3. SIMPLE & COMPOUND INTEREST
Introduction to the Topic

Whenever we keep any amount in bank, we receive interest. The interest is usually specified as, say 10% per annum. The 10% per annum means that if Rs. 100 is the money invested, one would receive 10% of this *i.e.* Rs. 10 every year. Thus the amount of Interest received depends on the principal that is invested and also on the number of years that the money is invested for.

Basically we can say that our money invested grows at 10% every year. Thus this concept of Interest can be applicable in many situations wherever growth (or for that matter decline) is present and is not limited to just banks or monetary parameters.

Relevance in CAT

The concept of Simple and Compound interest is of the very few topics which attract direct questions in the exam. Questions generally come from different areas which include direct questions on simple and compound interest, installments, future value and present value. If prepared well, one can solve questions pretty quickly and efficiently.

The basic terminology which we come across are:

Principal	Denoted by *P*, is the original sum borrowed/invested.
Interest	Denoted by *I*, is the amount which is paid by borrower.
Rate of Interest	Denoted by *r*, is the rate at which interest is calculated.
Amount	Denoted by *A*, is the final sum that one gets which includes principal as well as interest.
Time period	Denoted by *t* or *n*, is the time interval for which money is borrowed/for using the lender's money .

There are two ways of calculating interest:
I. Simple Interest
II. Compound Interest

Simple **Interest,** in any time period, is calculated as a percentage of the initial amount invested. Thus in Simple Interest the Interest in any year is always constant. This constant amount is a fixed % of original value.

Compound **Interest,** in any time period is calculated as a percentage of the latest principal.

Thus the interest earned in earlier time periods get added to the initial investment and this new sum is considered to be reinvested and interest is calculated on this new amount.

Simple Interest

In simple interest, principal is constant and interest for each time period is calculated on the same principal.

   The interest payable on the principal is known as simple interest.

Simple Interest (S.I.) = $\dfrac{P \times R \times T}{100}$

Where P = Principal or sum being borrowed.
R = Rate of interest per year.
T = Time period for which the amount is borrowed.
   Amount = Principal + Simple Interest

If T is not a whole number, then the period is represented as a fraction of the year, *i.e.*, 1 month = $\dfrac{1}{12}$ th of a year.

The following table gives an example of how simple interest exactly works. Let principal at the beginning of 1st year be Rs. 100 and rate of interest 10% per annum. Details are shown below:

	Under Simple Interest			
Year	Principal at the beginning of the year	Interest for the year	Interest till the end of the year	Amount at the end of the year
1	100	10	10	110
2	100	10	20	120
3	100	10	30	130
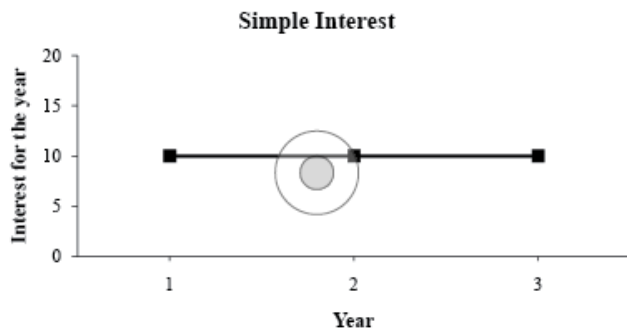
Simple Interest

Please also note down the following observations from the table.
1.   The simple interest earned every year is constant and equal to Rs. 10, which is 10% of the principal.
2.   The principal in the case of SI is always the same at the beginning of every year.
3.   In case of simple interest, yearly amounts are in Arithmetic Progression.

Example 1: Calculate the interest to be paid on a principal of Rs. 15,000 borrowed at a rate of 10% for a period of 3 years and 6 months?
Solution:

S.I. = $\dfrac{P \times R \times T}{100}$

where, $P = 15000$, $R = 10$ and $T = 3.5$

So, S.I. = $\dfrac{(15000 \times 10 \times 3.5)}{100}$ = Rs. 5250

Example 2: At what simple rate of interest shall a sum of money double itself in 5 years?

Solution:

We can say that the amount received by the lender is double the amount given, so, Interest = Principal.

So, if x is the Principal, then x is the Simple Interest.

Or, $x = \dfrac{(x \times R \times 5)}{100}$ Or, R $= \dfrac{100}{5} = 20\%$

Example 3: Suppose a certain sum doubles in five years under simple interest, in how many years would it become 6 times itself at the same rate of interest?

Solution:

If P is sum, the amount at the end of five years will be $2P$ (as the sum doubles).

Since Amount = Principal + Interest, the interest for five years is P.

If the sum has to become 6 times itself the amount should be $6P$, out of which P is the principal and the balance $5P$ is the interest.

Since the interest is P for five years, we get the interest of $5P$ in 25 years (as interest is same every year under simple interest).

The sum becomes 6 times itself in 25 years.

Example 4: Rajat took a loan from a bank at the rate of 8% per annum simple interest and gave the same amount to Ashish as a loan at the rate of 12% per annum. If at the end of 12 years, he made a profit of Rs. 320 in the deal, what was the amount he borrowed?

Solution:

Let the original amount be Rs. x. Then,

$\dfrac{x \times 12 \times 12}{100} - \dfrac{x \times 8 \times 12}{100} = 320$

$\Rightarrow x = \dfrac{2000}{3} = $ Rs. 666.67

Alternate Method:

Rajat gave at the rate of 12% and took at the rate of 8%. Here his net profit is $12 - 8 = 4\%$

If the original sum = x, $\dfrac{x \times 12 \times 4}{100} = 320$ and $x = $ Rs. 666.67

Example 5: The rates of simple interest offered by banks A and B are in the ratio 7 : 8. Tarun wants to deposit his total savings in two banks in such a way that he receives equal half yearly interest from both. In what ratio, he should deposit his savings in both the banks?

Solution:

Let the savings be X and Y and the rates of simple interest be $7x$ and $8x$ respectively. Then,

$X \times 7x \times \dfrac{1}{2} \times \dfrac{1}{100} = Y \times 8x \times \dfrac{1}{2} \times \dfrac{1}{100}$ or

$\dfrac{X}{Y} = \dfrac{8}{7}$

i.e., $X : Y = 8 : 7$

Therefore, he should deposit his savings in ratio of 8 : 7.

Compound Interest

Compound Interest, in any time period, is calculated as a percentage of the amount outstanding at the start of the time period and not the initial investment.

Here, the increase happens by a constant % every time.

The following table gives an example of how compound interest exactly works. Let principal at the beginning of 1st year, be Rs. 100 and rate of interest 10% per annum. Details are shown below:

Year	Under Compound Interest			
	Principal at the beginning of the year	Interest for the year	Interest till the end of the year	Amount at the end of the year
1	100	10	10	110
2	110	11	21	121
3	12	12.1	33.1	133.1

Compound Interest (C.I.) = $P\left(1 + \dfrac{r}{100}\right)^n - P$

where,
P = Principal ;
r = Rate of Interest ;
n = Time period, and
Amount = $P\left(1 + \dfrac{r}{100}\right)^n$

Please also note down the following observations from the table.
1. The principal for C.I. was increasing constantly. The interest earned each year was added onto the principal at the end of that year and the resultant was the principal for the next year.
2. The increase in the interest earned each year on account of C.I. was equal to 10% of the interest earned in the previous year
3. In case of compound interest, yearly amounts are in Geometric Progression

Some important points

- If the word interest is given and nothing else is specified, the interest is considered as S.I.
- If the interest is given by bank and nothing is specified, it is always C.I.
- Population growth is always taken on compounding basis.

Example 6: What shall be the amount for a sum of Rs. 1,000 at 10% for 3 years compounded annually?
Solution:
Using formula,

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

$= 1000\left(1 + \dfrac{10}{100}\right)^3 = 1331$

Alternate Method:

We can done this with the help of multiplying factor as well

Multiplying factor for 10% increase is 1.1

So, $A = 1000(1.1)^3$

$= 1331$

So, amount at the end of 3 years in case of Compound Interest (C.I.) is Rs. 1331.

Example 7: Find the compound interest on Rs. 5000 at 9% per annum for 2 years, compounding being done annually.
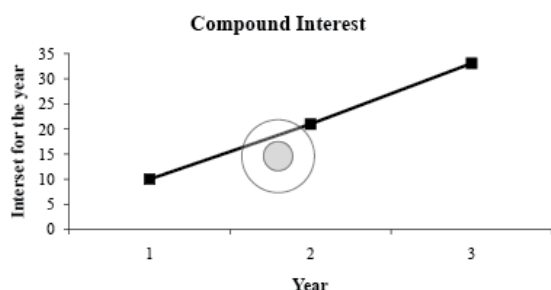
Solution:

We can find out compound interest by successive increase method. Because there are two successive increment of 9%.

i.e. $9 + 9 + \dfrac{9 \times 9}{100} = 18.81\%$

$\left[\text{using } x + y + \dfrac{xy}{100} \text{ formula} \right]$

Hence, Compound Interest $= \dfrac{18.81}{100} \times 5000 = $ Rs. 940

Compound Interest

Non-Annual Compounding

Process of adding interest earned back to the principal every six months is called semi-annual compounding.   Compounding can be done with any frequency and not just annual or semi-annual. The interest earned every quarter or every month or for that matter everyday can be added back to the principal and this new sum can be considered as principal for next quarter or next month or next day respectively.

The only thing to be considered is that in the formula '*r*' refers to the rate of interest per period (year if annual compounding, 6 months if semi-annual compounding or 1 month if monthly compounding) and '*n*' refers to the number of time periods. Thus if it is given that compounding happens every quarter and money is invested at 12% per annum for 5 years, then '*r*' to be used in the formula is $= \dfrac{12}{4} =$ 3% per quarter and '*n*' will be $5 \times 4 = 20$ quarters.

Higher the frequency of compounding, the more beneficial it will be for us as consumers keeping money in a bank.

Let us see the effect of frequency of compounding on rate of interest '*r*' and time period '*n*' through the following table.

	Compounding done in a year	Interest added to principal after every	Rate (*r*) of interest	Time '*n*' period
Annually	1	1 year	*R*	*n*

Semi-Annually	2	6 months	$\dfrac{R}{2}$	$n \times 2$
Quarterly	4	3 months	$\dfrac{R}{4}$	$n \times 4$
Monthly	12	1 month	$\dfrac{R}{12}$	$n \times 12$

When compounding is done more than once a year, the rate of interest given in the problem is called **Nominal Rate of Interest.**

A rate of interest which will yield simple interest in one year equal to the interest obtained under the compound interest at the given nominal rate of interest is called **Effective Rate of Interest.**

Example 8: Find amount for Rs. 50,000 at 20% per annum, compounded semi-annually for 2 years.

Solution:

Here $n = (2 \text{ years}) \times 2 = 4$ periods

Similarly, $R = \dfrac{20}{2} = 10\%$ per time period

(As interest compounded semi-annually)

$P = 50,000$

$A = 50000 \left(1 + \dfrac{10}{100}\right)^4 = 50000 \times 1.4641 = \text{Rs. } 73205$

Example 9: Find C.I. on Rs. 40,000 at 10% for 9 months compounded quarterly.

Solution:

$n = 3$ periods, $R\left(\dfrac{10}{4}\right) = 2.5\%$ per period and $P = \text{Rs. } 40,000$

$\text{Amount} = 40000 \left(1 + \dfrac{2.5}{100}\right)^3 = \text{Rs. } 43076 \text{ (approx.)}$

C.I. = Amount − Principal = 43076 − 40000 = Rs. 3076

Some important points

- The difference between the Compound Interest and Simple Interest on a certain sum for two years is equal to the interest calculated for one year on one year's Simple Interest.

- The difference between the Compound Interest for k years and the Compound Interest for $(k + 1)$ years is the interest for one year on the amount at the end of kth year.

Example 10: The difference between the C.I. and S.I. on a certain amount at 10% per annum for 2 years, compounded annually is Rs. 482. Find the principal.

Solution:

For 1$^{\text{st}}$ period, S.I. = C.I.

The difference between the values of C.I. and S.I. is because of accumulated interest building on interest which is reinvested.

Therefore, for period 2, the difference between C.I. and S.I. is the interest on the interest for period 1.
In the above example, the difference being 482 is the interest generated on interest for period 1.
10% of interest for Period 1 = Rs. 482

Interest for Period 2 = Rs. $482 \times \dfrac{100}{10}$ = Rs. 4820

10% of Principal = 4820

Therefore, Principal = Rs. $4820 \times \dfrac{100}{10}$ = Rs. 48200

Example 11: An amount is invested in bank at compound interest. The amounts after 1st and 3rd years are Rs. 1200 and Rs. 1587, respectively. What is the rate of interest?

Solution:

Let the amount invested be A and the rate of interest be r.

$\Rightarrow$ Therefore $A\left(1 + \dfrac{r}{100}\right) = 1200$ and $A\left(1 + \dfrac{r}{100}\right)^3 = 1587$.

Dividing the 2nd equation by the 1st we get

$\left(1 + \dfrac{r}{100}\right)^2 = \dfrac{1587}{1200} \Rightarrow \left(1 + \dfrac{r}{100}\right)^2 = \dfrac{529}{400}$

$\Rightarrow 1 + \dfrac{r}{100} = \dfrac{23}{20}$

$\Rightarrow r = 15\%$

Example 12: Manu bought a scooty for Rs. 70,000. He paid Rs. 20,000 as down payment and the rest he agreed to pay after 3 years with simple interest on the remaining amount at the rate of 10% per annum. How much more would he needs to pay?

a. Rs. 15,000   b. Rs. 15,600
c. Rs. 20,000   d. Rs. 18,500

Solution: (a)

The remaining amount he has to pay = 70000 − 20000 = 50000

∴ The interest which he would have to pay on the remaining amount

$= \dfrac{(50000 \times 10 \times 3)}{100}$ = Rs. 15,000

∴ He would have to pay Rs. 15,000 more.

Example 13: Megha had to pay a loan of Rs. 1,12,880 in 2 annual installments where the first payment is half of the second payment. If the interest is calculated annually at the rate of 5% per annum on the balance amount, then what is the first payment.

a. Rs. 40,464   b. Rs. 40,580
c. Rs. 40,803   d. Rs. 40,580

Solution:

Principal = Rs. 1,12,880

Interest for the first year = (5% of 112880)

Amount to be paid after 1 year (1.05 × 112880) = Rs. 1,18,524

If first installment is x, then principal for second year

= 118524 − x

Amount to be paid after 2 years = second installment

= 1.05 × (118524 − x)

However, second installment = 2 × first installment

∴ $1.05 \times (118524 - x) = 2x$

∴ $x = $ Rs. 40,803

Depreciation of Value

Fall in the value of any asset because of factors like wear and tear, outdated technology, usage etc. is called depreciation. If P is the original value and r is the rate of depreciation per year, then the final value (F) after n number of years is given by the formula,

$$F = P \times \left(1 - \frac{r}{100}\right)^n$$

Example 14: A building having value of 7,29,000 is constructed on land worth Rs. 13,31,000, if the worth of the land depreciates at 10% per annum and that of the building appreciates at the rate of 10% per annum then in how many years value of both will be same.

a. 1.5　　　b. 2　　　c. 2.5　　　d. 3

Solution: (d)

Let n be the number of years after which the worth of the land and building become equal.

$$= 1331000 \times \left(1 - \left(\frac{10}{100}\right)\right)^n = 729000 \times \left(1 + \left(\frac{10}{100}\right)\right)^n$$

$$\therefore \frac{110^3}{90^3} = \frac{(1 + 0.1)^n}{(1 - 0.1)^n}$$

$$\therefore \frac{110^3}{90^3} = \left(\frac{1.1}{0.9}\right)^n$$

$$\therefore \left(\frac{110}{90}\right)^3 = \left(\frac{110}{90}\right)^n$$

$$\therefore n = 3$$

Hence, after 3 years both will have the same value.

Example 15: Vipin purchased a car 3 years ago for Rs. 6 lakh. Its value depreciated each year at 25% per annum. What is the present value of the car?

Solution:

$$6,00,000\left(1 - \frac{25}{100}\right)^3 = 6,00,000 \times \left(\frac{3}{4}\right)^3 = 2,53,125$$

Population

Let the original population of a town be P and the annual increase be r%, then the population in n years (P_n) will be given by,

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

If the annual decrease is r%, then the population in n years is given by a change of sign in the formula:

$$P_n = P \times \left(1 - \frac{r}{100}\right)^n$$

(We can also apply the concept of Compound Interest in calculation of population.)

Example 16: The population of a city at present is 40 million. It is observed that the rate of increase is 10% every year, then what will be the population of the city 5 years from now?

Solution:

$P = 40$ million, $r = 10\%$, n = 5 years

Hence, the population after 5 years = 40 million × $(1.10)^5 \approx 64.4$ million.

So, the population becomes 64.4 million after 5 years.

Growth Rate
This is generally used to state the growth of investments over a period of years.

Growth rates are mainly of two types:
I.   Average Annual Growth Rate (AAGR)
II. Compound Annual Growth Rate (CAGR)

The Average Annual Growth Rate, also known as the Simple Annual Growth Rate, is the arithmetic mean of the growth rates over a number of years.

For example, if an investment grows 10% in the first year, 15% in the second year and 14% in the third year, and 13% in the fourth years, then,

$$\text{AAGR} = \frac{(10 + 15 + 14 + 13)}{4} = 13\%$$

Compound Annual Growth Rate is the consistent growth in value of an investment year after year. It's rarely real. It is the rate at which an investment would grow if it were to grow at a consistent rate.

The absolute growth is the difference between the final value and the initial value.

Formulas **Concerning Growth Rates':**

Absolute Growth = Final Value − Initial Value

Growth Rate of a year

$$= \frac{\text{Final Value} - \text{Initial Value}}{\text{Initial Value}} \times 100$$

$$\text{CAGR} = \left(\frac{\text{Final Value}}{\text{Initial Value}} \right)^{\frac{1}{\text{number of years}}} - 1$$

SAGR or AAGR

$$= \frac{\text{Sum of the Growth Rates (as a \%) of all the years}}{\text{Number of Years}}$$

For example, in the example stated for AAGR, an amount of Rs. 10,000 would grow to Rs. 14,421 in 3 years.

$$\text{The CAGR} = \left(\frac{14421}{10000} \right)^{\frac{1}{3}} - 1 = 0.1297 = 12.97\%$$

This is the same value you would have got had you used Geometric Mean to find compound interest, as follows:

$$= \sqrt[3]{1.1 \times 1.15 \times 1.14} - 1 = \sqrt[3]{1.4421} - 1 = 12.97\%$$

The value of CAGR is always less than the AAGR.

In the above example only, if we want to calculate CAGR, then it will be

$$= \sqrt[4]{1.1 \times 1.14 \times 1.13 \times 1.15} - 1 = 12.98\%$$

Directions for questions 17 to 19: Refer to the graph and answer the questions that follow.

Revenue of XYZ Ltd. from 2005 to 2010.

Example 17: By how much percent has the revenue increased from 2005 to 2010?

Solution:

Revenue in 2005 = Rs. 8 crores and the revenue in 2010 = Rs. 18 crores.

Required percentage or Growth Rate

$$= (18 - 8) \times \frac{100}{8} = 125\%$$

Example 18: Calculate Simple Annual Growth Rate of revenue in the given period 2005 to 2010?

Solution:

$$\text{Simple Annual Growth Rate} = \frac{\text{Growth Rate}}{\text{Number of Years}}$$

$$= \frac{125}{5} = 25\%$$

Example 19: Find the compounded annual rate of growth of revenue in the period 2005 to 2010?

Solution:

$$\text{CAGR} = \left(\frac{\text{Final Value}}{\text{Initial Value}} \right)^{\frac{1}{\text{number of years}}} - 1$$

$$\text{CAGR} = \left(\left(\frac{18}{8} \right)^{\frac{1}{5}} - 1 \right) \times 100$$

$$= (1.176 - 1) \times 100$$

$\therefore$ Rate of interest = 17.6%

1. Find the simple interest on Rs. 8000 for 5 years at 6% per annum.
    a. 1200   b. 2400   c. 4200   d. 4000

2. What sum would amount to Rs. 39930 in three years at the rate of 10% per annum compound interest?
    a. 22000   b. 30000   c. 28000   d. 32000

3. What principal would amount to Rs. 12800 in 6 years at the rate of 10% p.a. simple interest?
    a. 12000   b. 6000   c. 8000   d. 10000

4. How much will Rs. 20000 approximately amount to in 2 years at 15% p.a. The interest being compounded semi - annually?
    a. 27809   b. 27609   c. 26709   d. 28709

5. If Rs. 8000 has been lent at 10% p.a. The interest being compounded annually, what is the interest for third year?
    a. 986   b. 968   c. 869   d. 896

6. If Rs. 4000 becomes Rs. 4800 in 2 years, what will Rs. 6000 become at the end of 4 years at the same rate of interest, under simple interest?
    a. 3600   b. 2400   c. 8400   d. 7200

7. *X* takes Rs. 3000 from *Y* for 2 years at the rate of 10% half-yearly interest. What amount will be paid by *X* to *Y* after the end of 2 years?
    a. 4000   b. 4200   c. 2800   d. 3600

8. A sum at simple interest of 4% per annum amounts to Rs. 6240 in 5 years. Find the sum.
    a. 3000   b. 5200   c. 5000   d. 4800

9. A sum of money becomes five times in 20 years at S.I. Find the rate of interest.
    a. 25%   b. 20%   c. 15%   d. 18%

10. Simple interest for the sum of Rs. 1500 is Rs. 30 in 4 years. Find the rate of S.I.
    a. 7.5%   b. 2%   c. 0.5%   d. 5%

11. Simple interest for a sum of Rs. 1550 for 2 years is Rs. 60 more than the simple interest for Rs. 1450 for the same duration. Find the rate of interest.
    a. 15%   b. 30%   c. 10%   d. 20%

12. A sum of Rs. 500 amounts to Rs. 650 in 3 years at simple interest. If the interest rate is increased by 4%, it would amount to how much?
    a. 910   b. 810   c. 710   d. 610

13. Find the compound interest on Rs. 10,000 at 4% p.a. for 2 years, compounded annually.
    a. 820   b. 832   c. 816   d. 824

14. Find the compound interest on Rs. 8000 in 2 years at 4% p.a., the interest being compounded half yearly?
    a. 728.18   b. 659.45   c. 458.26   d. 589.48

15. Find the compound interest on Rs. 16000 at 20% p.a. for 9 months, compounded quarterly.
    a. 3533   b. 5252   c. 2522   d. 4252

16. Find the interest Mr. Omar gets on a sum of Rs. 100000 deposited in a bank for 4 years which offers 12% per annum simple rate of interest.
    a. Rs. 48000 b. Rs. 32000 c. Rs. 28000 d. Rs. 80000

17. A sum of money invested for 5 years at $7\frac{1}{2}$% per annum yields Rs. 180000 simple interest. What is the total amount received at the end of 5 years?
    a. Rs. 400000   b. Rs. 480000
    c. Rs. 540000   d. Rs. 660000

18. The simple interest on a sum of money is $\frac{1}{16}$ of the principal, and the number of years is equal to the rate per annum. Find the rate percent.
    a. 5.4   b. 2.5   c. 3.5   d. 4.8

19. At what rate will a sum of money double itself with simple interest in 10 years?
    a. 15%   b. 12.5%   c. 10%   d. 8%

20. In how many years will a sum of Rs. 800 at 10% per annum compounded half yearly become Rs. 926.10?
    a. $2\frac{1}{2}$ b. 3   c. 2   d. $1\frac{1}{3}$

21. A sum of Rs. 400 would become Rs. 441 after 2 years at r% compound interest, find the value of 'r'.
    a. 15%   b. 5%   c. 10%   d. 20%

22. Rs. 12000 amounts to Rs. 15972 in 3 years at C.I. The rate of interest is?
    a. 20%   b. 10%   c. 6%   d. 7.5%

23. In what time period will Rs. 8000 amount to Rs. 12000 at 20% p.a. of simple interest?
    a. 3.25 years   b. 2.5 years
    c. 4.5 years   d. 6 years

24. The C.I. on Rs. 8000 for 3 years at 8% for first year, 10% for second year and 12% for third year will be?
    a. 2722.24   b. 2644.48   c. 2836.18   d. 2684.12

25. What is the time period in which a sum of money double itself at 20% per annum simple interest?
    a. 4 years   b. 5 years   c. 3 years   d. 6 years

Practice Exercise – Medium

1. A certain sum amounts to Rs. 7200 in 2 years and to Rs. 8640 in 3 years, interest being compounded annually. Find the principal?
    a. 4000   b. 5000   c. 6000   d. 7000

2. A certain sum at a certain rate of S.I. amounts to Rs. 2250 in 4 years and Rs. 2400 in 7 years. Find the sum and rate of interest.
    a. 3050, 3.52%   b. 5020, 2.43%
    c. 2050, 2.43%   d. 3050, 2.85%

3. Atif lent out a certain sum. He lent $\frac{1}{3}$ part of his sum at 7% S.I., $\frac{1}{4}$ part at 8% S.I. and remaining part at 10% S.I. If Rs. 765 is his total interest, then find the money lent out.
    a. 10,500   b. 6000   c. 9000   d. 7000

4. An amount becomes 6 times in 7 years when invested under S.I. at a certain rate. In how many years will the amount become 16 times of the original amount at the same rate?
    a. 28 years   b. 20 years   c. 21 years   d. 30 years

5. At what rate does a sum of money become $\frac{16}{9}$ times in 2 years, if compounded annually?
    a. 66.67%   b. 40%   c. 33.33%   d. 50%

6. Raman borrowed Rs. 21000 at the rate of 10% p.a. compound interest. If this amount has to be repaid in two equal annual instalments, find the amount of each instalment.
    a. 12400   b. 14200   c. 11200   d 12100

7. Modita borrowed Rs. 15000 at 10% p.a. He repaid Rs. 8000 at the end of the 1st year. What amount should he pay at the end of the 2nd year to completely discharge the loan, compound interest being reckoned annually?
    a. 9530   b. 9350   c. 8410   d. 8230

8. If the difference between the C.I. and S.I. at the end of 2 years for the same principal is Rs. 200. What is the principal amount? Rate is 5% per annum in both the cases.

a. Rs. 50,000   b. Rs. 80,000
c. Rs. 70,000   d. Rs. 60,000

9. Of a certain sum $\frac{1}{3}$ rd is invested at 3%, $\frac{1}{6}$ th at 6% and the rest at 8%. If the simple interest for 2 years from all these investments amount to Rs. 900, find the original sum.
a. Rs. 4000   b. Rs. 7500   c. Rs. 6000   d. Rs. 7000

10. Mr. J.R. Sahni has Rs. 12000 with him. He invested some money at 14% p.a. and the balance at 15% p.a. simple interest. After two years, he got Rs. 3500 as interest. Find the sums invested by him at 14% and 15% respectively.
a. Rs. 4000 and Rs. 8000
b. Rs. 5000 and Rs. 7000
c. Rs. 4800 and Rs. 7200
d. Rs. 3000 and Rs. 9000

11. Mr. sanket invested a total amount of Rs. 16500 for two years in two schemes A and B with rates of simple interest 10% and 12% respectively. If the total amount of interest earned was Rs. 3620, what was the amount invested in scheme B?
a. Rs. 8000   b. Rs. 8400   c. Rs. 7500   d. Rs. 9000

12. Meenakshi opened a boutique with an initial investment of Rs. 32000. In the first year, she incurred a loss of 5%. However, during the second year, she earned a profit of 10%, which rose to $12\frac{1}{2}$ % in the third year. Find a net profit for the entire period of 3 years.
a. Rs. 5400   b. Rs. 6520   c. Rs. 5620   d. Rs. 4800

13. A yearly payment to the servant is Rs. 90 plus one turban. The servant leaves the job after 9 months and receives Rs. 65 and a turban. Then, find the price of the turban.
a. Rs. 10   b. Rs. 15
c. Rs. 7.50   d. Cannot be determined

14. A man invests Rs. 3000 at the rate of 5% per annum. How much more should he invest at the rate of 8%, so that he can earn a total of 6% per annum?
a. Rs. 1200   b. Rs. 1300   c. Rs. 1500   d. Rs. 2000

15. A trader owes a merchant Rs. 10028 due in 1 year, hence the trader wants to settle the account after 3 months. If the rate of interest is 12% per annum, how much cash should he pay
a. Rs. 9025   b. Rs. 9200   c. Rs. 9600   d. Rs. 9200

Practice Exercise – Difficult

1. Ram borrowed Rs. *X* at the interest rate of 10% on a compound interest basis. He repaid Rs. 100 at the end of year 1, Rs. 200 at the end of year 2, Rs. 300 at the end of year 3 and Rs. 44 at the end of year 4 to repay his debt. What was *X*?
a. 517.64   b. 511.65   c. 528.61   d. 524.62

2. Saumya borrows Rs. 45000 from a bank at 10% compound interest. He repays it in three annual installments that are in arithmetic progression. He ends up paying Rs. 54000 totally. How much did he pay in year 1?
a. 21000   b. 19500   c. 16500   d. 18000

3. Mr. Sehgal left an amount of Rs. 510000 to be divided between his two sons aged 12 years and 10 years such that both of them would get an equal amount when each attain 18 years age. What is the share of elder brother if the whole amount was invested at 10% simple interest?
a. 160000   b. 24000   c. 180000   d. 270000

4. Stuti took loan from ICICI Bank for her 2 year course of PG diploma at IMT. She took a loan of Rs. 6 lakh such that she would be charged at 8% per annum. C.I. during her course and at 10% C.I. after the completion of course. She returned half of the amount which she had to pay on the completion of her studies and remaining after 2 years. What is the total amount returned by Stuti?

a. 10.311 lakh   b. 10.323 lakh
c. 10.52 lakh   d. None of these

5. A milkman had 1000 cows at the beginning of year 2011 and the no. of cows each year increases by 10% by giving birth (compounded annually). At the end of each year he doubles the no. of cows by purchasing the same no. of cows with him at the time. What is the no. of cows at the beginning of 2014?
   a. 9848   b. 10648   c. 10400   d. 8768

6. Pinku and Minku have equal amounts. Pinku invested all his amount at 10% compounded annually for 2 years amd Minku invested $\dfrac{1}{4}$ at 10% compound interest (annually) and rest at r% per annum simple interest for the same 2 years period. The amount received by both at the end of 2 years is same. What is the value of r?
   a. 11%   b. 11.5%   c. 10.5%   d. 12%

7. Ramit bought a rectangular plot (of land) in Gurgaon 5 years ago at the rate of Rs. 10000 per m^2. The cost of plot increases by 5% in every 6 years and the worth of a rupee falls down at the rate of 2% in every 5 years. What is the approximate value of the land per mt^2 25 years hence?
   a. 9850   b. 11300   c. 15000   d. 13100

8. There are two investment schemes offered by two different financial institutions X and Y as follows:
   Scheme X : Rate of interest = 10% per annum and period of maturity = 2 years
   Amount is returned with compound interest compounded annually.
   Scheme Y : Rate of interest = 11% per annum
   Amount is returned with simple interest.
   For what duration, should I invest Rs. 38,000 in scheme Y, so as to get same amount in return if I had invested in scheme X?
   a. $\dfrac{29}{11}$ years   b. $\dfrac{21}{11}$ years
   c. $\dfrac{31}{7}$ years   d. $\dfrac{17}{7}$ years

9. Asha puts some amount in bank and obtains an interest of Rs. 15 at the end of one year. She added Rs. 85 to this amount and put the whole amount again in the bank for another year. At the end of the 2nd year, Asha got Rs. 420 as total (interest + principal). What amount did she put in the begining and what is the rate of interest offered by the bank if the minimum amount that can be deposited in the bank is Rs. 75?
   a. 200, 4.5%   b. 300, 5%
   c. 300, 6%   d. 200, 7.5%

10. A certain sum of money is invested at a rate of 6% for one year. Then the entire amount is invested at 8% for the second year. This amount is invested at 10% for the third year, 12% for the fourth year and x% for the fifth year. If this generates the same interest as a sum of money invested at a rate of 10% per annum compound interest for 5 years, find x?
   a. 6.58%   b. 8.35%   c. 4.28%   d. 5.69%