\ 441 + 8820$

$= Rs.\ 9261$

Compound intrest $=$ Amount $-$ principal

$= 9261 - 8000$

$= Rs\ 1261$

10) rate (R) = 10%.

principal (P) = 200/-

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

for 2 years = $P\left(1+\frac{10}{100}\right)^2$

$= P\left(\frac{11}{10}\right)^2$

$= P\left(\frac{121}{100}\right)$

$S.I = 200 = \frac{PTR}{100}$

$= \frac{P \times R \times 2}{100_5}$

$P = 200 \times 5$

$= 1000/-$

$A = 1000\left(\frac{121}{100}\right)$

$= Rs.1210$

Compound interest = A - P

$= 1210 - 1000$

$= Rs.210$

11. Principal (P) = 64000/-

rate (R) = 10% = $\frac{10}{4}$ %

Time = 1 year = 4 quarters

Simple interest for 1st quarter year = Rs. $\left[\frac{64000 \times \frac{10}{4} \times 1}{100}\right]$

= Rs. 1600

Amount at the end of first quarter year = 1600 + 64000

= 65600

Simple interest for the second quarter year = Rs. $\left[\frac{65600 \times \frac{10}{4} \times 1}{100}\right]$

= Rs. 1640 + 65600

= Rs. 67240

Simple interest for third quarter year = Rs. $\left[\frac{67240 \times \frac{10}{4} \times 1}{100}\right]$

= Rs. 1681

Amount at the end of the third quarter = 1681 + 67240

= Rs. 68921.

Simple interest for the fourth quarter year = Rs. $\left[\frac{68921 \times \frac{10}{4} \times 1}{100}\right]$

= Rs. 1723.025.

Amount for the end of the fourth quarter year = 1723.025 + 68921

= 70644.025.

Compound interest = Amount − principal

= ₹70644.025 − 60000

= 6644.025

12). Ramesh deposited (P) = ₹7500/-

Rate (R) = 12% per annum.

$= \frac{12}{4}\% = 3\%$ per quarter

Time (T) = 9 months

= 3 quarters

Simple interest for the first quarter year $= Rs.\left[\frac{7500 \times 1 \times 3}{100}\right]$

$= Rs.225$

Amount at the end of the first quarter year = 7500 + 225

= Rs. 7725

Simple interest for the second quarter year $= Rs.\left[\frac{7725 \times 1 \times 3}{100}\right]$

$= Rs.231.75$

Amount at the end of the 2nd quarter year = 231.75 + 7725 = ₹7956.75

Simple interest for third quarter year = Rs. $\left[\frac{7956.75 \times 2 \times 1}{100}\right]$

= Rs. 238.7025

Amount at the end of the third quarter = 238.7025 + 7956.75

= 8195.4525

11) principal (P) = 9600 /-.

Rate (R) = $5\frac{1}{2}\% = \frac{11}{2}\%$ p.a.

Time = 3 years

Simple interest for the first year

= Rs. $\left[\frac{9600 \times \frac{11}{2} \times 1}{100}\right]$

= Rs. 528.

Amount at the end of the first year

= 9600 + 528

= Rs 10128

Simple interest for the second year

= Rs. $\left[\frac{10128 \times \frac{11}{2} \times 1}{100}\right]$

= Rs. 557.04

Amount at the end of the second year = 10128 + 557.04

= Rs. 10685.04

Simple interest for the third year

$$= \text{Rs.} \left[\frac{10685.04 \times \frac{11}{2} \times 1}{100} \right]$$

= Rs 587.6772

Amount at the end of the third year = 10685.04 + 587.677

= Rs 11272.71

Compound interest = 11272.71 − 9600

= Rs. 1672.7172

14). Surabhi borrowed money (P) = ₹12000/-

Rate (R) = 5% per annum.

Time = 3 years

Simple interest for first year

$$= \text{Rs.} \left[\frac{12000 \times 5 \times 1}{100} \right]$$

= Rs. 600

Amount at the end of the first year

= 12000 + 600

= Rs. 12600/-

Simple Interest for the second year

$= Rs. \left[\frac{12600 \times 5 \times 1}{100}\right]$

= Rs. 630

Amount at the end of the second year

= 12600 + 630

= Rs. 13230/-

Simple interest for the third year

$= Rs \left[\frac{13230 \times 5 \times 1}{100}\right]$

= Rs. 661.5

Amount at the end of the third year

= 661.5 + 13230

= Rs. 13891.5/-

Compound Interest = Amount - principal

= 13891.5 - 12000

= Rs. 1891.5

15). Daljit received money = Rs. 40000/-

Rate (R) = 7% per annum

time (T) = 2 years.

Simple interest for the first year

$= \text{Rs.} \left[\frac{40000 \times 1 \times 7}{100} \right]$

$= 2800$

Amount at the end of the first year

$= 40000 + 2800$

$= \text{Rs. } 42800/-$

Simple interest for the second year

$= \text{Rs.} \left[\frac{42800 \times 7 \times 1}{100} \right]$

$= \text{Rs. } 2996/-$

Amount at the end of the second year

$= 2996 + 42800$

$= \text{Rs. } 45796.$

Compound interest = Amount − principal

$= 45796 - 40000$

$= 5796/-$

17

Amount after $\frac{9}{4}$ years $= P\left(1 + \frac{R}{100}\right)^n$

$= 15625 \left(1 + \frac{16}{100}\right)^{9/4}$

$= 15625 \times 1.3964$

$= \text{Rs. } 21819.786$

18) Here P = Rs. 125000.

Rate (R) = 6%

time = n = 4 months $= \frac{4}{12}$ years $= \frac{1}{3}$ years

Compound Interest Ex 14.2

Exercise 14.2

1. Calculate the amount and compound interest in each of the following.

i) Principal = Rs. 3000, Rate 5%, Time = 2 years

When the interest is compound annually it is given by $A = P\left(1+\frac{R}{100}\right)^n$

Here P = Rs. 3000,

R = 5% per annum, $n = 2$.

Amount 'A' after 2 years $= P\left(1+\frac{R}{100}\right)^2$

$= 3000\left(1+\frac{5}{20}\right)^2$

$= 3000\left(\frac{21}{20}\right)^2$

$= 3000 \times 1.1025$

$= 3307.5$

Compound interest $= A - P$

$= 3307.50 - 3000$

C.I. = Rs. 307.50

ii) Principal = Rs. 3000, Rate = 8%, Time = 2 years

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

$P = 3000$, $R = 8\%$, $n = 2$.

Amount A after 2 years $= P\left(1+\frac{R}{100}\right)^n$

$= 3000\left(1+\frac{18}{100}\right)^2$

$= 3000 \times 1.3924$

A. = Rs. 4177.20

Compound interest = A − P

= 4177.20 − 3000

C.I. = Rs. 1177.2

(iii) principal = Rs. 5000, rate = 10 paise per rupee per annum, time = 2 years

Sol:- When the interest is compounded annually is given by $A = P\left(1+\frac{R}{100}\right)^n$

Here $P = Rs.5000$, $R = 10\%$

$n = 2$

Amount A after 2 years $= P\left(1+\frac{R}{100}\right)^2$

$= 5000 \times \left(1+\frac{10}{100}\right)^2$

$= 5000 \times \left(\frac{11}{10}\right)^2$

$= 5000 \times 1.21$

$= Rs.6050$

Compound Interest = A − P

= 6050 − 5000

= Rs. 1050/-

(iv) Principal = Rs. 2000, Rate = 4 paise per rupee per annum, Time = 3 years

Sol:- When the interest is compounded annually is given by $A = P\left(1+\frac{R}{100}\right)^n$

Here $P = 2000$, $n = 3$, $R = 4\%$.

Amount after 3 years $= P\left(1+\frac{R}{100}\right)^n$

$= 2000 \times \left(1+\frac{4}{100}\right)^3$

$= 2000 \times \left(\frac{26}{25}\right)^3$

$= 2000 \times 1.1248$

~~= Rs. 2163.2~~

A = Rs. 2249.68

Compound Interest = A − P

= 2249.68 − 2000

= Rs. 249.68

v) Principal = Rs. 12800, Rate = $7\frac{1}{2}$ %. Time = 3 years

Sol:- When the interest is compounded annually

is given by $A = P\left(1+\frac{R}{100}\right)^n$.

Here $P = 12800$, $n = 3$, $R = \frac{15}{2}$ %.

Amount 'A' after 3 years $= P\left(1+\frac{R}{100}\right)^3$

$= 12800\left(1+\frac{15}{2\times100}\right)^3$

$= 12800 \times 1.2422$

$=$ Rs. 15901.40

Compound interest $= A - P$

$= 15901.40 - 12800$

$=$ Rs 3101.40

vi) Principal = Rs. 10000, Rate 20% per annum)

Compounded half yearly, time = 2 years

Sol:- Here, principal $P =$ Rs. 10000,

$R =$ 20% per annum

$n =$ 2 years

Amount after 2 years $= P\left(1+\frac{R}{200}\right)^{2n}$

$= 10000\left(1+\frac{20}{200}\right)^4$

$= 10000\left(1+\frac{1}{10}\right)^4$

$= 10000 \left(\frac{11}{10}\right)^4$

$= 10000 \times 1.4641$

$= Rs. 14641$

Compound interest $= A - P$

$= 14641 - 10000$

$= Rs. 4641$

vii) Principal $= Rs. 160000$, Rate $= 10$ paise per rupee per annum compounded half yearly, Time $= 2$ years.

Sol:- Here principal $(P) = Rs. 160000$

$R = 10\%$

$n = 2$ years.

Amount after 2 years $= P\left(1 + \frac{R}{200}\right)^{2n}$

$= 160000\left(1 + \frac{10}{200}\right)^4$

$= 160000\left(\frac{21}{20}\right)^4$

$= 160000 \times 1.2155$

$= Rs. 194481$

Compound interest $= A - P$

$= 194481 - 160000$

$= Rs. 34481$

2). Find the amount of Rs 2400 after 3 years, when the interest is compounded annually at the rate of 20% per annum.

Sol:- Principal (P) = 2400 $\quad n = 3$.

Rate (R) = 20%.

When the interest is computed annually is given by $A = P\left(1+\frac{R}{100}\right)^n$

Amount A after 3 years $= P\left(1+\frac{R}{100}\right)^3$

$= 2400\left(1+\frac{20}{100}\right)^3$

$= 2400\left(\frac{6}{5}\right)^3$

$= 24000 \times 1.728$

$=$ Rs 41472/-

3). Rahman lent Rs 16000 to Rasheed at the rate of $12\frac{1}{2}$% per annum compound interest. Find the amount payable by Rasheed to Rahman after 3 years.

Sol:- Principal (P) = Rs 16000

Rate (R) $= 12\frac{1}{2}\% = \frac{25}{2}\%$

$n = 3$

When the interest is compuled annually is given by $A = P\left(1+\frac{R}{100}\right)^n$.

Amount A after 2 years $= P\left(1+\frac{R}{100}\right)^2$

$= 16000\left(1+\frac{12.5}{100}\right)^2$

$= 16000 \times 1.1238$

$=$ Rs. 17981.25

4). Meera borrowed a sum of Rs. 1000 from Sita for two years. If the rate of interest is 10% compuled annually, find the amount that Meera has to pay back.

Sol:-

Principal (P) = 1000.

Rate (R) = 10%

n = 2 years.

When the interest is computed annually is given by $A = P\left(1+\frac{R}{100}\right)^n$

Amount A after 2 years $= P\left(1+\frac{R}{100}\right)^2$

$= 1000\left(1+\frac{10}{100}\right)^2$

$= 1000 \times \left(\frac{11}{10}\right)^2$

$= 1000 \times 1.21$

$=$ Rs. 1210.

5). Find the difference between the compound interest and simple interest on a sum of Rs. 50,000 at 10% per annum for 2 years.

Sol:- Principal (P) = 50,000. n = 2 years

Rate (R) = 10%.

When the interest is computed annually is given by $A = P\left(1+\frac{R}{100}\right)^n$

Amount A after 2 years $= P\left(1+\frac{R}{100}\right)^2$

$= 50,000\left(1+\frac{10}{100}\right)^2$

$= 50,000\left(\frac{11}{10}\right)^2$

$= 50,000 \times 1.21$

$=$ Rs 60500

Compound interest $= A - P$

$= 60500 - 50000$

$=$ Rs. 10500.

Simple interest $= \frac{PTR}{100}$

$= \frac{50000 \times 2 \times 10}{100}$

$= 10000$

The difference between Compound interest and Simple interest $= 10500 - 10000$

$=$ Rs. 500

6). Amit borrowed Rs. 16000 at $17\frac{1}{2}\%$ per annum simple interest. On the same day, he lent it to ashu at the same rate but compounded annually. What does he gain at the end of 2 years?

Sol!:

Principal (P) = Rs. 16000.

Rate (R) = $17\frac{1}{2}\% = \frac{35}{2}\%$.

n = 2 year.

When the interest is compounded annually it is given by $A = P\left(1+\frac{R}{100}\right)^n$

Amount A after 2 years = $P\left(1+\frac{R}{100}\right)^2$

$= 16000\left(1+\frac{\frac{35}{2}}{100}\right)^2$

$= 16000 \times 1.380$

$= Rs. 22090.$

Compound interest = A − P

$= 22090 - 16000$

$= Rs. 6090$

Simple interest = $\frac{PTR}{100} = \frac{16000 \times 2 \times 17\frac{1}{2}}{100}$

$= Rs. 5600$

The gains at the end of 2 years is =

6). Amit borrowed Rs. 16000 at $17\frac{1}{2}\%$ per annum simple interest. On the same day, he lent it to ashu at the same rate but compounded annually. What does he gain at the end of 2 years?

Sol!:

Principal (P) = Rs. 16000.

Rate (R) = $17\frac{1}{2}\% = \frac{35}{2}\%$.

n = 2 year.

When the interest is compounded annually it is given by $A = P\left(1+\frac{R}{100}\right)^n$

Amount A after 2 years = $P\left(1+\frac{R}{100}\right)^2$

$= 16000\left(1+\frac{\frac{35}{2}}{100}\right)^2$

$= 16000 \times 1.380$

$= Rs. 22090.$

Compound interest = A − P

$= 22090 - 16000$

$= Rs. 6090$

Simple interest = $\frac{PTR}{100} = \frac{16000 \times 2 \times 17\frac{1}{2}}{100}$

$= Rs. 5600$

The gains at the end of 2 years is =

Amount after 18 months $= P\left(1+\frac{R}{200}\right)^{2n}$

$= 8000\left(1+\frac{10}{200}\right)^{2\times\frac{3}{2}}$

$= 8000\left(\frac{21}{20}\right)^3$

$= 8000 \times 1.1578$

$=$ Rs. 9261

Compounded interest $= A - P$

$= 9261 - 8000$

$=$ Rs. 1261

Q). Kamal borrowed Rs. 57600 from LIC against her policy at $12\frac{1}{2}\%$ per annum to built a house. Find the amount that she pays to the LIC after $1\frac{1}{2}$ year if the interest is calculated half yearly?

Sol:-. Principal (P) = Rs. 57600.

Rate (R) = $12\frac{1}{2}\%$.

$= \frac{25}{2}\%$ per annum

Time = n = $1\frac{1}{2}$ year $= \frac{3}{2}$ year.

Amount after $\frac{3}{2}$ year $= P\left(1+\frac{R}{200}\right)^{2n}$

$= 57600\left(1+\frac{25}{2}/_{200}\right)^{2\times\frac{3}{2}}$

$= 57600 \times 1.1994$

$=$ Rs. 69089.06

10). Cost of the house (P) = 60000.

Rate of interest (R) = 5% per annum.

Time = $n = 1\frac{1}{2}$ years $= \frac{3}{2}$ years

Amount after one year and half.

$= P\left(1+\frac{R}{200}\right)^{n}$

$= 60000\left(1+\frac{5}{\frac{200}{40}}\right)^{2\times\frac{3}{2}}$

$= 60000\left(\frac{41}{40}\right)^{3}$

$= 60000 \times 1.076$

$=$ Rs. 68921.

Compound interest $= A - P$

$= 68921 - 60000$

$=$ Rs. 8921.

11.) Principal (P) = Rs. 10000

Rate (R) = 20% per annum

$n = 2$ years

Amount after 2 years $= P\left(1+\frac{R}{100}\right)^2$

$= 245760\left(1+\frac{12.5}{100}\right)^2$

$= 245760(1.2656)$

$= Rs.\ 311040$

But compounded half yearly, then

Amount after 2 years $= P\left(1+\frac{R}{200}\right)^{2n}$

$= 245760\left(1+\frac{12.5}{200}\right)^4$

$= 245760(1.2744)$

$= Rs.\ 313203.75$.

He gains after two years = Amount in compound half yearly - Amount in annually.

$= 313203.75 - 311040.$

$= Rs.\ 2163.75$

12. Investement (P) = 8192

Rate (R) = $12\frac{1}{2}\% = \frac{25}{2}\%$ per annum

time = 18 months $= \frac{18}{12}$ years.

$= \frac{3}{2}$ years

Compounded half yearly,

Amount after 2 years $= P\left(1+\frac{R}{200}\right)^{n}$

$= 8192\left(1+\frac{12.5}{200}\right)^{2\times\frac{3}{2}}$

$= 8192 \times 1.1994$

$= Rs\ 9826.$

14). Here $P = Rs.\ 15625$

$n = 9$ months $= \frac{9}{12}$ years

$= \frac{3}{4}$ years

$R = 16\%$ per annum

Amount after 9 months $= P\left(1+\frac{R}{400}\right)^{4n}$

$= 15625\left(1+\frac{16}{400}\right)^{4\times\frac{3}{4}}$

$= 15625 \times 1.1248$

$= Rs.\ 17576.$

Compound interest $= A - P$

$= 17576 - 15625$

$= Rs.\ 1951$

15). Here

Rekha deposited (P) = 16000.

Rate (R) = 20% per annum

n = 1 year.

Compounded quarterly,

Amount after 1 year $= P\left(1+\frac{R}{400}\right)^{4n}$

$= 16000\left(1+\frac{20}{400}\right)^{4\times1}$

$= 16000\left(1+\frac{1}{20}\right)^{4}$

$= 16000 \times \left(\frac{21}{20}\right)^{4}$

$= 16000 \times 1.2155$

$= ₹ 19448.1$

Compound interest = A − P

$= 19448.1 - 16000$

$= ₹ 3448.10$

16) Here

P = ₹ 12500

n = 1 years

Rate of interest is 18% per first year

R = 18%. ∴ n = 1 year.

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

$= 12500\left(1+\frac{15}{100}\right)^1$

$= 12500 \times 1.15$

$=$ Rs. 14375.

This amount principal for the second year $(P) = 14375$.

Rate $(R) = 16\%$.

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

$= 14375\left(1+\frac{16}{100}\right)^1$

$= 14375 \times 1.16$

$=$ Rs. 16675.

17) Here

$P =$ Rs. 15625

Rate of interest $(R) = 16\%$ per annum

Time $= n = 2\frac{1}{4}$ years

$= \frac{9}{4}$ years

Compounded annually

Compound Interest Ex 14.3

Exercise 14.3

1) Compound Interest = ₹64.

Rate (R) = 5% per annum

n = 2 years

Compound Interest = A − P = 164

$\Rightarrow P\left(1-\frac{R}{100}\right)^n - P = 164$

$\Rightarrow P\left(1-\frac{5}{20}\right)^2 - P = 164$

$\Rightarrow P\left(\frac{21}{20}\right)^2 - P = 164$

$P\left[\left(\frac{21}{20}\right)^2 - 1\right] = 164$

$P = \frac{164 \times 400}{41}$

Sum P = Rs. 1600

2) Here P = 10%, n = 2 years

Compound interest = Rs. 210

Let the principal be Rs. 100 then

Amount after 2 years = $Rs.\left[100\times\left(1+\frac{10}{100}\right)^2\right]$

$= 100 \times \left(\frac{11}{10}\right)^2$

= Rs. 121

Compound intrest $= A - P$

$= 121 - 100$

$= ₹21$

Now,

If compound intrest is Rs. 21, principal = 100

If compound intrest is Rs. 1, principal = $\frac{100}{21}$

If compound intrest is = Rs. 210

principal $= Rs. \left[\frac{100}{21} \times 210\right]$

$= 1000$

7).

Here

Amount (A) $= ₹56.25$

Rate (R) $= 10\%$ per annum.

$n = 2$ years

Compounded annually, $R = ?$

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

$₹56.25 = P\left(1 + \frac{10}{100}\right)^2$

$= P\left(\frac{11}{10}\right)^2$

$P = \frac{756.25}{1.21} = ₹625.$

4). Amount (A) = Rs. 4913.

$n = 18 \text{ months} = \frac{18}{12} \text{ years} = \frac{3}{2} \text{ years}$

$R = 12\frac{1}{2}\% = \frac{25}{2}\%$ per annum

Compounded half yearly.

Amount after 18 months $= P\left(1+\frac{R}{200}\right)^{2n}$

$4913 = P\left(1+\frac{12.5}{200}\right)^{2\times\frac{3}{2}}$

$= P \times 1.1994$

$P = \frac{4913}{1.1994} = 4096.2147$

$P = \text{Rs. } 4096.21$

5) Here Rate (R) = 15% per annum.

$n = 3$ years , $P = ?$

C.I − S.I = ₹283.50

Compound Intrest $= P\left(1+\frac{R}{100}\right)^{n} - P$

$= P\left(1+\frac{15}{100}\right)^{3} - P$

Simple intrest $= \frac{PTR}{100} = \frac{P\times 3\times 15}{100}$

C.I − S.I = 283.50

$\Rightarrow P\left(1+\frac{15}{100}\right)^3 - P - P \times 0.45 = 283.50$

$\Rightarrow 1.520P - P - P \times 0.45 = 283.50$

$P[0.07] = 283.50$

$P = 4050.$

6). Here

$R = 15\%$ per annum

C.I = 1290.

$n = 2$ years

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

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

$P = \frac{1290}{1.3225}$

$C.I = A - P$

$C.I = P\left(1+\frac{15}{100}\right)^2 - P$

$1290 = P(1.3225) - P$

$1290 = P \times 0.3225$

$P = \frac{1290}{0.3225}$

$P = \text{Rs. } 4000.$

7) Here

Compound interest = Rs 163.20

Rate (R) = 4% per annum.

Sum (P) = Rs. 2000

period (n) = ?

$C.I = A - P$

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

$163.20 = 2000\left(1 + \frac{4}{100}\right)^n - 2000$

$163.20 = 2000\,(1.04)^n - 2000$

$163.20 = 2000\left[(1.04)^n - 1\right]$

$0.0816 = (1.04)^n - 1$

$(1.04)^n = 1.0816$

take log on both sides

$\log_e (1.04)^n = \log_e (1.0816)$

$n \log_e (1.04) = \log_e (1.0816)$

$n = \frac{\log_e (1.0816)}{\log_e (1.04)}$

$n = \frac{0.0790}{0.0198}$

$n = 2$ years

8) Sum (P) = 5000

Amount (A) = 6655

Rate (R) = 10% per annum

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

$6655 = 5000\left(1+\frac{10}{100}\right)^n$

$1.331 = \left(\frac{11}{10}\right)^n$

$1.331 = (1.1)^n$

Take log on both sides

$\log_e(1.331) = \log_e(1.1)^n$

$\log_e(1.331) = n \log_e(1.1)$

$n = \frac{\log_e(1.331)}{\log_e(1.1)}$

$n = \frac{0.1241}{0.041}$

$n = 3$ years

9) Sum (P) = [illegible]

Amount (A) = Rs. 4576.

Rate (R) = 8% per annum

Compounded half yearly

$$A = P\left(1+\frac{R}{200}\right)^{2n}$$

$$4576 = 4400\left(1+\frac{8}{200}\right)^{2n}$$

$$1.04 = \left(1+\frac{8}{200}\right)^{2n}$$

$$1.04 = (1.04)^{2n}$$

taking $\log_e$ on both sides

$$\log_e(1.04) = \log_e(1.04)^{2n}$$

$$\log_e(1.04) = 2n \log_e(1.04)$$

$$2n = \frac{\log_e(1.04)}{\log_e(1.00)}$$

$$\boxed{n = \frac{1}{2} \text{ year}}$$

10) Here

$$S.I - C.I = Rs.20$$

$n = 2$ years

Rate $(R) = 4\%$ per annum,

$P = ?$

$$C.I. = A - P = P\left(1+\frac{R}{100}\right)^n - P$$

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

$$S.I = \frac{PTR}{100} = \frac{P \times 2 \times 4}{100}$$

$$0.08 \times P - P \times (1.04)^2 + P = 20$$

$$0.08P - 1.0816 \times P + P = 20$$

$$P[0.08 - 1.0816 + 1] = 20$$

$$P = Rs.12500$$

11) $P = Rs.1000$

Amount $(A) = Rs.1331$.

$R = 10\%$ per annum.

$n = ?$

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

$$1331 = 1000\left(1 + \frac{10}{100}\right)^n$$

$$1.331 = (1.1)^n$$

Taking log on both sides

$$\log_e(1.331) = \log_e(1.1)^n$$

$$\log_e(1.331) = n \log_e(1.1)$$

$$n = \frac{\log_e(1.331)}{\log_e(1.1)}$$

$$n = \frac{0.1241}{0.0413}$$

$$n = 3 \text{ years}$$

12) Here

$P = Rs.600$

Amount $(A) = Rs.774.40/-$

$n = 2$ years $\quad R = ?$

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

$$774.40 = 600\left(1+\frac{R}{100}\right)^2$$

$$1.21 = \left(1+\frac{R}{100}\right)^2$$

$$1+\frac{R}{100} = \sqrt{1.21} = 1.1$$

$$\frac{R}{100} = 1.1 - 1 = 0.1$$

$$R = 0.1 \times 100$$

$R = 10\%$ per annum.

13) Here $P = Rs.2000$

$A = Rs.2662$

$n = 1\frac{1}{2}$ year $= \frac{3}{2}$ years.

$$A = P\left(1+\frac{R}{200}\right)^{2n}$$

$$2662 = 2000\left(1+\frac{R}{200}\right)^{2\times\frac{3}{2}}$$

$$1.331 = \left(1+\frac{R}{200}\right)^3$$

$$1.1 = 1+\frac{R}{200}$$

$\Rightarrow \frac{R}{100} = 0.1$

$R = 0.1 \times 200$

$R = 20\%$ per annum.

(b) Simple interest = 200

Compound interest = 210

$n = 2$ years

$S.I = \frac{PTR}{100} \Rightarrow 200 = \frac{P \times R \times 2}{100}$

$P \times R = 10000 \quad -(1)$

$C.I = P\left(1 + \frac{R}{100}\right)^n - P$

$210 = P\left(1 + \frac{R}{100}\right)^2 - P$

$210 = P\left(1 + \frac{R^2}{100} + \frac{R}{50} - 1\right)$

$210 = 100\left(\frac{R}{10} + \frac{1}{5}\right)$

$R = 10\%$

From equation (1) $\Rightarrow$

$P \times R = 10000$

$P = \frac{10000}{10}$

$P = \text{Rs. } 1000$

15) Here

$P = ₦2000$

$A = ₦2315.25$ $\quad \therefore n = 1\frac{1}{2} = \frac{3}{2}$ years

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

$2315.25 = 2000\left(1+\frac{R}{100}\right)^{3/2}$

$1.1576 = \left(1+\frac{R}{100}\right)^{3/2}$

$\left(1+\frac{R}{100}\right) = 1.1025$

$\frac{R}{100} = 0.1025$

$R = 10.25\%$ per annum.

16) Here

$A = 2P$

$n = 3$ years

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

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

$1.2599 = 1+\frac{R}{100}$

$\frac{R}{100} = 0.2599$

Rate $(R) = 25.99\%$

17). Here, Given data is.

$A = 4P$

$n = 2$ years

Interest is compounded half yearly.

$$A = P\left(1 + \frac{R}{200}\right)^{2n}$$

$$4P = P\left(1 + \frac{R}{200}\right)^{4}$$

$$1.4142 = 1 + \frac{R}{200}$$

$$\frac{R}{200} = 0.4142$$

Rate (R) = 82.84%.

18). Here

Amount (A) = Rs. 5832.

$n = 2$ years

Rate (R) = 8%.

$P = ?$

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

$$5832 = P\left(1 + \frac{8}{100}\right)^{2}$$

$$5832 = P \times 1.1664$$

$$P = \frac{5832}{1.1664} = \text{Rs } 5000.$$

17). Here, Given data is.

$A = 4P$

$n = 2$ years

Interest is compounded half yearly.

$A = P\left(1 + \frac{R}{200}\right)^{2n}$

$4P = P\left(1 + \frac{R}{200}\right)^{4}$

$1.4142 = 1 + \frac{R}{200}$

$\frac{R}{200} = 0.4142$

Rate (R) = 82.84%.

18). Here

Amount (A) = Rs. 5832.

$n = 2$ years

Rate (R) = 8%.

$P = ?$.

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

$5832 = P\left(1 + \frac{8}{100}\right)^{2}$

$5832 = P \times 1.1664$

$P = \frac{5832}{1.1664} = Rs\ 5000.$

19) Here C.S − S.I = Rs. 360

n = 2 years

R = 7.5% per annum

Sum (P) = ?

$$C.I = P\left(1+\frac{R}{100}\right)^n - P$$

$$= P\left(1+\frac{7.5}{100}\right)^2 - P$$

C.I = 1.155P − P

$$S.I = \frac{PTR}{100} = \frac{P \times 2 \times 7.5}{100} = 0.15P$$

C.S − S.I = 360

1.155P − P − 0.15P = 360.

P [1.155 − 1 − 0.15] = 360

P (5 × 10⁻³) = 360

P = Rs. 72000

20). Here S.I − C.I = Rs. 46

$$R = 6\frac{2}{3}\% = \frac{20}{3}\% \text{ per annum.}$$

n = 3 years

$$C.I = P\left(1+\frac{R}{100}\right)^n - P$$

$$= P\left(1+\frac{20}{2\times100}\right)^3 - P$$

$$C.I = 1.2136P - P$$

$$S.I = \frac{PTR}{100} = \frac{P\times3\times\frac{20}{3}}{100} = 0.2P$$

$$S.I - C.I = 0.2P - 1.2136P + P$$

$$46 = P(0.2 - 1.2136 + 1)$$

$$P = Rs.\ 3382$$

21). Sum of money (P) = Rs. 12000

R = 5% per annum

Amount (A) = Rs. 13230 n = n years

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

$$13230 = 12000\left(1+\frac{5}{100}\right)^n$$

$$1.1025 = (1.05)^n$$

taking $\log_e$ on both sides

$$\log_e(1.1025) = \log_e(1.05)^n$$

$$= n\log_e(1.05)$$

$$n = \frac{\log_e(1.1025)}{\log_e(1.05)} = \frac{0.0423}{0.0211}$$

$$n = 2 \text{ years}$$

22). Sum of money (P) = Rs. 4000

Compound Interest = Rs. 410.

n = 2 years

R = ?

$C.I = A - P$

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

$410 = 4000\left(1 + \frac{R}{100}\right)^2 - 4000$

$0.1025 = \left(1 + \frac{R}{100}\right)^2 - 1$

$\left(1 + \frac{R}{100}\right)^2 = (1.1025)^{1/2}$

$= 1.05$

$\frac{R}{100} = 0.05$

$R = 5\%$

Rate of interest (R) = 5% per annum

23). R = 2% per annum

n = 2 years

Amount (A) = Rs 10404

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

$10404 = P\left(1 + \frac{2}{100}\right)^2$

$$10404 = P(1.0404)$$

$$P = ₹10000$$

24).

Here

$$P = Rs.1600$$

$$A = Rs.\ 1852.20$$

Rate $(R) = 5\%$ per annum

$$n = ?$$

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

$$1852.20 = 1600\left(1 + \frac{5}{100}\right)^n$$

$$1.1576 = (1.05)^n$$

taking $\log_e$ on both sides

$$\log_e(1.1576) = \log_e(1.05)^n$$

$$\log_e(1.1576) = n\log_e(1.05)^n$$

$$n = \frac{\log_e(1.1576)}{\log_e(1.05)}$$

$$= \frac{0.0635}{0.0211}$$

$$n = 3 \text{ years}$$

25) Here P = Rs. 1000.

Amount (A) = 1102.50.

n = 2 years

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

$$1102.50 = 1000\left(1 + \frac{R}{100}\right)^2$$

$$1.1025 = \left(1 + \frac{R}{100}\right)^2$$

$$1 + \frac{R}{100} = 1.05$$

$$\frac{R}{100} = 0.05$$

R = 5% per annum

26) Compound interest = Rs. 378.

Sum (P) = Rs. 1800.

Rate (R) = 10% per annum.

$$C.I = A - P = P\left(1 + \frac{R}{100}\right)^n - P$$

$$378 = 1800\left(1 + \frac{10}{100}\right)^n - 1800$$

$$0.21 = \left(1 + \frac{1}{10}\right)^n - 1$$

$$1.21 = (1.1)^n$$

taking log on both sides

then.

$\log_e(1.21) = \log_e(1.1)^n$

$\log_e(1.21) = n \log_e(1.1)$.

$$n = \frac{\log_e(1.21)}{\log_e(1.1)}$$

$$n = \frac{0.0827}{0.041}$$

$\boxed{n = 2 \text{ years}}$

27). Amount (A) = Rs. 45582.25

Rate (R) = $6\frac{3}{4}\% = \frac{27}{4}\%$ per annum

$n = 2$ years

$P = ?$

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

$$45582.25 = P\left(1 + \frac{27}{4 \times 100}\right)^2$$

$$= P \times 1.1395$$

$$P = \frac{45582.25}{1.1395}$$

P = Rs. 40,000/-

28) Amount (A) = Rs. 453690/-

n = 2 years.

Rate (R) = 6.5% per annum

P = ?

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

$$453690 = P\left(1 + \frac{6.5}{100}\right)^2$$

$$= 1.134225 \times P$$

$$P = \frac{453690}{1.134225}$$

$$P = \text{Rs. } 4,00,000/-$$