RBI PHASE 1 RECAP

5th JULY '18

QUANT – INTEREST

INTEREST

 Meaning of Interest:

Interest is money paid to the lender by the borrower for using his money for a specified period of time.

Terminology pertaining to Interest:

1) Principal (p): the amount of money that is initially borrowed is called the 'capital' or 'principal money'. It is denoted by 'p'.

2) Time (t): the period for which money is deposited or borrowed is called 'time'. It is denoted by 't'.

3) Rate of Interest (r): It is the rate at which the interest is calculated and is always specified in percentage terms. It is denoted by 'r'.

4) Amount (A): the sum of the principal and the interest at the end of any time is called the 'amount' which is denoted by 'A'.

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Simple interest

When the interest is payable on the principal alone, it is known as simple interest. In case of simple interest the principal remains same every year. The interest for any year is same as that for any other year.

Basic formula:
Basic or traditional formula to calculate SI is:

SI = P x t x r / 100

Short cut method:
We use percentage method to solve the question of this chapter. As interest is like profit and profit is also calculated by percentage method.

Compound interest

Under compound interest, the interest is added to the principal at the end of each period to arrive at the new principal for the next period.

In other words, the amount received at the end of the first year (or period) becomes the principal for the next period and so on.

It is the result of reinvesting interest.

Basic formula:

$A = p\left[1 + r/100\right]^n$

Where p= principal

n= years

r= rate of interest

A= total amount

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Compounding more than once a year:

CI is not always calculated yearly. It can be half yearly or quarterly.

For half yearly: In this case we divide the rate by 2 and multiply the time by 2. (a year have 2 halves of six months).

For quarterly: in this case we divide the rate by 4 and multiply the time by 4. (because in a year there are 4 quarters of 3-3 months.)

Important note:
*If the word interest is given and nothing else is specified, the interest is considered as SI.
*If the interest is given by a bank and nothing is specified, it is always CI.
*The compound interest for the first year is the same as simple interest for one year.
*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.

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Q.1) Rahul borrowed RS. 830 from Mr. Lal at 12% p.a.SI for 3 years. He then added some money to the borrowed sum and lent it to Shobha for the same period at the rate of 14% p.a.SI. If Rahul gains RS. 93.90 in the whole transaction, what amount did he add from his side?
[a] RS. 105
[b] RS. 100
[c] RS. 150
[d] RS. 110

Solution (a)

SI for 3 years at 12% p.a. for RS. 830 = 36% (12 x 3) of 830

= RS. 298.8

Rahul gain 298.8 + 93.90 = RS. 392.70 (by 14% p.a. SI for 3 years or 42% for three years)

If 42 % = 392.70

100% = 392.70 x 100 / 42

=RS. 935 (amount he lent to Shobha)

money added = 935 – 830 = 105 RS.

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Q.2) A sum of RS.5000 is divided into two parts A and B such that simple interest at the rate of 20% p.a. on A and B after 2 and 3 years respectively are equal. Which of the following is false about A and B?
[a] the ratio of A to B is 2:3
[b] the ratio of A to B is 3:2
[c] A exceeds B by RS. 1000
[d] the total interest earned on A and B is RS. 2400

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Solution (a)

Let A = RS.X and B= (5000 – X)

Then, (X x 2 x 20) /100 = (5000 – X) x 3 x 20 / 100

2X = 15,000 – 3X

5X = 15,000

X = 3000

A = X = RS. 3000 and B

= 5000 – X

= 5000 – 3000 = RS. 2000

A/B = 3000/2000 = 3/2

Thus, [a] is not true

And [b] is true

A – B = RS. 1000

Thus, [c] is true.

The total interest

A=(3000 x 2x 20) /100 = RS. 1200

B = (2000 x 3 x 20) /100 = RS. 1200

Total interest = RS. 2400

Thus [d] is true.

Only option [a] is false.

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Q.3) I was told by a banker that if I invest a certain amount 'p' for 2 years at a compounded rate of interest of 20%, I would get 80 paise more than what I would if I invested tha same amount for the same rate and period but on simple interest. find the amount p.

[a] RS. 2

[b] RS. 200

[c] RS. 25

[d] RS. 20

Solution (d)

In two years, the difference between the CI and SI is nothing but the interest on the first year's interest (taken as principal)

80 paise is the interest on the first-year interest which is 20%

If 20% = 80 paise

100% = 80 x 100 / 20 = 400 paise or 4 RS.

RS. 4 is 20% of p

If 20% = Rs. 4

100 % = 4 x 100 / 20 = RS. 20

Hence, p = RS. 20

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Q.4) Find the sum of money, which at 3 ¾ percent for 3 years and 4 months will yield the same simple interest as RS. 160 at 2 ½ % for 2 years and 6 months.
[a] RS. 95
[b] RS.62
[c] RS. 75
[d] RS. 80

Solution (d)
(P x 3.75 x 3 4/12) / 100 = (160 x 2 ½ x2 ½) / 100
So, p = RS. 80

Q.5) In a particular bank, returns on deposits is paid at simple interest. But if the amount is not withdrawn for 5 years, then at the end of 5 years the investor is also paid a bonus which is one fourth of the total interest accrued. If a person deposits RS. 'p' and withdrawn an amount equal to p at the end of every five years, then what is the interest earned in the 50 years period? Take the rate of interest at 16% per annum.

[a] 50p

[b] 10p

[c] 16.125p

[d] cannot be determined

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Solution (b)

In a five-year period, the total amount earned as interest and bonus

= (p x 16 x 5 /100) + 5/4

=p

On withdrawing an amount equal to p, the amount remaining is equal to p. in every 5 years, the interest earned is p.

Hence, in 50 years, the interest earned is

= 50/5 x p = 10p

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Q.6) Ramu invest the sum of RS. 2 lakhs for seven years at consistent rate of 2%. In the initial few years simple interest is considered while compound interest is considered for the remaining period on the total amount. Find out the total interest for the above sum if only the last two years involved a compound interest.

[a] RS. 28080

[b] RS. 20808

[c] RS. 22888

[d] RS. 28888

Solution (d)

Interest for first five years at 2% on simple interest for RS. 2,00,000

= (2 x 5 x 200,000)/ 100 = RS. 20,000

After 5 years principal = 2,00,000 + 20,000 = RS. 2,20,000

Interest for two years at 2% on compound interest for RS. 2,20,000

By using effective % method

2+2+(2x2/100)

=4+.04= 4.04%

4.04% of 2,20,000 = RS.8,888

Total amount = 220,000 + 8,888

= 2,28,888

Total interest = amount – p

2,28,888 – 2,00,000 =RS. 28888

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Q.7) A money lender lends a certain sum of money at a certain rate of interest. The compound interest for the 2nd year is RS. 300 and for the 3rd year is RS. 360.what is the sum that the money lender lent?
[a] RS. 1250
[b] RS. 2500
[c] RS. 1000
[d] RS. 5000

Solution (a)

RS. 300 is the interest for the 2nd year. The interest for the 3rd year is RS. 360

Hence, 360 – 300 = RS. 60 is interest for one year on RS. 300

In % (r) = 60 x 100 / 300 = 20%

Now p for the second year:

If 20% = 300

100% = 300 x 100 / 20

=RS.1500 is the p for 2nd year

(second year principal amount is included with the interest for the first year.)

P for the first year:

So, this RS. 1500 = 120% (100% principal + 20% interest)

If 120% = 1500

 100% = 120 / 1500 x 100= RS. 1250

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Q.8) A certain sum invested at 4% per annum compound interest, compounded half yearly, amounts to RS. 7803 at the end of the one year. The sum is:
[a] RS.7,800
[b] RS. 7,500
[c] RS. 7,000
[d] RS. 8,000

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Solution (b)
When interest is compounded half-yearly, rate% becomes half and time becomes double
New rate = 2%
New time = 2 years
Required rate % for 2 years CI
(by using effective % method)
(2+2)+ 2x2 /100 = 4.04%
According to the question,
100+(4.04% of sum) = RS. 7803
104.04% = 7803
100% = 7803 x 100 / 104.04
=RS. 7,500

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Q.9) A sum of money invested at simple interest doubles itself in eight years.In how many years will it become 16 times itself at double this rate of simple interest?
[a] 64
[b] 60
[c] 48
[d] 32

Solution(b)
Money doubles (1 +1) in 8 years
Money becomes 16 times (1 + 15) in
15 x 8 =120 years
but rate of interest is double so it will take half of the years
120/2 = 60 years (ans.)

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Q.10) At a certain private bank, the rate of compound interest charged for vehicle loans is as follows. For two years it is 16% p.a.; for more than two years and up to four years it is 12% p.a.; for more than four years it is 10% p.a. if a person takes a loan of RS. 1,00,000 from the bank for a period of 3 years, how much more / less interest does he have to pay, compared to a two- year tenure?

[a] RS. 5,932.8

[b] RS. 5,392.8

[c] RS. 6,923.8

[d] RS. 5,329.8

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Solution (a)

Amount to be paid at the end of three years (when the loan is taken for three years at the rate of 12 % p.a.)

For first year = 1,00,000 + 12,000 (12 % of 1,00,000) = RS. 1,12,000

For two years = 1,12,000 + 13,440 (12% of 1,12,000) = RS. 1,25,440

For three years = 1,25,440 + 15,052.8 (12% of 1,25,440) =RS. 1,40,492.8

Amount to be paid at the end of two years (when the loan is taken for two years at the rate of 16% p.a.)

for first year = 1,00,000 + 1600 (16% of 1,00,000) = RS. 1,16,000

for two years = 1,16,000 + 18,560 (16% of 1,16,000) = RS. 1,34,560

so, the required difference = 1,40,492.8 – 1,34,560 = RS. 5932.8