Frank Solutions Class 9

Maths

Chapter 3 Compound Interest

Exercise 3.1

1. Find the amount and the compound interest payable annually on the following:

i.Rs. 25000 **for** $1\frac{1}{2}$ **years at** 10% **per annum.**

ii.Rs. 320000 **for** 2 **years at** $7\frac{1}{2}\%$ **per annum.**

iii.Rs. 10000 **for** $2\frac{1}{2}$ **years at** 6% **per annum.**

iv.Rs. 24000 **for** $1\frac{1}{2}$ **years at** $7\frac{1}{2}\%$ **per annum.**

Ans:

(i) Rs. 25000 for $1\frac{1}{2}$ years at 10% per annum

Solving further, we have principal 25000 and time is $1\frac{1}{2}$ years and the rate is 10% per annum,

So, the amount after 1 year,

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

$$= 25000\left(1+\frac{10}{100}\right)$$

$$= 25000\left(\frac{11}{100}\right)$$

$$= 27500$$

Now, finding the interest for next 6 months,

$$= \frac{27500 \times 6 \times 10}{100 \times 12}$$
$$= 1375$$

Thus, the amount after $1\frac{1}{2}$ years will be

$$= 27500 + 1375$$
$$= 28875 \text{ rupees}$$

And the compound interest will be,

$$= 28875 - 25000$$
$$= 3875 \text{ rupees}$$

(ii) Rs. 320000 for 2 years at $7\frac{1}{2}\%$ per annum,

Solving further, we have principal 320000 and time is 2 years and the rate is $7\frac{1}{2}\%$ per annum,

So, the amount after 1 year,

$$= P\left(1 + \frac{r}{100}\right)$$
$$= 32000\left(1 + \frac{15}{2 \times 100}\right)$$
$$= 32000\left(1 + \frac{3}{40}\right)$$
$$= 32000\left(\frac{43}{40}\right)$$
$$= 34400$$

Now, finding the amount after 2 years,

$$= P\left(1+\frac{r}{100}\right)$$
$$= 34400\left(1+\frac{15}{2\times 100}\right)$$
$$= 34400\left(1+\frac{3}{40}\right)$$
$$= 34400\left(\frac{43}{40}\right)$$
$$= 36980$$

Thus, the amount after 2 years will be 36890 rupees,

And the compound interest will be,

$$= 36890 - 32000$$
$$= 4980 \text{ rupees}$$

(iii) Rs. 10000 for $2\frac{1}{2}$ years at 6% per annum,

Solving further, we have principal 10000 and time is $2\frac{1}{2}$ years and the rate is 6% per annum,

So, the amount after 1 year,

$$= P\left(1+\frac{r}{100}\right)$$
$$= 10000\left(1+\frac{6}{100}\right)$$
$$= 10000\times\frac{106}{100}$$
$$= 10600$$

Now, finding the amount after 2 years,

$$= P\left(1+\frac{r}{100}\right)$$
$$= 10600\left(1+\frac{6}{100}\right)$$
$$= 10600\times\frac{106}{100}$$
$$= 11236$$

Therefore, the amount for the next 6 months will be ,

$$= \frac{11236 \times 6 \times 6}{100 \times 12}$$
$$= 337.08$$

Now, amount after $1\frac{1}{2}$ years is

$$= 11236 + 337.08$$
$$= 11573.08 \text{ rupees}$$

Now, the compound interest will be,

$$= 11573.08 - 10000$$
$$= 1573.08$$

(iv) Rs. 24000 for $1\frac{1}{2}$ years at $7\frac{1}{2}\%$ per annum,

Solving further, we have principal 24000 and time is $1\frac{1}{2}$ years and the rate is $7\frac{1}{2}\%$ per annum,

The rate of interest will be $7\frac{1}{2} = \frac{15}{2}\%$,

Thus, the compound interest after 1year,

$$= P\left(1 + \frac{r}{100}\right)$$
$$= 24000\left(1 + \frac{15}{2 \times 100}\right)$$
$$= 24000 \times \left(1 + \frac{3}{40}\right)$$
$$= 24000\left(\frac{43}{40}\right)$$
$$= 25800$$

Now, calculate the interest for 6 months,

$$= \frac{25800 \times 15 \times 6}{200 \times 12}$$
$$= 967.50$$

Thus, the amount after $1\frac{1}{2}$ years,

$= 25800 + 967.50$

$= 26767.50$

Now, the compound interest will be

$= 26767.50 - 24000$

$= 2767.50$

2. Find the amount and the compound interest payable annually on:

i. Rs. 16000 for 2 years at 15% and 12% for the successive years.

ii. Rs. 17500 for 3 years at $8\%, 10\%, 12\%$ for the successive years.

Ans:

(i) Rs. 16000 for 2 years at 15% and 12% for the successive years,

Calculating the amount for 1^{st} year , thus it is given that $P = 16000, T = 1, R = 15\%$,

Calculating further,

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

$= \frac{16000 \times 5 \times 1}{100}$

$= 2400$

Amount for the first year is $16000 + 2400 = 18400$ rupees,

Now, calculating for the second year,

$= \frac{18400 \times 5 \times 1}{100}$

$= 2208$

Amount for second year is

$\Rightarrow 18400 + 2208 = 20608$ rupees,

Now, the compound interest will be,

$= A - P$

=20608-16000

=4608 rupees

(ii) Rs. 17500 for 3 years at $8\%,10\%,12\%$ for the successive years,

Calculating the amount for 1^{st} year , thus it is given that $P = 17500, R = 8\%, T = 1$,

Calculating further,

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

$$= \frac{17500 \times 8 \times 1}{100}$$

$$= 1400$$

Amount for the first year is $17500 + 1400 = 18900$ rupees,

Now, calculating for the second year,

$$= \frac{18900 \times 10 \times 1}{100}$$

$$= 1890$$

Amount for second year is

$\Rightarrow 18900 + 1890 = 20790$ rupees,

Now, calculating for the third year,

$$= \frac{20790 \times 12 \times 1}{100}$$

$$= 2494.80$$

Thus, the amount will be $\Rightarrow 20790 + 2494.80 = 23284.80$ rupees

Now, the compound interest will be,

$= A - P$

=23284.8 – 17500

=5784.80 rupees

3. Calculate the amount and compound interest on Rs. 20000 for 3years at 10% per annum, interest being payable annually.

Ans: It is given that principal amount is Rs. 20000 and the rate is 10% for 3years,

Calculating further,

$$= P\left(1+\frac{r}{100}\right)$$
$$= 20000\left(1+\frac{10}{100}\right)$$
$$= 20000\times\frac{110}{100}$$
$$= 22000 \text{ rupees}$$

Amount after second year,

$$= P\left(1+\frac{r}{100}\right)$$
$$= 22000\left(1+\frac{10}{100}\right)$$
$$= 22000\times\frac{110}{100}$$
$$= 24200 \text{ rupees}$$

Now, amount for the third year will be,

$$= P\left(1+\frac{r}{100}\right)$$
$$= 24200\left(1+\frac{10}{100}\right)$$
$$= 24200\times\frac{110}{100}$$
$$= 26620 \text{ rupees}$$

Now, calculating the compound interest,

$$= A - P$$
$$=26620-20000$$
$$=6620 \text{ rupees}$$

4. Compute the compound interest for the third year on Rs. 5000 invested for 5 years at 10% per annum, the interest being payable annually.

Ans: It is given that principal amount is 5000, rate is 10% and the time is given 5 years,

Now, calculating the amount for first year,

$$= \frac{5000 \times 10 \times 1}{100}$$
$$= 500$$

Amount will be $\Rightarrow 5000 + 500 = 5500 \text{ rupees}$,

Now, for the second year will be,

$$= \frac{5500 \times 10 \times 1}{100}$$
$$= 550$$

$\Rightarrow 5500 + 550 = 6050 \text{ rupees}$,

Calculating the amount of third year,

$$= \frac{6050 \times 10 \times 1}{100}$$
$$= 605$$

Thus, the compound interest for third year will be 605 rupees.

5. Rakesh invested Rs. 25600 at 5% per annum compound interest payable annually for 3 years. Find the amount standing to his credit at the end of the second year.

Ans: it is given that principal amount is 25600, the time is 3 years and the value of rate is 5%,

$$\Rightarrow \text{interest} = \frac{25600 \times 5 \times 1}{100}$$
$$= 1280 \text{ rupees}$$

Thus, the amount is $\Rightarrow 25600 + 1280 = 26880 \text{ rupees}$,

Now, calculating the amount for the second year,

$$\Rightarrow \text{interest} = \frac{26880 \times 5 \times 1}{100}$$
$$= 1344$$

Thus, the amount will be $\Rightarrow 26880 + 1344 = 28224 \text{ rupees}$.

6. Find the amount and compound interest on Rs. 7500 for $1\frac{1}{2}$ years at 8%, payable semi-annually.

Ans: It is given that principal amount is 7500, at rate of 8% semi-annually, and the time is given $1\frac{1}{2}$ years,

$$= P\left(1+\frac{r}{100}\right)$$
$$= 7500\left(1+\frac{4}{100}\right)$$
$$= 7500\times\frac{104}{100}$$
$$= 7800 \text{ rupees}$$

Now, the amount after first year will be,

$$= P\left(1+\frac{r}{100}\right)$$
$$= 7800\left(1+\frac{4}{100}\right)$$
$$= 7800\times\frac{104}{100}$$
$$= 8112 \text{ rupees}$$

Thus, the amount we get after $1\frac{1}{2}$ years will be,

$$= P\left(1+\frac{r}{100}\right)$$
$$= 8112\left(1+\frac{4}{100}\right)$$
$$= 8112\times\frac{104}{100}$$
$$= 8436.48 \text{ rupees}$$

Therefore, the compound interest will be,

$$= A - P$$
$$= 8436.48 - 7500$$
$$= 936.48 \text{ rupees}$$

7. A man invests Rs. 24000 for two years at compound interest, if his money amount to Rs. 27600 after one year, find the amount at the end of second year.

Ans: Amount after one year,

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

$$\Rightarrow 27600 = 24000\left(1+\frac{r}{100}\right)$$

$$\Rightarrow 1+\frac{r}{100} = \frac{27600}{24000}$$

$$= \frac{23}{20}$$

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

$$= \frac{3}{20}$$

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

$$= 15$$

Calculating the amount after two year,

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

$$= 27600\left(1+\frac{15}{100}\right)$$

$$= 27600\times\frac{115}{100}$$

$$= 31740 \text{ rupees}$$

8. How much will Rs. 14000 amounts to 2 years at compound interest, if the rates for the successive years will be 5% and 8% respectively?

Ans: it is given that principal amount is 14000 time is 2 years, and the rate 5%,

Thus, amount after one year will be,

$$= P\left(1+\frac{r}{100}\right)$$
$$= 14000\left(1+\frac{5}{100}\right)$$
$$= 14000\times\frac{105}{100}$$
$$= 14700$$

Amount we get after second year will be,

$$= P\left(1+\frac{r}{100}\right)$$
$$= 14700\left(1+\frac{8}{100}\right)$$
$$= 14700\times\frac{108}{100}$$
$$= 15876 \text{ rupees}$$

Therefore, the amount will be 15876 rupees.

9) Find the amount and the compound interest on Rs. 17500 for 3 years, if the rates for successive years is $4\%, 5\%$ and 6% respectively, the interest is payable annually.

Ans: it is given that,

$P_1 = 17500$

$r = 4\%$

Using the formula,

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

Putting values and solving further,

$$= 17500\left(1+\frac{4}{100}\right)$$
$$= 17500\left(\frac{104}{100}\right)$$
$$= 18200$$

Therefore,

$P_2 = 18200$

$r = 5\%$

Let us find the amount after 2 years,

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

Putting values and solving further,

$= 18200\left(1 + \frac{5}{100}\right)$

$= 18200 \times \frac{105}{100}$

$= 19110$

Therefore,

$P_3 = 19110$

$r = 6\%$

Let us find the amount after 3 years,

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

Putting values and solving further,

$= 19110\left(1 + \frac{6}{100}\right)$

$= 19110 \times \frac{106}{100}$

$= 20256.60$

Therefore,

The amount will be Rs. 20256.60

Now, let us find the compound interest by using the formula,

$= A - P$

$= 20256.60 - 17500$

$= 27256.60$

10) A man borrows Rs. 4000 at 14% p.a., compound interest, being payable half-yearly. Find the amount he has to pay at the end of $1\frac{1}{2}$ years.

Ans: The information for 1st half-year is as follows:

$P = 4000$

$r = 14\%$

$T = 1\frac{1}{2} years$

Now, let us find out the interest on it:

$= \frac{4000 \times 14 \times 1}{100 \times 12}$

$= 280$

So, the amount is:

$= 4000 + 280$

$= 4280$

Now,

The information for 2nd half-year is as follows:

$P = 4280$

$r = 14\%$

$T = \frac{1}{2} year$

Now, let us find out the interest on it:

$= \frac{4280 \times 14 \times 1}{100 \times 2}$

$= 299.60$

So, the amount is:

$= 4280 + 299.60$

$= 4579.60$

Now,

The information for 3rd half-year is as follows:

$P = 4579.60$

$r = 14\%$

$T = \frac{1}{2} year$

Now, let us find out the interest on it:

$= \frac{4579.60 \times 14 \times 1}{100 \times 2}$

$= 320.572$

So, the amount is:

$= 4579.60 + 320.572$

$= 4900.172$

Therefore, the amount which has to be paid at the end of $1\frac{1}{2}$ years is Rs. 4900.172

11) Calculate the amount and compound interest to the nearest rupee on Rs. 42000 for 2 years at 8% per annum, interest being payable half-yearly.

Ans: Given in the question that,

$P = 42000$

$r = 4\%$

$t = 4$ half years

let us find the amount after $\frac{1}{2}$ year

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

Putting values and solving further,

$= 42000\left(1 + \frac{4}{100}\right)$

$= 42000 \times \frac{104}{100}$

$= 43680$

Therefore,

$P_2 = 43680$ rupees

Now, let us find the amount after 1 year

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

Putting values and solving further,

$= 43680\left(1+\frac{4}{100}\right)$

$= 43680\times\frac{104}{100}$

$= 45427.20$

Therefore,

$P_3 = 45427.20$ rupees

Now, let us find the amount after $1\frac{1}{2}$ year

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

Putting values and solving further,

$= 45427.20\left(1+\frac{4}{100}\right)$

$= 45427.20\times\frac{104}{100}$

$= 47244.29$

Therefore,

$P_4 = 472449.29$ rupees

Now, let us find the amount after 2 year

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

Putting values and solving further,

$$= 47244.29\left(1+\frac{4}{100}\right)$$
$$= 47244.29\times\frac{104}{100}$$
$$= 49134.06$$

Therefore,

The amount will be 49134.06 rupees.

Let us find the compound interest by using the formula as follows:

$$= A - P$$
$$= 49134.06 - 42000$$
$$= 7134.06 \text{ rupees}$$

12) A man lends Rs. 15000 at 10.5% per annum C.I., interest reckoned yearly, and another man lends the same sum at 10% per annum, interest being reckoned half-yearly. Who is the gainer at the end of one year and by how much?

Ans: Information for 1 year:

$$P = 15000$$
$$r = 10.5\%$$

let us calculate the amount after 1 year

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

Putting values and solving further,

$$= 15000\left(1+\frac{10.5}{100}\right)$$
$$= 15000\times\frac{110.5}{100}$$
$$= 16575$$

Therefore, the amount after 1 year is 16575 rupees

Information for $\frac{1}{2}$ year:

$P_1 = 15000$

$r = 5\%$

let us calculate the amount after $\frac{1}{2}$ year

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

Putting values and solving further,

$= 15000\left(1 + \frac{5}{100}\right)$

$= 15000 \times \frac{105}{100}$

$= 15750$

Therefore,

$P_2 = 15750$

$r = 5\%$

let us find the amount after 1 year,

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

Putting values and solving further,

$= 15750\left(1 + \frac{5}{100}\right)$

$= 15750 \times \frac{105}{100}$

$= 16537.50$

Therefore,

The first man gains by $\text{Rs.}16575 - \text{Rs.}16537.50$,

$= 37.50$ rupees

13) Find the difference between the compound interest and simple interest on Rs. 20000 at 12% per annum for 3 years, the compound interest being payable annually.

Ans: Information for 1 year:

$P_1 = 20000$

$r = 12\%$

let us calculate the amount after $\frac{1}{2}$ year

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

Putting values and solving further,

$$= 20000\left(1+\frac{12}{100}\right)$$

$$= 20000\left(\frac{112}{100}\right)$$

$$= 22400$$

Therefore,

$P_2 = 22400$

$r = 12\%$

let us calculate the amount after 2 years

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

Putting values and solving further,

$$= 22400\left(1+\frac{12}{100}\right)$$

$$= 22400\left(\frac{112}{100}\right)$$

$$= 25088$$

Therefore,

$P_3 = 25088$

$r = 12\%$

let us calculate the amount after 3 year

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

Putting values and solving further,

$= 25088\left(1+\frac{12}{100}\right)$

$= 25088\left(\frac{112}{100}\right)$

$= 28098.56$

Therefore,

The amount is 28098.56 rupees.

Now, let us find out the compound interest by using the formula as follows:

$= A - P$

$= 28098.56 - 20000$

$= 8098.56$

Now, let us calculate the simple interest

$\frac{20000 \times 12 \times 3}{100}$

$= 7200$

Difference between the compound and the simple interest is as follows:

$= 8098.56 - 7200$

$= 898.56 \text{ rupees}$

14) The simple interest on a certain sum of money at 4% p.a. for 2 years is 1500 rupees. What will be the compound interest on the same sum for the same time?

Ans: As we know that the simple interest is calculated by the formula as follows:

$= \frac{P \times r \times t}{100}$

Putting values and solving further,

$1500 = \frac{P \times 8}{100}$

$P = \frac{150000}{8}$

$= 18750 \text{ rupees}$

Now, let us find the compound interest,

$P = 18750$ rupees

$r = 4\%$

$t = 2$ years

Now, solving further

$P_1 = 18750$ rupees

$r = 4\%$

Let us calculate the amount after 1 year

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

Putting values and solving further,

$$= 18750\left(1 + \frac{4}{100}\right)$$

$$= 18750\left(\frac{104}{100}\right)$$

$$= 19500$$

Therefore,

$P_2 = 19500$ rupees

$r = 4\%$

let us calculate the amount after 2 year

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

Putting values and solving further,

$$= 19500\left(1 + \frac{4}{100}\right)$$

$$= 19500\left(\frac{104}{100}\right)$$

$$= 20280$$

Therefore,

The amount is 20280 rupees,

Now, let us find the compound interest,

$= A - P$

$= 20280 - 18750$

$= 1530$ rupees

15) Find the difference between simple and compound interest on Rs. 5000 invested for 3 years at 6% p.a., interest payable yearly.

Ans: Information for 1 year:

$P_1 = 5000$

$r = 6\%$

let us calculate the amount after 1 year

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

Putting values and solving further,

$$= 5000\left(1 + \frac{6}{100}\right)$$

$$= 5000\left(\frac{106}{100}\right)$$

$= 5300$

let us calculate the amount after 2 years

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

Putting values and solving further,

$$= 5300\left(1 + \frac{6}{100}\right)$$

$$= 5300\left(\frac{106}{100}\right)$$

$= 5618$

Therefore,

$P_3 = 5618$

$r = 6\%$

let us calculate the amount after 3 years

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

Putting values and solving further,

$= 5618\left(1+\frac{6}{100}\right)$

$= 5618\times\frac{106}{100}$

$= 5955.08$

Therefore, the amount is Rs. 5955.08.

Now, let us find the compound interest,

$= A - P$

$= 5955.08 - 5000$

$= 955.08$

Now, let us find the simple interest by using the formula as follows:

$= \frac{P\times r\times t}{100}$

Putting values and solving further,

$= \frac{5000\times 6\times 3}{100}$

$= 900$

Now, let us find the difference between the compound interest and the simple interest

$= 955.08 - 900$

$= 55.08$ rupees

16) Simple interest on a sum of money for 2 years at 4% is Rs. 450. Find the compound interest at the same rate for 1 year if the interest is reckoned half-yearly.

Ans: As we know that the simple interest is calculated by the formula as follows:

$= \frac{P\times r\times t}{100}$

Putting values and solving further,

$$450 = \frac{P \times 4 \times 2}{100}$$

$$P = 5625$$

let us calculate the amount after ½ years

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

Putting values and solving further,

$$5625\left(1 + \frac{2}{100}\right)$$

$$5626\left(\frac{102}{100}\right)$$

$$= 5737.50$$

Therefore,

$$P_2 = 5737.50$$

$$r = 2\%$$

let us calculate the amount after 1 years

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

Putting values and solving further,

$$= 5737.50\left(1 + \frac{2}{100}\right)$$

$$= 5737.50 \times \frac{102}{100}$$

$$= 5852.25$$

Therefore,

The amount is Rs. 5852.25

Now, let us find the compound interest,

$$= A - P$$

$$= 5852.25 - 5625$$

$$= 227.25$$

17) A man borrows Rs. 62500 at 8% p.a., simple interest for 2 years. He immediately lends the money out at CI at the same rate and for same time. What is his gain at the end of 2 years?

Ans: As we know that the simple interest is calculated by the formula as follows:

$$= \frac{P \times r \times t}{100}$$

Putting values and solving further,

$$= \frac{62500 \times 8 \times 2}{100}$$
$$= 10000$$

Now, let us find the amount

$$= 62500 + 10000$$
$$= 72500$$

Information for 1 year:

$$P_1 = 62500$$
$$r = 8\%$$

let us calculate the amount after 1 year

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

Putting values and solving further,

$$= 62500\left(1 + \frac{8}{100}\right)$$
$$= 62500\left(\frac{108}{100}\right)$$
$$= 67500$$

Therefore,

$$P_2 = 67500 \text{ rupees}$$
$$r = 8\%$$

let us calculate the amount after 2 year

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

Putting values and solving further,

$$= 67500\left(1+\frac{8}{100}\right)$$

$$= 67500\left(\frac{108}{100}\right)$$

$$= 72900$$

Therefore, the gain amount is $72900-72500$,

$= 400$ rupees

18) What sum will amount to Rs. 10120 in 2 years at C.1. payable annually, if the rates are 10% and 15% for the successive years?

Ans: Information for 1 year:

$P_1 = 100$

$r = 10\%$

let us calculate the simple interest:

$$= \frac{P \times r \times t}{100}$$

Putting values and solving further,

$$= \frac{100 \times 10 \times 1}{100}$$

$$= 10$$

Now, let us find the amount

$$= 100 + 10$$

$= 110$ rupees

Information for 2nd year:

$P_1 = 110$

$r = 15\%$

$t = 1$ year

let us calculate the simple interest:

$$= \frac{P \times r \times t}{100}$$

Putting values and solving further,

$$= \frac{100 \times 15 \times 1}{100}$$
$$= 16.50$$

Now, let us find the amount

$$= 110 + 16.50$$
$$= 126.50 \text{ rupees}$$

As, we can see that when the amount is Rs. 126.50 then the principal is Rs. 100

So, when the amount is Rs. 10120

Then the principle

$$= \frac{10120 \times 100}{126.50}$$
$$= 8000 \text{ rupees}$$

19) Sunil borrows Rs. 50000 at 10% S.I. for $1\frac{1}{2}$ years. He immediately invests the entire amount for $1\frac{1}{2}$ years at 10% compounded annually. What is his gain at the end of the stipulated time, when he repays his loan?

Ans: Let us calculate the simple interest paid by Sunil:

For that it is given that:

$P = 50000$

$r = 10\%$

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

Simple interest:

$$= \frac{P \times r \times t}{100}$$

Putting values and solving further,

$$= \frac{50000 \times 10 \times 3}{100 \times 2}$$
$$= 7500$$

Now, let us calculate the compound interest earned by Sunil:

Information for 1 year:

$P = 50000$

$r = 10\%$

$t = 1 \text{ year}$

let us calculate the simple interest:

$$= \frac{P \times r \times t}{100}$$

Putting values and solving further,

$$= \frac{50000 \times 10 \times 1}{100}$$

$$= 5000$$

Now, let us find the amount

$$= 50000 + 5000$$

$$= 55000 \text{ rupees}$$

Information for next half year:

$P = 55000$

$r = 10\%$

$t = \frac{1}{2} \text{ year}$

let us calculate the simple interest:

$$= \frac{P \times r \times t}{100}$$

Putting values and solving further,

$$= \frac{55000 \times 10 \times 1}{100}$$

$$= 2750$$

Now, let us find the amount

$$= 55000 + 2750$$

$$= 7750 \text{ rupees}$$

Therefore, the total Compound interest earned:

$$= 55750 + 2750$$

$$= 57750 \text{ rupees}$$

Sunil's gain is as follows:

$CI - SI = 250$ rupees

20) The value of a mobile depreciated by 5% per year during the first two years and 10% per year during the third year. Express the total depreciation of the value of the mobile in percent during the three years.

Ans: Let us assume that the value of the mobile in the beginning is Rs. 100

Depreciation in 1^{st} year is as follows:

5% of 100

$= 5$ rupees

So, the value of machine in 2^{nd} year:

Depreciation subtracted form original value in 1^{st} year

$= 100 - 5$

$= 95$ rupees

Depreciation in 2^{nd} year is as follows:

5% of 95

$= 4.75$ rupees

So, the value of the machine in the third year:

Depreciation subtracted from original value in 2^{nd} year

$= 95 - 4.75$

$= 90.25$ rupees

Depreciation in 3^{rd} year is as follows:

10% of 90.25

$= 9.025$ rupees

So, the value of the machine in the third year:

Depreciation subtracted from original value in 3^{rd} year

$= 90.25 - 9.025$

$= 81.225$ rupees

Net depreciation will be $\Rightarrow 100-81.225=18.775$ rupees

21) A man borrows Rs. 6500 at 10% per annum compound interest payable half-yearly. He repays Rs. 2000 at the end of every six months. Calculate the amount outstanding at the end of the third payment. Give your answer to the nearest rupee.

Ans: In first year:

$P=6500$ rupees

$r=105$

$t=\frac{1}{2}$ years

Simple interest:

$=\frac{P\times r\times t}{100}$

Putting values and solving further,

$=\frac{6500\times 10\times 1}{100\times 2}$

$=Rs.325$

Now, let us find the amount

$=6500+325$

$=6825$ rupees

So, the money paid at the end of 1st half year is equal to Rs. 2000

And the balance money for the 2nd half year is as follows:

$=6825-2000$

$=4825$ rupees

In second year:

$P=4825$ rupees

$r=10\%$

$t=\frac{1}{2}$ years

Simple interest:

$= \frac{P \times r \times t}{100}$

Putting values and solving further,

$= \frac{4825 \times 10 \times 1}{100 \times 2}$

$= Rs.241.25$

Now, let us find the amount

$= 4825 + 241.25$

$= 5066.25$ rupees

So, the money paid at the end of 2nd half year is equal to Rs. 2000

And the balance money for the 3rd half year is as follows:

$= 6066.25 - 2000$

$= 3066.25$ rupees

In third year:

$P = 3066.25$ rupees

$r = 10\%$

$t = \frac{1}{2}$ years

Simple interest:

$= \frac{P \times r \times t}{100}$

Putting values and solving further,

$= \frac{3066.25 \times 10 \times 1}{100 \times 2}$

$= Rs.153.3125$

Now, let us find the amount

$= 3066.25 + 153.3125$

$= 3219.5625$ rupees

So, the money paid at the end of 2nd half year is equal to Rs. 2000

And the balance money for the 3rd half year is as follows:

$= 6066.25 - 2000$

$= 3066.25$ rupees

Amount outstanding at the end of 3rd payment

$= 3219.5625 - 2000$

$= 1220$ rupees

22. A man borrows Rs. 20000 at 10% per annum compound interest payable annually. If he repays Rs. 5000 at the end of the first year and Rs. 10000 at the end of the second year; how much should he pay at the end of the third year in order to clear the account? Find the answer correct to the nearest rupee.

Ans: Calculating half year it is given that

$P = 2000$ rupees

$t = 1$ year

$r = 10\%$

$$\Rightarrow \text{interest} = \frac{20000 \times 10 \times 1}{100}$$

$= 2000$ rupees

Thus, the amount will be $\Rightarrow 20000 + 20000 = 22000$ rupees.

So, money paid at the end of first half year is 5000 rupees,

Thus, balance money for second half year

$= 22000 - 5000$

$= 17000$ rupees

Now, for second half year is $P = 17000, r = 10\%, t = 1$ year,

$$\Rightarrow \text{interest} = \frac{17000 \times 10 \times 1}{100}$$

$= 1700$

Thus, the amount will be $\Rightarrow 17000 + 1700 = 18700$ rupees.

So, money paid at the end of second half year will be 10000 rupees,

Now, balance money for third half year

$= 18700 - 10000$

$= 8700$ rupees

Then, for third half year $P = 8700, r = 10\%, t = 1$ year,

$\Rightarrow \text{interest} = \dfrac{8700 \times 10 \times 1}{100}$

$= 870$ rupees

Now, the amount will be $\Rightarrow 8700 + 870 = 9570$ rupees.

Therefore, a man should pay 9570 rupees at the end of third half year to clear the account.

23. Ankita bought a gold ring worth Rs. x. the value of the ring increased at 10% per year compounded annually, on which the appreciation for the first year plus the appreciation for the second year amounts to Rs. 6300. Find the value of the ring.

Ans: Assume the value of ring $(P_1) = 100$ rupees,

Appreciation $(C.I)$ for the first year

$\Rightarrow \text{interest} = \dfrac{100 \times 10 \times 1}{100}$

$= 10$ rupees

Value of the ring at the end of first year (A_1),

$= 100 + 10$

$= 110$ rupees

Now, the value of the ring at the beginning of second year $(P_2) = 110$ rupees,

Appreciation (CI) for the second year

$= \dfrac{110 \times 10 \times 1}{100}$

$= 11$ rupees

Now, the sum of appreciation $(C.I)$ for the 1^{st} year and appreciation $(C.I)$ for the 2^{nd} year,

$= (10+11)$

$= 21$ rupees

Now, when sum of appreciation is rupees 21, then value of the ring $(P_1) = 100$ rupees,

The sum of appreciation is rupees 6300, then value of the ring,

$= \frac{100 \times 6300}{21}$

$= 30000$ rupees

Thus, the value of the ring is 30000 rupees.

24. Priyanka lends Rs. $15,500$ at 10% for the first year, at 15% for the second year at 20% for the third year. if the rates of interest are compounded yearly, find the difference between the compound interest of the second year and the third year.

Ans: It is given that for first year is $P = 15500, r = 10\%, t = 1$ year,

$\Rightarrow \text{interest} = \frac{15500 \times 10 \times 1}{100}$

$= 1550$ rupees

So, the amount will be

$= 15500 + 1550$

$= 17050$ rupees

Now, for second year $P = 17050, r = 15\%, t = 1$ year,

$\Rightarrow \text{interest} = \frac{17050 \times 15 \times 1}{100}$

$= 2557.50$ rupees

Then, for third year $P = 19607.50, r = 20\%, t = 1$ year,

$\Rightarrow \text{interest} = \frac{19607.50 \times 20 \times 1}{100}$

$= 3921.50$ rupees

So, the amount will be

$= 19607.50 + 3921.50$

$= 23529$ rupees

Now, the difference between the C.I of the second year and the third year will be

$= 3921.50 - 2557.50$

$= 1364$ rupees

25. Samidha borrowed Rs. 7500 from Shreya at 30% per annum compounded interest. After 2 years, Samidha gave Rs. 10000 and a juicer to Shreya to clear the debt. Find the cost of the juicer.

Ans: Calculating for the first year $P = 7500, r = 30\%, t = 1$ year,

$\Rightarrow \text{interest} = \dfrac{7500 \times 30 \times 1}{100}$

$= 2550$ rupees

Thus, the amount will be

$= 7500 + 2250$

$= 9750$ rupees

Now, for the second year $P = 9750, r = 30\%, t = 1$ year,

$\Rightarrow \text{interest} = \dfrac{9750 \times 30 \times 1}{100}$

$= 2925$ rupees

Thus, the amount will be

$= 9750 + 2925$

$= 12675$ rupees

Hence, the total amount to be paid by Samidha will be 12675 rupees,

Samidga gave 1000 rupees and juicer to Shreya

So, the amount of juicer will be,

$\Rightarrow 1000 + \text{cost of juicer} = 12675$

$\Rightarrow \text{cost of juicer} = 12675 - 1000$

$= 2675$ rupees

Exercise 3.2

1) Find the amount and the compound interest on the following:

i. **Rs.** 8000 **for 3 years at** 10% **per annum compounded annually.**

ii. **Rs.** 15000 **for 2 years at** 8% **per annum compounded semi-annually.**

iii. **Rs.** 12000 **for** $1\frac{1}{2}$ **years at** 5% **per annum compounded annually.**

iv. **Rs.** 25000 **for 2 years at** 6% **per annum compounded semi-annually.**

v. **Rs.** 16000 **for 3 years at** $10\%, 8\%, 6\%$ **for successive years.**

Ans:

(i) Given in the question that,

$P = 8000$ rupees

$t = 3$ years

$r = 10\%$

Now, using the formula

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

Putting the values and solving further,

$$= 8000\left(1+\frac{10}{100}\right)^3$$

$$= 8000\left(\frac{11}{10}\right)^3$$

$$= 8000 \times \frac{1331}{1000}$$

$$= 10648$$

Therefore, the amount will be 10648,

Now, let us find out the compound interest

Using the formula

$\Rightarrow A - P$

In which A is the amount.

$= 10648 - 8000$

$= 2648$ rupees

(ii) Given in the question that,

$P = 15000$

$t = 2$ years

$r = 8\%$

Now, using the formula

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

Putting the values and solving further,

$= 15000\left(1 + \frac{8}{200}\right)^{4}$

$= 15000 \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25}$

$= 17547.88$

Therefore, the amount 17547.88 rupees

Now, let us find out the compound interest

Using the formula

$\Rightarrow A - P$

In which A is the amount.

$= 17546.88 - 15000$

$= 2547.88$ rupees

(iii) Given in the question that,

$P = 12000$

$t = 1\frac{1}{2}$ years

$r = 5\%$

Now, using the formula

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

Putting the values and solving further,

$$= 12000\left(1+\frac{5}{100}\right)$$
$$= 12000\left(\frac{105}{100}\right)$$
$$= 12600$$

Now, let us find out the interest for the next half year

$$= \frac{12600\times 5}{100\times 2}$$
$$= 315$$

Therefore, the amount will be

$$= 12600+315$$
$$= 12915 \text{ rupees}$$

The compound interest:

$$= A-P$$
$$= 12915-12000$$
$$= 915 \text{ rupees}$$

(iv) Given that in the question,

$P = 25000$ rupees

$t = 2$ years

$r = 6\%$

Now, using the formula

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

Putting the values and solving further,

$$= 25000\left(1+\frac{6}{200}\right)^{4}$$
$$= 25000\left(\frac{103}{100}\right)^{4}$$
$$= 28137.72$$

Therefore, the amount is 28137.72 rupees.

Now, let us find out the compound interest

Using the formula

$= A - P$

In which A is the amount.

$= 28137.72 - 25000$

$= 3137.72$ rupees

(v) Given in the question that

$P = 16000$ rupees

$t = 3$ years

$r = 10\%, 8\%, 6\%$

Now, using the formula

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

Putting the values and solving further,

$= 16000\left(1+\frac{10}{100}\right)\left(1+\frac{8}{100}\right)\left(1+\frac{6}{100}\right)$

$= 16000\left(\frac{11}{10}\right)\left(\frac{108}{100}\right)\left(\frac{106}{100}\right)$

$= 20148.48$

Therefore, the amount will be $= 20148.48$ rupees

Now, let us find out the compound interest

Using the formula

$\Rightarrow A - P$

In which A is the amount.

$= 20148.48 - 16000$

$= 4148.48$ rupees

2) Find the amount and compounded interest on Rs. 15000 in $2\frac{1}{2}$ years at 15% p.a. compounded annually.

Ans: Given in the question that,

$P = 15000$ rupees

$t = 2\frac{1}{2}$ years

$r = 10\%$

Now, let us find out the amount after 2 years by using the formula as follows

$$P\left(1+\frac{r}{100}\right)^t$$

Putting values and solving further

$$= 15000\left(1+\frac{10}{100}\right)^2$$

$$= 15000\left(\frac{11}{10}\right)^2$$

$$= 18150$$

Now, let us find the interest for the half year.

$$= \frac{18150 \times 10}{100 \times 2}$$

$$= 907.5$$

Therefore, the amount will be

$$= 18150 + 907.50$$

$$= 19057.50 \text{ rupees}$$

Now, let us find out the compound interest

Using the formula

$$\Rightarrow A - P$$

In which A is the amount.

$$= 19057.50 - 15000$$

$$= 4057.50 \text{ rupees}$$

3) Find the amount on Rs. 36000 in 2 years 15% p.a. compounded annually.

Ans: Given in the question that

P = Rs. 36000

T = 2 years

R = 15%

Now, using the formula

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

Putting the values and solving further,

$= 36000\left(1+\frac{15}{100}\right)^{2}$

$= 36000\left(\frac{115}{100}\right)^{2}$

$= 47610$

Therefore, the amount = Rs. 47610

4) Find the amount and compound interest on Rs. 50000 on $1\frac{1}{2}$ years at 8% p.a. compounded half-yearly.

Ans: Given –

P = Rs. 50000

t = $1\frac{1}{2}$ years

r = 8%

Now, using the formula

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

Putting the values and solving further,

$= 50000\left(1+\frac{8}{200}\right)^{2}$

$= 50000\left(\frac{104}{100}\right)^{3}$

$= 56243.20$

Therefore, the amount will be Rs. 56243.20

Now, let us find out the compound interest

Using the formula

A – P

In which A is the amount.

=56243.20 – 50000

= Rs. 6243.20

5) How much will Rs. 25000 amounts to in 2 years at compound interest, if the rates for 1st and 2nd years be 4% and 5% p.a. respectively?

Ans: Given –

P = Rs. 25000

t = 2 years

r = 4%, 5%

Now, using the formula

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

Putting the values and solving further,

$= 25000\left(1+\frac{4}{100}\right)\left(1+\frac{5}{100}\right)$

$= 25000\left(\frac{104}{100}\right)\times\left(\frac{105}{100}\right)$

$= 27300$

Therefore, the amount = Rs. 27300

6) Find compound interest on Rs. 31250 for 3 years, if the rates of interest for 1st, 2nd and 3rd years be 8%, 10% and 12% respectively.

Ans: Given –

P = Rs. 31250

t = 3 years

r = 8%, 10%, 12%

Now, using the formula

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

Putting the values and solving further,

$$= 31250\left(1+\frac{8}{100}\right)\left(1+\frac{10}{100}\right)\left(1+\frac{12}{100}\right)$$

$$= 31250\left(\frac{108}{100}\right)\left(\frac{110}{100}\right)\left(\frac{112}{100}\right)$$

$$= 41580$$

Therefore, the amount = Rs. 41580

7) Calculate the rate percent when Rs. 28000 amounts to Rs. 30870 in 2 years at compounded annually.

Ans: Given –

P = Rs. 28000

t = 2 years

A = 30870

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

Putting the values and solving further,

$$28000\left(1+\frac{r}{100}\right)^2$$

$$= 30870$$

Now,

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

$$=\frac{30870}{28000}$$

$$=\frac{441}{400}$$

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

Solving further,

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

$$\frac{r}{100}=\frac{21}{20}-1$$

$$r=5$$

Therefore, the rate of interest is 5%

8) In what time will Rs. 15625 amounts to Rs. 17576 at 4% p.a. compound interest?

Ans: Given –

P = Rs. 15625

r = 4%

A = 17576

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

Putting the values and solving further,

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

$$= 17576$$

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

$$= \frac{17576}{15625}$$

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

Therefore, the time is 3 years.

9) In how many years will Rs. 2000 amount to Rs. 2662 at 10% p.a. compound interest?

Ans: Given –

P = Rs. 2000

r = 10%

A = 2662

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

Putting the values and solving further,

$$= 2000\left(1+\frac{10}{100}\right)^{t}$$

$$= 2662$$

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

$$= \frac{2662}{2000}$$

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

Therefore, the time is 3 years.

10) The simple interest on a certain sum for 3 years at 4% is Rs. 600. Find the compound interest for the same sum at the same percent and in the same time.

Ans: Given –

r = 4%

t = 3 years

The simple interest:

$$600 = \frac{P \times r \times t}{100}$$

$$P = \frac{60000}{12}$$

$$= 5000$$

P = Rs. 5000

Now, let us find out the compound interest by using the formula as follows:

$$P\left(1+\frac{r}{100}\right)^t$$

Putting the values and solving further,

$$5000\left(1+\frac{4}{100}\right)^3$$

$$= 5624.32$$

Therefore, the amount = Rs. 5624.32

The compound interest:

A – P

= 5624.32 – 5000

= Rs. 624.32

11) The compound interest payable annually on a certain sum for 2 years is Rs. 40.80 and the simple interest is Rs. 40. Find the sum and the rate percent.

Ans: Given:

t = 2 years

compound interest = Rs. 40.80

simple interest = Rs. 40

Simple interest $= \frac{P \times r \times t}{100}$

Therefore,

$40 = \frac{P \times r \times t}{100}$

Pr = 2000

Similarly,

The compound interest:

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

$40.80 = P\left[\left(1+\frac{r}{100}\right)\right]^2 - 1$

$40.80 = P\left(1+\frac{r^2}{10000}+\frac{2r}{100}-1\right)$

$40.80 = \Pr\left(\frac{r}{10000}+\frac{2}{100}\right)$

$40.80 = 2000\left(\frac{r+200}{10000}\right)$

$r = 204 - 200$

$r = 4$

Therefore, r = 4%

So, Pr = 2000

$P = \frac{2000}{4}$

P = 500

12) The difference between simple interest and compound interest compounded annually on certain sum is Rs. 448 for 2 years at 8 percent per annum. Find the sum.

Ans: As we know that,

Compound interest = A – P

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

$$= P\left(\frac{108}{100}\right)^2 - p$$

$$= \frac{11664P - 10000P}{10000}$$

$$= \frac{1664P}{10000}$$

Similarly,

Simple interest $= \frac{P \times r \times t}{100}$

i.e.,

$$\frac{P \times 8 \times 2}{100}$$

$$= \frac{16P}{100}$$

Compound interest – Simple interest = Rs. 448

Therefore,

$$\frac{1664P}{10000} - \frac{16P}{100} = 448$$

$$64P = 4480000$$

$$P = 70000$$

Therefore, the sum is equal to Rs. 70000

13) The difference between C.1. payable annually and S.I. on Rs. 50000 for two years is Rs.125 at the same rate of interest per annum. Find the rate of interest.

Ans: Let us assume that the rate of interest per year is r%

The simple interest for 2 years:

$= \frac{P \times r \times t}{100}$

$\frac{50000 \times r \times 2}{100}$

$= = 1000r$

Similarly,

The compound interest in 2 years = A – P

$= 50000\left(1+\frac{r}{100}\right)^2 - 50000$

Now,

The compound interest – simple interest = 125

Therefore,

$50000\left(1+\frac{r}{100}\right)^2 - 50000$ -1000r = 125

$50000 + 5r^2 + 1000r – 50000 – 1000r = 125$

$r = \pm 5$

Therefore, the rate of interest is equal to 5%

14) What principal will amount to Rs. 15729 in two years, if the rate of interest for successive years are 5% and 7% respectively, the interest is being compounded annually.

Ans: Given –

Amount = Rs. 15729

t = 2 years

$r_1 = 5\%$

$r_2 = 7\%$

Now,

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

$$15729 = P\left(1+\frac{5}{100}\right)\left(1+\frac{7}{100}\right)$$

$$P = \frac{15729\times 10000}{105\times 107}$$

$$P = 14000$$

15) At what rate percent will Rs. 12000 yield Rs. 13891.50 as compound interest in 3 years?

Ans: Given –

Amount = Rs. 13891.50

t = 3 years

P = Rs. 12000

So,

$$13891.50 = 12000\left(1+\frac{r}{100}\right)^3$$

$$\frac{13891.50}{12000\times 100} = \left(1+\frac{r}{100}\right)^3$$

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

$$r = 5\%$$

16) A sum of Rs. 16820 is to be divided between two girls A and B, 27 and 25 years old respectively, in such a way that, if their portions be invested at 5% per annum compound interest payable annually, they will receive equal amounts on reaching 40 years of age. What is the share of each in the original sum of money?

Ans: Let us assume that the share of A is x

So, the share of B = 16820 - x

For A,

P = x

r = 5%

t = 12 years

Now, solving further

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

$$= x\left(1+\frac{5}{100}\right)^{13}$$

$$= x\left(\frac{21}{20}\right)^{12}$$

For B,

P = 16820 - x

r = 5%

t = 15 years

now, solving further,

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

$$= 16820x\left(1+\frac{5}{100}\right)^{15}$$

$$= 16820 - x\left(\frac{21}{20}\right)^{15}$$

It is given in the question, that both receives equal sums on reaching the age of 40 years

Therefore,

$$x = (16820 - x)\left(\frac{21}{20}\right)^{15}$$

$$x = 8820$$

Thus,

Share of A = Rs. 8820

And similarly,

$$= 16820 - x$$

$$= 8000$$

Share of B = Rs. 8000