



SpeedLabs

MATHS

CBSE 8th

TEEVRA EDUTECH PVT. LTD.

Comparing Quantities

Exercise 8.3

- Q.1** Calculate the amount and compound interest on
- (a) Rs 10,800 for 3 years at $12\frac{1}{2}\%$ per annum compounded annually.
 - (b) Rs 18,000 for $2\frac{1}{2}$ years at 10% per annum compounded annually.
 - (c) Rs 62,500 for $1\frac{1}{2}$ years at 8% per annum compounded half yearly.
 - (d) Rs 8,000 for 1 year at 9% per annum compounded half yearly.
(You could use the year by year calculation using S.I. formula to verify).
 - (e) Rs 10,000 for 1 year at 8% per annum compounded half yearly.

Sol:

(a) Given, $P = \text{Rs } 10800$, $n = 3$ years

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

$$\text{Amount } A = P\left(1 + \frac{R}{100}\right)^n = 10800\left(1 + \frac{25}{2 \times 100}\right)^3$$

$$= 10800\left(1 + \frac{1}{2 \times 4}\right)^3$$

$$= 10800\left(1 + \frac{1}{8}\right)^3 = 10800 \times \left(\frac{9}{8}\right)^3$$

$$= 10800 \times \frac{9}{8} \times \frac{9}{8} \times \frac{9}{8} = 10800 \times \frac{729}{512}$$

$$= \frac{7873200}{512} = \text{Rs } 15,377.34$$

$$CI = A - P = \text{Rs } 15377.34 - \text{Rs } 10800 = \text{Rs } 4,577.34.$$

(b) $P = \text{Rs } 18000$, $n = 2\frac{1}{2}$ years, $R = 10\%$ p. a.

First, we have to find amount for 2 years.

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

$$= 18,000\left(1 + \frac{10}{100}\right)^2 = 18,000\left(1 + \frac{1}{10}\right)^2$$

$$= 18000 \times \frac{11}{10} \times \frac{11}{10}$$

$$= \frac{21,78,000}{100} = \text{Rs } 21,780$$

Interest for $\frac{1}{2}$ year on Rs 21780 at rate of 10%

$$= \left(\frac{21780 \times 10 \times 1}{100 \times 2} \right) = \text{Rs } 1,089$$

Total amount for $2\frac{1}{2}$ years at rate of 10%

$$= \text{Rs } 21,780 + \text{Rs } 1,089$$

$$= \text{Rs } 22,869$$

$$\text{C.I.} = A - P = \text{Rs } 22,869 - \text{Rs } 18,000 = \text{Rs } 4,869.$$

(c) Given, $P = \text{Rs } 62,500$, $n = 1\frac{1}{2}$ years $= \frac{3}{2}$ years, $R = 8\%$

Since, interest is compounded half yearly

$$\text{So, } n = \frac{3}{2} \times 2 = 3 \text{ half years}$$

$$R = \frac{8}{2} = 4\% \text{ half yearly}$$

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

$$= 62500 \left(1 + \frac{4}{100} \right)^3$$

$$= 62,500 \left(1 + \frac{1}{25} \right)^3 = 62,500 \times \left(\frac{26}{25} \right)^3$$

$$= 62500 \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25}$$

$$A = \text{Rs } 70,304.$$

$$\text{C.I.} = A - P$$

$$= \text{Rs } 70,304 - \text{Rs } 62,500 = \text{Rs } 7,804$$

(d) Given, $P = \text{Rs } 8,000$, $R = 9\%$, $n = 1$ year

Since, interest is compounded half yearly.

$$\text{So, } n = 2 \times 1 = 2 \text{ half years}$$

$$R = \frac{9}{2} = \frac{9}{2}\% \text{ half yearly}$$

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

$$= 8,000 \left(1 + \frac{9}{2 \times 100}\right)^2 = 8,000 \left(1 + \frac{9}{200}\right)^2$$

$$= 8,000 \times \left(\frac{209}{200}\right)^2 = 8,000 \times \frac{209}{200} \times \frac{209}{200} = \text{Rs } 8,736.20$$

$$\text{C.P.} = A - P$$

$$= \text{Rs } 8736.20 - \text{Rs } 8,000.00 = \text{Rs } 736.20.$$

(e) Given, $P = \text{Rs } 10,000$, $T = 1 \text{ year}$, $R = 8\% \text{ per annum} = \frac{8}{2} = 4\%$

Since, interest is compounded half yearly.

$$n = 1 \times 2 = 2 \text{ half yearly}$$

$$R = \frac{8}{2} = 4\% \text{ half yearly}$$

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

$$= 10,000 \left(1 + \frac{4}{100}\right)^2 = 10,000 \left(1 + \frac{1}{25}\right)^2$$

$$= 10,000 \times \left(\frac{26}{25}\right)^2 = 10,000 \times \frac{26}{25} \times \frac{26}{25} = \frac{6760000}{625} = 10816$$

$$\text{C.I.} = A - P = \text{Rs } 10,816 - \text{Rs } 10,000 = \text{Rs } 816.$$

Q.2 Kamala borrowed Rs 26,400 from a Bank to buy a scooter at a rate of 15%p.a. compounded yearly. What amount will she pay at the end of 2 years and 4 months to clear the loan?

(Hint: Find A for 2 years with interest is compounded yearly and then find SI on the 2nd year amount for $\frac{4}{12}$ years).

Sol: Given, $P = \text{Rs } 26,400$, $R = 15\%$, $n = 2 \text{ years } 4 \text{ months}$

First, we have to calculate amount for two years.

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

$$= 26,400 \left(1 + \frac{15}{100}\right)^2$$

$$= 26,400\left(1 + \frac{3}{20}\right)^2$$

$$= 26400 \left(\frac{23}{20}\right)^2$$

$$= 26400 \times \frac{23}{20} \times \frac{23}{20}$$

$$= \text{Rs } 34,914$$

Interest for 4 months = $\frac{4}{12}$ years = $\frac{1}{3}$ years at rate of 15%

$$= \frac{34,914 \times 15 \times 1}{100 \times 3} = \text{Rs } 1745.70$$

Total amount = Rs 34,914 + Rs 1745.70 = Rs 36,659.70

Q.3 Fabina borrows Rs 12,500 at 12% per annum for 3 years at simple interest and Radha borrows the same amount for the same time period at 10% per annum, compounded annually. Who pays more interest and by how much?

Sol: Amount for Fabina,

Given, P = 12,500, R = 12%, T = 3 years

$$\text{Simple interest for Fabina} = \frac{P \times R \times T}{100}$$

$$= \frac{12500 \times 12 \times 3}{100} = \frac{450000}{100} = \text{Rs } 4,500$$

Amount for Radha,

Given P = 12,500, R = 10%, n = 3 years

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

$$= 12,500 \left(1 + \frac{10}{100}\right)^3 = 12,500 \left(1 + \frac{1}{10}\right)^3$$

$$= 12500 \times \left(\frac{11}{10}\right)^3 = 12500 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} = \text{Rs } 16,637.5$$

C.I. for Radha = A - P

$$= \text{Rs } 16,637.5 - \text{Rs } 12,500 = \text{Rs } 4,137.5$$

Fabina pays more interest = Rs 4,500 - Rs 4,137.5

$$= \text{Rs } 362.5 = \text{Rs } 362.50. \text{Ans.}$$

Q.4 I borrowed Rs 12,000 from Jamshed at 6% per annum simple interest for 2 years. Had I borrowed this sum at 6% per annum compound interest, what extra amount would I have to pay?

Sol: Given, P = Rs 12000, R = 6% p.a., T = 2 years

$$\text{Simple interest} = \frac{P \times R \times T}{100} = \frac{12000 \times 6 \times 2}{100} = 1440$$

Had he borrowed this sum at 6% p.a. then by using below formula, for C.I.,
= Rs 816.

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

$$= 12000 \left(1 + \frac{6}{100} \right)^2 = 12000 \times \left(\frac{106}{100} \right)^2$$

$$= 12000 \times \frac{106}{100} \times \frac{106}{100}$$

$$= \text{Rs } 13,483.2$$

$$\text{C.I.} = A - P$$

$$= \text{Rs } 13,483.2 - \text{Rs } 12,000 = \text{Rs } 1,483.2$$

$$\text{Difference in both interest} = \text{Rs } 1,483.2 - \text{Rs } 1,440 = \text{Rs } 43.20.$$

He would have to pay Rs 43.20 extra amount.

Q.5 Vasudevan invested Rs 60,000 at an interest rate of 12% per annum compounded half yearly. What amount would he get.

(i) After 6 months?

(ii) After 1 year?

Sol: (i) Given, P = Rs 60,000, R = 12% p. a.

When interest is compounded half yearly.

$$R = \frac{12}{2} = 6\% \text{ half yearly}$$

$$n = 6 \text{ months} = \frac{6}{12} \times 2 = 1 \text{ half year}$$

$$\text{Amount} = P \left(1 + \frac{R}{100} \right)^n = 60,000 \left(1 + \frac{6}{100} \right)^1$$

$$= 60,000 \times \frac{106}{100} = \text{Rs } 63,600$$

After 6 months Vasudevan would get amount Rs 63,600.

(ii) Given, $P = \text{Rs } 60,000$, $R = 12\%$, $T = 1$ year

When interest is compounded half yearly.

$$R = \frac{12}{2} = 6\% \text{ per half yearly, } n = 2T = 2 \times 1 = 2 \text{ half years}$$

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

$$\begin{aligned} A &= P \left(1 + \frac{6}{100}\right)^2 = 60,000 \times \left(\frac{106}{100}\right)^2 \\ &= 60000 \times \frac{106}{100} \times \frac{106}{100} = 60000 \times \frac{106}{100} \times \frac{106}{100} \\ &= \frac{67,41,60,000}{10000} = \text{Rs } 67416 \end{aligned}$$

Q.6 Arif took a loan of Rs 80,000 from a bank. If the rate of interest is 10% per annum, find the difference in amounts he would be paying after $1\frac{1}{2}$ years if the interest is

(i) Compounded annually.

(ii) compounded half yearly.

Sol: Given, $P = \text{Rs } 80,000$, $R = 10\%$ p.a., $n = 1\frac{1}{2}$ years.

First we will calculate the amount for 1 year.

$$\begin{aligned} A &= P \left(1 + \frac{R}{100}\right)^n \\ &= 80000 \left(1 + \frac{10}{100}\right)^1 = 80,000 \times \left(1 + \frac{10}{100}\right)^1 \\ &= 80,000 \times \frac{11}{10} = \text{Rs } 88,000 \end{aligned}$$

Interest for $\frac{1}{2}$ year at rate of 10% on

$$\text{Rs } 88,000 = \text{Rs } \frac{88000 \times 10 \times 1}{100 \times 2} = 4400$$

$$\text{Total amount} = \text{Rs } 88,000 + \text{Rs } 4,400 = \text{Rs } 92,400$$

(ii) When compound interest compounded semi – annually then,

$$R = \frac{10}{2} = 5\%, n = 2T = 2 \times \frac{3}{2} = 3 \text{ half years}$$

$$A = P \left(1 + \frac{R}{100}\right)^n = 80,000 \left(1 + \frac{5}{100}\right)^3$$

$$= 80,000 \left(1 + \frac{1}{20}\right)^3 = 80,000 \left(\frac{21}{20}\right)^3$$

$$= 80,000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} = \text{Rs } 92,610$$

$$\text{Difference in amounts} = \text{Rs } 92,610 - \text{Rs } 92,400 = \text{Rs } 210.$$

Q.7 Maria invested Rs 8,000 in a business. She would be Paid interest at 5% per annum compounded annually. Find

- (i) The amount credited against her name at the end of the second year.
- (ii) The interest for the 3rd year.

Sol: Given, $P = \text{Rs } 8000$, $R = 5\%$, $T = 2$ years

Amount after two years

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

$$= 8,000 \left(1 + \frac{5}{100}\right)^2$$

$$= 8,000 \times \left(1 + \frac{1}{20}\right)^2$$

$$= 8,000 \times \left(\frac{21}{20}\right)^2 = 8,000 \times \frac{21}{20} \times \frac{21}{20}$$

$$= \text{Rs } 8,820$$

(ii) Amount after three years

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

$$= 8000 \left(1 + \frac{1}{20}\right)^3 = 8000 \times \left(\frac{21}{20}\right)^3$$

$$= 8000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} = \text{Rs } 9,261$$

$$\text{Interest for 3rd year} = \text{Rs } 9,261 - \text{Rs } 8,820 = \text{Rs } 441$$

Q.8 Find the amount and the compound interest on Rs 10,000 for $1\frac{1}{2}$ years at 10% per annum, compounded half yearly. Would this interest be more than the interest he would get if it was compounded annually?

Sol: Given, P = Rs 10,000, R = 10% = $\frac{10}{2}$ = 5% half yearly

$$n = T = 1\frac{1}{2} = \frac{3}{2} \times 2 = 3 \text{ half years}$$

$$A = P \left(1 + \frac{R}{100}\right)^n = 10,000 \left(1 + \frac{5}{100}\right)^3$$

$$= 10,000 \left(1 + \frac{1}{20}\right)^3 = 10,000 \times \left(\frac{21}{20}\right)^3$$

$$= 10,000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$$

$$= \frac{92610000}{80000} = \text{Rs } 11,576.25$$

$$\text{C.I.} = A - P = 11,576.25 - 10,000 = \text{Rs } 1,576.25$$

If it is compounded annually, then, First we will calculate the amount for one year

$$A = P \left(1 + \frac{R}{100}\right)^n = 10000 \left(1 + \frac{10}{100}\right)^1 = 10000 \times \frac{110}{100} = \text{Rs } 11000$$

$$\text{Interest for } \frac{1}{2} \text{ year} = 11000 \times \frac{1}{2} \times \frac{10}{100} = \text{Rs } 550$$

$$\text{Total amount} = \text{Rs } 11000 + \text{Rs } 550 = \text{Rs } 11550$$

$$\text{C.I.} = 11,550 - 10,000 = 1,550$$

Yes, interest Rs 1,576.25 is more than Rs 1,550.

Q.9 Find the amount which Ram will get on Rs 4096, if he gave it for 18 months at $12\frac{1}{2}\%$ per annum, Interest being compounded half yearly.

Sol: Given, $P = \text{Rs } 4096$, $n = T = 18 \text{ months} = \frac{18}{6} = 3 \text{ half years}$.

(Since 6 months = 1 half year)

$R = 12\frac{1}{2}\% = \frac{25}{2}\%$ annually and $\frac{25}{2 \times 2} = \frac{25}{4}$ half yearly.

$$\begin{aligned}A &= P \left(1 + \frac{R}{100}\right)^n \\&= 4,096 \left(1 + \frac{25}{4 \times 100}\right)^3 = 4,096 \left(1 + \frac{1}{4 \times 4}\right)^3 \\&= 4096 \left(1 + \frac{1}{16}\right)^3 = 4096 \left(\frac{17}{16}\right)^3 \\&= 4096 \times \frac{17}{16} \times \frac{17}{16} \times \frac{17}{16} = \text{Rs } 4913.\end{aligned}$$

Q.10 The population of a place increased to 54,000 in 2003 at a rate of 5% per annum

(i) Find the population in 2001.

(ii) What would be its population in 2005?

Sol: (i) Given, $A_{2003} = 54000$, $R = 5\%$, $n = T = 2 \text{ years}$

Population would be less in 2001 than 2003 in two years.

Here population is increasing.

$$\begin{aligned}\text{So, } A_{2003} &= P_{2001} \left(1 + \frac{R}{100}\right)^2 \\54,000 &= P_{2001} \left(1 + \frac{5}{100}\right)^2 = P_{2001} \left(1 + \frac{1}{20}\right)^2 \\54000 &= P_{2001} \left(\frac{21}{20}\right)^2 \\P_{2001} &= \frac{54,000 \times 400}{441} \\&= 48,979.59184 = 48,980 \text{ approximately.}\end{aligned}$$

Therefore, population in 2001 was 48,980.

(ii) According to the question, population is increasing, so, population in 2005

$$\begin{aligned}A &= P \left(1 + \frac{R}{100}\right)^n \\&= 54,000 \left(1 + \frac{5}{100}\right)^2 = 54,000 \times \left(1 + \frac{1}{20}\right)^2 \\&= 54000 \times \frac{21}{20} \times \frac{21}{20} = 59535\end{aligned}$$

Therefore, population in 2005 would be 59,535.

Q.11 In a Laboratory, the count of bacteria in a certain experiment was increasing at the rate of 2.5% per hour. Find the bacteria at the end of 2 hours if the count was initially 5,06,000.

Sol: Given, $R = 2.5\%$, $T = 2$ hours, $P = 506000$, after two hours, number of bacteria

$$\begin{aligned}A &= P \left(1 + \frac{R}{100}\right)^n \\&= 5,06,000 \left(1 + \frac{2.5}{100}\right)^2 = 5,06,000 \left(1 + \frac{25}{1000}\right)^2 \\&= 5,06,000 \left(1 + \frac{1}{40}\right)^2 = 5,06,000 \times \left(\frac{41}{40}\right)^2 \\&= \frac{5,06,000 \times 41 \times 41}{40 \times 40} = 5,31,616.25\end{aligned}$$

Hence, number of bacteria after two hours are 531616.

Q.12 A scooter was bought at Rs 42,000. Its value depreciated at the rate of 8% per annum. Find its value after one year.

Sol: Given, $P = \text{Rs } 42000$, $n = T = 1$ year, $R = 8\%$ per annum

$$\begin{aligned}A &= P \left(1 - \frac{R}{100}\right)^n = 42000 \left(1 - \frac{8}{100}\right)^1 = 42000 \left(\frac{92}{100}\right)^1 \\&= \frac{42000 \times 92}{100} = 420 \times 92 \\&= \text{Rs } 38,640\end{aligned}$$

Hence, the value of scooter after one year is Rs 38,640.