Comparing Quantities: Exercise 8.3

Q.1 Calculate the amount and compound interest on
(a) Rs. 10,800 for 3 years at 1212% per annum compounded annually.
(b) Rs. 18,000 for 212 years at 10% per annum compounded annually.
(c) Rs. 62,500 for 112 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 SI formula to verify).
(e) Rs. 10,000 for 1 year at 8% per annum compounded half yearly.

***Sol.* (a) Given:** Principal amount (P) = Rs 10,800,

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

Number of years (n) = 3.

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

$= 10800\left(1+\frac{25}{2x100}\right)^3$

$= 10800\left(\frac{225}{200}\right)^3$

$= 10800\left(\frac{225}{200}x\frac{225}{200}x\frac{225}{200}\right)$

= Rs. 15377.34

Thus, Compound Interest, C.I. = A – P
= 15377.34 – 10800
= Rs. 4,577.34

(b) Given: principal amount (P) = Rs 18,000,
Rate (R) = 10%,

Number of years (n) = $2\frac{1}{2}$ years

Firstly calculate for first 2 years:

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

= Rs. $18000\left(1+\frac{1}{10}\right)^2$

= Rs. $\left(18000\ x\frac{11}{10}x\frac{11}{10}\right)$

= Rs. 21,780

Now for calculation of S.I. for next 6 months:

$$S.I. = \frac{21780x\frac{1}{2}x10}{100}$$

= Rs. 1089

Thus, interest for the first 2 yr = Rs. (21780 - 18000)
= Rs. 3780

And interest for next $\frac{1}{2}$ year = Rs. 1,089

Thus, total C.I. = Rs. 18000 + Rs. 4869
= Rs. 22,869

(c) Given: Principal amount (P) = Rs 62,500,
Rate(R) = 8% per annum or 4% per half year,

Number of years (n) = $1\frac{1}{2}$

Since there are 3 half years in $1\frac{1}{2}$ year.

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

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

$= 62500\left(\frac{26}{25} x \frac{26}{25} x \frac{26}{25}\right)$

= Rs 70304

Thus, Compound Interest, C.I. = A – P
= Rs (70304 – 62500)
= Rs 7,804

(d) Given: Principal amount (P) = Rs 8,000,

Rate(R) = 9% per annum or $\frac{9}{2}$ % per half year,

Number of years (n) = 1.
Since there are 2 half years in 1 year.

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

$= 8000\left(1+\frac{9}{200}\right)^2$

$= 8000\left(\frac{209}{200} x \frac{209}{200}\right)$

= Rs. 8736.20

Thus, Compound Interest, C.I. = A – P
= Rs. (8736.20 – 8000)
= Rs. 736.20

(e) Given: Principal amount (P) = Rs 10,000,
Rate(R) = 8% per annum or 4% per half year,
Number of years (n) =1.
Since there are 2 half years in 1 year.

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

$= 10000\left(1+\frac{4}{100}\right)^2$

$= 10000\left(\frac{26}{25} x \frac{26}{25}\right)$

= Rs 10,816

Thus, Compound Interest, C.I. = A – P

= Rs (10816 – 10000)

= 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:** Borrowed amount, principal (P) = Rs. 26,400,
Rate(R) = 15% per annum compounded yearly,

Number of years (n) $= 2\frac{4}{12}$ years $= 2\frac{1}{3}$

Firstly, calculation for first 2 years:

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

$= 26400\left(1+\frac{15}{100}\right)^2$

$= 26400\left(\frac{115}{100}\right)^2$

$= 26400\left(\frac{115}{100} x \frac{115}{100}\right)$

= Rs. 34,914

Now, Calculation for next $\frac{1}{3}$ years:

$$S.I. = \frac{34914 x \frac{1}{3} x 15}{100}$$

= Rs. 1,745.70

Now, interest for the first two years = Rs. (34914 – 26400)

= Rs. 8,514

And interest for the next $\frac{1}{3}$ year = Rs. 1,745.70

Therefore, Total compound interest, C.I. = 8514 + 1745.70 = Rs. 10,259
Thus, Amount = P + C.I.
= Rs. 26400 + Rs. 10259.70
= 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.* Given:** Borrowed amount, principal (P) = Rs. 12,500,
Rate(R) = 12% per annum,
Number of years (n) = 3 years.

Simple Interest (S. I.) for Fabina = $\frac{PxRxT}{100} = \frac{12500 \times 12 \times 3}{100}$ = Rs. 4500

For calculation of Radha:
Borrowed amount, Principal (P) = Rs 12,500,
Rate(R) = 10% per annum,
Number of years (n) =3 years

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

$= 12500\left(1+\frac{10}{100}\right)^3$

$= 12500\left(\frac{110}{100} x \frac{110}{100} x \frac{110}{100}\right)$

= Rs 16,637.50

Therefore, Compound Interest, C.I. = A – P
= Rs (16637.50 – 12500)
= Rs 4,137.50

The difference between Fabina's and Radha's interest = Rs (4500 – 4137.50)
= Rs 362.50
Thus, Fabina pays more of amount Rs 362.50.

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:** borrowed amount, principal (P) = Rs 12,000
Rate(R) = 6% per annum,
Number of years (n) = 2 years.

Since, simple interest, S. I. = $\frac{PxRxT}{100} = \frac{12000 \times 6 \times 2}{100}$ = Rs. 1,440

Now, calculation for Compound Interest (C.I.):

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

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

$$= 12000\left(\frac{106}{100}\text{x}\frac{106}{100}\right)$$

= Rs 13,483.20

Thus, Compound Interest = A – P

= Rs. 13483.20 – Rs. 12000

= Rs. 1,483.20

Now, for extra amount = C.I. – S.I.

= Rs. 1,483.20 – Rs. 1,440

= Rs. 43.20

Thus, extra amount to be paid = Rs. 43.20

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: Vasudevan invested amount, principal (P) = Rs 60,000,
Rate(R) = 12% per annum = 6% per half year,
Number of years (n) = 6 months or 1 half year.

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

$$= 60000\left(1+\frac{6}{100}\right)^1$$

$$= 60000\left(\frac{106}{100}\right)$$

= Rs 63,600

(ii) For for 1 year calculation,
Since, in 1 year 2 half years. So, n = 2.

$$A = 60000\left(1+\frac{6}{100}\right)^2$$

$$= 60000\left(\frac{106}{100}\text{x}\frac{106}{100}\right)$$

= Rs 67,416

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. **(i) Given:** Loan amount, principal (P) = Rs 80,000,
Rate(R) = 10% per annum,

Number of years (n) = $1\frac{1}{2}$ half year.

Now, calculation of compound interest for 1st year:

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

$= 80000\left(1+\frac{10}{100}\right)^{1}$

$= 80000\left(\frac{110}{100}\right)^{1}$

= Rs 88,000

Calculation of simple interest for next $\frac{1}{2}$ year by taking Rs. 88,000 as principal:

S.I. = $\frac{PxRxT}{100} = \frac{88000\times10\times12}{100}$ = Rs. 4,400

Therefore, interest for first year = Rs 88,000 – Rs 80,000
= Rs 8,000

And interest for $\frac{1}{2}$ year = Rs 4,400

Thus, compound interest, C.I. = Rs. 8,000 + Rs. 4,400
= Rs. 12,400

Thus, Total amount with compound interest = Rs. (80000 + 12400)
= Rs. 92,400

(ii) Now calculation for the interest compounded half yearly:
Rate(R) = 10% per annum or 5% per half yearly.

Since, there will be three half years in $1\frac{1}{2}$ years.

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

$A = 80000\left(1+\frac{5}{100}\right)^{3}$

$= 80000\left(\frac{105}{100}x\frac{105}{100}x\frac{105}{100}\right)$

= Rs 92,610

Thus, the difference between both the amount amounts = Rs 92,610 – Rs 92,400
= 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.* (i) Given:** Maria investment, principal (P) = Rs 8,000,

Rate(R) = 5% per annum,
Number of years (n) = 2 years.

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

$$A = 8000\left(1+\frac{5}{100}\right)^2$$

$$= 8000\left(\frac{105}{100} \text{ x } \frac{105}{100}\right)$$

= Rs 8,820

Thus, amount credited against her name at the end of the second year = 8820 Rs.

(ii) Now, calculating S.I. for next year by taking principle amount = Rs 8,820

S.I. = $\frac{8820 \times 5 \times 1}{100}$ = Rs 441

Thus, The interest for the 3rd year = 441 Rs.

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:** principal (P) = Rs 10,000
Rate(R) = 10% per annum or 5% per half year,

Number of years (n) = $1\frac{1}{2}$ years

In year $1\frac{1}{2}$ there are 3 half years.

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

$$A = 10000\left(1+\frac{5}{100}\right)^3$$

$$= 10000\left(\frac{105}{100} \text{ x } \frac{105}{100} \text{ x } \frac{105}{100}\right)$$

= Rs. 11,576.25

So, Compound Interest C.I. = A – P
= Rs 11576.25 – Rs 10000
= Rs 1,576.25

Now, calculation for amount of first year:

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

$$A = 10000\left(1+\frac{10}{100}\right)^1$$

$= 10000\left(\frac{110}{100}\right)$

= Rs. 11,000

Now, Simple interest for next half year by taking Rs. 11,000 as principal:

$$S.I. = \frac{11000 \times 10 \times \frac{1}{2}}{100}$$

= Rs. 550

Therefore, interest for the first year = Rs. 11000 – Rs. 10000

= Rs. 1000

So, Compound Interest, C.I. will be = Rs. 1000 + Rs. 550

= Rs. 1,550

Therefore, the interest will be higher when the interest is compounded half a year when compared to the interest compounded annually.

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:** Principal (P) = Rs. 4,096,

Rate(R) = $12\frac{1}{2}$% per annum or $\frac{25}{4}$% per half year,

Number of months = 18

Since, 18 months = 3 half years,

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

$$A = 4096\left(1+\frac{25}{400}\right)^3$$

$$= 4096\left(\frac{425}{400} \times \frac{425}{400} \times \frac{425}{400}\right)$$

= Rs 4,913

Thus, the required amount = Rs. 4,913

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:** population in 2003 = 54,000

Thus, 54000 = Population in 2001 $\left(1+\frac{5}{100}\right)^2$

So, Population in 2001= $54000 \times \left(\frac{20}{21} \times \frac{20}{21}\right)$

= Rs 48979.59

Thus, the population in the year 2001 = 48,980 (approx).

(ii) Now, population in 2005 = $54000 \text{ x } \left(1+\frac{5}{100}\right)^2$

$= 54000 \text{ x } \left(\frac{21}{20} \text{x} \frac{21}{20}\right)$

= 59,535

Thus, the population in the year 2005 = 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:** Initial count of bacteria = 5,06,000

Now, bacteria at the end of 2 hours = $506000 \text{ x } \left(1+\frac{2.5}{100}\right)^2$

$= 54000 \text{ x} \left(\frac{41}{40} \text{x} \frac{41}{40}\right)$

= 5,31,616.25

Thus, the count of bacteria at the end of 2 hours = 5,31,616 (approx.)

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:** Scooter amount, principal (P) = Rs. 42,000

Rate = 8% per annum

Depreciation = 8% of Rs 42,000 per year

$= \frac{42000 \times 8 \times 1}{100}$

= Rs 3,360

THus, value after one year = Rs 42000 – Rs 3360

= Rs 38,640