Simple and Compound Interest- Key Notes

Important formula and equations

Principal: The money borrowed or lent out for a certain period is called the principal or the sum.
Interest: Extra money paid for using other's money is called interest.
Simple Interest (SI): If the interest on a sum borrowed for certain period is reckoned uniformly, then it is called simple interest.

Let Principal= P, Rate= R% per annum (p.a) and Time= T years. Then
(i) Simple Interest= $(P*R*T)/100$
(ii) $P = (100*SI)/(R*T)$; $R= (100*SI)/(P*T)$ and $T= (100*SI)/(P*R)$

Key notes on Simple Interest

A sum of money becomes n times itself in T years at simple interest, then the rate of interest is
Rate= $\dfrac{100(n-l)}{T}$%

If a sum of money becomes n times in T years at SI then it will be m times of itself in ..... years
Required time= $\dfrac{(m-l)*T}{(n-l)}$ years

If SI on a sum of money is 1/xth of the principal and the time T is equal to the rate percent R, then
Rate= Time= $\sqrt{100/x}$

A certain sum is at SI at a certain rate for T years. And if it had been put at R1 % higher rate, then it would fetch Rs.x more, then the
Principal= $\dfrac{x*100}{T*R1}$

The annual payment that will discharge a debt of Rs.P due in T years at the arte of interest R% per annum is Annual payment =
$\dfrac{100P}{100T+RT\dfrac{(T-1)}{2}}$

Let the rate of interest for first 1 years is r1% per annum, for the next t2 years is r2 % per annum and for the period beyond that is r3 %. Suppose all together the simple interest for t3 years is Rs.I. Then
Principal= $\dfrac{100*I}{t1r1+t2r2+(t3-t1-t2)r3}$

The simple interest on a certain sum of money at r1 % per annum for t1 years is Rs.m. The interest on the same sum for t2 years at r2 % per annum is n.
Then the sum= $\dfrac{(m-n)*100}{r1t1-r2t2}$

Key notes on Compound interest

Compound Interest: (Amount - Principal)
Amount= $P* (1+R/100)^{n}$

When the interest is compounded K times a year, Amount= $P(1 + R / K*100)^{kt}$

When the interest is paid half yearly, say at r%per annum compound interest, then the amount after t years is given by:

$P(1 + R / 2*100)^{2t}$

Similarly, if the interest is paid quarterly, say at r% per annum compound interest, then the amount due after t years is given by:

$P(1 + r / 4 * 100)^{4t}$

Under the method of equated instalments, the value of each instalment is the same.

Equal Annual Instalment under

(a) Simple Interest, x = $\frac{2P(100 + nr)}{n[200 + (n - 1)r]}$

(b) Compound Interest, x = Pr / 100[1 – $(100/100 + r)^{n}$]

Exercise questions

1.A father left a will of Rs.35 lakhs between his two daughters aged 8.5 and 16 such that they may get equal amounts when each of them reach the age of 21 years. The original amount of Rs.35 lakhs has been instructed to be invested at 10% p.a. simple interest. How much did the elder daughter get at the time of the will?

A) Rs.17.5 lakhs
B)Rs.21 lakhs
C) Rs.15 lakhs
D) Rs. 20 lakhs

2.What will Rs.1500 amount to in three years if it is invested in 20% p.a. compound interest, interest being compounded annually?

A) 2400
B) 2592
C) 2678
D)2540

3. If a sum of money grows to 144/121 times when invested for two years in a scheme where interest is compounded annually, how long will the same sum of money take to treble if invested at the same rate of interest in a scheme where interest is computed using simple interest method?

A) 9 years
B) 22 years
C) 18 years
D)33 years

4. The population of a town was 3600 three years back. It is 4800 right now. What will be the population three years down the line, if the rate of growth of population has been constant over the years and has been compounding annually?

A) 6000

B) 6400
C) 7200
D)9600

5. A man invests Rs.5000 for 3 years at 5% p.a. compound interest reckoned yearly. Income tax at the rate of 20% on the interest earned is deducted at the end of each year. Find the amount at the end of the third year.
A) 5624.32
B)5630.50
C)5788.125
D)5627.20

6. The difference between the compound interest and the simple interest on a certain sum at 12% p.a. for two years is Rs.90. What will be the value of the amount at the end of 3 years?
A) 9000
B) 6250
C) 8530.80
D)8780.80

7. Vijay invested Rs.50,000 partly at 10% and partly at 15%. His total income after a year was Rs.7000. How much did he invest at the rate of 10%?
A) Rs.40,000
B)Rs.40,000
C)Rs.12,000
D)Rs.20,000

8. A sum of money invested for a certain number of years at 8% p.a. simple interest grows to Rs.180. The same sum of money invested for the same number of years at 4% p.a. simple interest grows to Rs.120 only. For how many years was the sum invested?
A) 25 years
B) 40 years
C) 33 years and 4 months
D)Cannot be determined

9. How long will it take for a sum of money to grow from Rs.1250 to Rs.10,000, if it is invested at 12.5% p.a simple interest?
A) 8 years
B) 64 years
C) 72 years
D)56 years

10. Rs.5887 is divided between Shyam and Ram, such that Shyam's share at the end of 9 years is equal to Ram's share at the end of 11
years, compounded annually at the rate of 5%. Find the share of Shyam.
A) 2088
B) 2000
C) 3087
D)None of these

Answer Key

Exercise Questions

1. The simple Interest on a certain sum of money at the rate of 4% p.a. for 5 years is Rs. 1680. At what rate of interest the same amount of interest can be received on the same sum after 4 years ?

a) 5%   b)6%   c)7%   d)8%

2. The interest on a certain deposit at 4.5% p.a. is Rs. 405 in one year. How much will the additional interest in one year be on the same deposit at 5% p.a. ?

a)Rs.50   b) Rs. 45   c)Rs.40.5   d)Rs. 48.5

3. Mr.Govind invested an amount of Rs.13900 divided in two different schemes S1 and S2 at the simple interst rate of 14% p.a. and 11% p.a. respectively. If the total amount of simple interest earned in two years was Rs.3508, what was the amount invested in Scheme S2?

   a) Rs.6400   b)Rs.6500   c) Rs.7200   d) Rs.7500

4. A sum of money was invested in a bank at 8% simple interest p.a. for 3 years. Instead had it been invested in mutual fund at 8.5% p.a. simple interest for 4 years, the earning would have been Rs.500 more. What is the sum invested?

a) Rs.4500   b) Rs.5000   c) Rs.3500   d) Rs. 5500

5. A person borrowed Rs.600 @ 3% per annum S.I and Rs.800 @ 4½ % per annum on the agreement that the whole sum will be returned only when the total interest becomes Rs.246. The number of years, after which the borrowed sum is to be returned, is

a) 2 years   b) 3years   c) 4 years   d) 5 years

6. A sum of Rs.13000 is divided into three parts such that the simple interests accrued on them for two, three and four years respectively may be equal. Find the amount deposited for 4 years.

a)5000 b) 6000   c)4000   d)3000

7. A sum of Rs.100 is lent at simple interest of 3% p.a. for the first month, 9% p.a. for the second month, 27% p.a. for the third month and so on. What is the total amount of interest earned at the end of the year approximately

a) Rs.797160   b) Rs.791160 c)Rs.65930   d) Rs.66430

8. If the simple interest on a sum of money at twelve percent per annum for two years is Rs.3800, compound interest on the same sum for the same period at the same rate of interest is

a) Rs.4028   b)Rs.4100   c)Rs.4128   d) 4228

9. A sum of money is borrowed and paid back in two annual installments of Rs.882 each allowing 5% compound interest. The sum borrowed was :

a) Rs.1620   b) Rs. 1640   c)Rs.1680 d)Rs.1700

10. Rakesh invested an amount of Rs.12000 at the rate of 10% simple interest and another amount at the rate of 20% simple interest. The total interest earned at the end of one year on the amount invested became 14 p.c.p.a. Find the total amount invested .

a) Rs.20000   b)Rs.22000   c) Rs.24000   d) Rs.25000

11.The rate fo simple interest in two banks is in the ratio of 4 : 5 . Amith wants to deposit his total saving in these two banks in such a way that he should receive equal half yearly interest from both. He should deposits the saving in the banks in the ratio of:

a) 2 : 5   b)5 : 4 c) 5 : 3   d)4 : 5

12. A sum of money becomes triple itself in 16 years. In how many years will it become 5 times at the same rate?

a) 32   b) 15   c) 27 d) 30

13. The compound interest on Rs.30,000 at 7% per annum is Rs. 4347. The period (in years) is:

a) 2   b) 2 ½   c) 3   d) 4

14. At what rate of compound interest per annum will a sum of Rs.1200 become Rs.1348.32 in 2 years?

a) 6%   b) 6.5%   c)7%   d) 7.5%

15. If the simple interest on a sum of money for 2 years at 5% per annum is Rs.50, what is the compound interest on the same at the same rate and for the same time?

a)Rs. 52   b)Rs. 51.25   c)Rs. 54.25   d) Rs. 60

16. Simple interest on a certain sum of money for 3 years at 8% per annum is half the compound interest on Rs. 4000 for 2 years at 10% per annum. The sum placed on simple interest is:

a) Rs.1550   b)Rs.1650   c) Rs.1750   d) Rs.2000

17. if the annual rate of simple interest increases from 10% to 12.5% .Then a man's yearly income from an investment increases by Rs.1250. His principle amount is:

a) Rs,45000   b)Rs.50,000   c) Rs. 60,000   d) Rs.65,000

18. Raghav borrows Rs.2550 to be paid back with compound interest at the rate of 4% per annum by the end of 2 years in two equal yearly instalments. How much will each instalment be ?

a) Rs.1275   b) Rs.1283 c) Rs.1352   d) Rs.1377

19. A man invested an amount of Rs.8000 in a fixed deposit scheme for 2 years at compound interest of 5% per annum. How much amount will Albert get on maturity of the fixed deposit ?

a) Rs.8600   b) Rs.8620   c) Rs.8820   d) Rs. 8840

20 . The difference between simple interest and compound interest on Rs.1200 for one year at 10% per annum reckoned half-yearly is :

a) Rs.2.50   b) Rs.3   c)Rs.3.75   d) Rs.4

Answer & Explanations

1. Expl: S.I. = 1680, R = 4% T = 5 years

   Principal = (100 *1680)/ (5*4) = 8400

   So P = 8400

   Rate = (100 *1680)/ (8400 * 4) = 5%

2. Expl : S.I. = Rs. 405 R = 4.5% T = 1 year

   Principal = (100 *405)/(4.5*1) = Rs.9000

   S.I at 5% interest = (9000*5*1)/100 = Rs.450

   Difference in interest = 450 – 405 = Rs.45

3. Let the sum invested in Scheme S1 be Rs.x and that in Scheme S2 be Rs.(13900-x).

   Then, (x*14*2)/100 + ((13900-x)*11*2)/100 = 3508;

   28x-22x= 3350800-(13900*22);

   6x = 45000;   x= 7500

   So sum invested in Scheme S2 = Rs. (13900-7500) = Rs.6400

4. Let the sum be Rs.x

S.I from the bank = x*8*3/100 = 34x/100Earnings in the form of interest from mutual fund = (x * 8.5 *4)/100 = 34x/100

Given that 34x/100 - 34x/100 = Rs.500 ; x = 5000

: . The sum invested = 5000

5. Let the time be x years. Then (600 *3* x)/100 + (800*9*x)/(2*100) = 24

18x+ 36x = 246 ; x = 246/54 = 4 years

Required time = 4 years

6. Let the amounts be x, y, z in ascending order of value. As the interest rate and interest accrued are same for 4 years 3 years and 2 years i.e. 4x = 3y = 2z = k.

L.C.M. of 4,3,2 = 12 So x:y:z: = 3000 : 4000 :6000

The amount deposited for 4 years = 3000

7. Total amount of Interest is

I = P/100 * 1[3/12 + 9/12 +27/12…. 3^{12}/12

Where P = 100; I = 1/12 (3+9+…..3^{12})

I = 1/12(3(3^{12}-1))/3-1

= 531440* 3/12*2 =Rs.66430

8. Expl: S I for 2 years = 3800 ie for one year =1900

The compound interest for Rs.1900 for the second year = 1900*12/100 =228

The CI for two years 3800+228 = 4028

9. Principal = 882/(1+(5/100)) + 882/(1+(5/100)= (882*20)/21+ (882*400)/441

=840 +800 = Rs.1640

10. Expl : Option (a). Let the second amount be Rs.x. then,

(12000* 10 * 1)/100 + (x*20 *1)/100 = ((12000 +x)* 14*1)/100

= 1200 +x/5 = (168000 +14x)/100

600000 + 100x = 840000 +70 x

30x = 240000; X = 8000

Total investment = 12000 +8000 = Rs.20000

11. Let the savings be X and Y and the rates of simple interest be 4x and 5x respectively.

Then X +4x * 1/2 *1/100 = Y + 5x * 1/2 *1/100 or X/Y = 5/4 i.e. X : Y = 5 : 4

12. Expl:Let sum be Rs.100. After 16 years it become 300. With in 16 years it increased Rs.200 i.e. after 8

years it is doubled. So after 32 years interest become Rs.400. Total Rs.500 i.e. 5 times more than the sum. So 32 years is the answer.

13. Expl: Amount = Rs. (30000 + 4347) = Rs. 34347.

Let the time be n years.

Then, $30000 (1 + 7/100)^n = 34347$

$(107/100)^n = 34347/30000 = 11449/10000 = (107/100)2$

So the period is 2 years.

14. Expl: Let the rate be R% p.a. $(1+ R)^2 = 1348.32$. Then, $1200* (1+ (R/100))2 = 1348.32$

$(1+R/100)2 = 134832/120000 = 11236/10000$:. $(1 + R/100) 2 = (106/100)2$

$1 + R/100 = 106/100$. So R = 6%

15. Expl: Simple interest for 2 years = Rs.50 ie. For 1 years Rs. 25. . In the first year the S.I and C.I are same ie.Rs. 25. So in the 2nd year in C.I calculated for 1 years interest also. So in second years for Rs.25 interest is 25*5/100 = 1.25 . So total C.P = 51.25.

16. Expl: C.I = $4000 * (1+10/100)^2 -4000$

= 4000 *11/10 + 11/10 -4000 = Rs.840

:. Sum = Rs.(420 * 100)/ (3 *8) = Rs.1750

17. Expl : Let the sum be Rs.x Then, (x*25/2*1/100) – (x*10*1/100)= 1250

25x-20x = 250000 ;   x=50000

18. Expl : Let the value of each instalment be Rs.x.

$x/(1+4/100) + x/(1+4/100)^2 = 2550 = 25x/26 + 625x/676 = 2550$

1275x = 2550 *676

x = (2550*676)/1275 = 1352.

:. Value of each instalment = Rs.1352

19. Expl : Amount = 8000 *1+(5/100)^2 = 8000 *21/20 * 21/20 = Rs.8820

20. Expl : S.I = (1000 *10 *4)/100 = Rs.400

C .I =1200 *1+5/100)2 −1200 = 123.

Difference = Rs.(123-120) = Rs.3