Simple & Compound Interest

Simple interest (SI)

This is one of the interest forms, when interest is calculated only on the principal and calculating uniformly through the intervals then the interest is called simple interest.

$$\text{Simple Interest} = \frac{(P \times R \times T)}{100}$$

What will be the simple interest on Rs. 80,000 at 16(2/3) % per annum for 9 months?

a. 8,000 b. 9,000 c. 10,000 d. 11,000

Explanation:

given:

Principal = Rs. 80,000

Rate of interest = $16\frac{2}{3}\%$

Time = 9 months

$$\text{Simple Interest} = \frac{80{,}000}{100} \times \frac{50}{3} \times \frac{3}{4}$$

Simple Interest = Rs.10,000

Find the simple interest on Rs.500 for 9 months at 6 paisa per month?
A. Rs.345B. Rs.270C. Rs.275D. Rs.324

Explanation:

I = (500*9*6)/100 = 270

A sum of Rs. 12,000 amounts to Rs. 15,000 in 4 years at the rate of simple interest. Find the rate of interest.

a. 6.25 % b. 4.25 % c. 5.9 % d. 5 %

Explanation:

Therefore,

S.I. = Rs. 15000 – Rs. 12000

S.I. = Rs. 3000

$$\text{Rate of Interest} = \frac{(100 \times \text{S.I.})}{(P \times T)}$$

$$= \frac{(100 \times 3000)}{(12000 \times 4)}$$

= 6.25 %

Rate of Interest = 6.25 %

A sum of money at simple interest amounts to Rs. 815 in 3 years and to Rs. 854 in 4 years. The sum is:

A) 650 B) 690 C) 698 D) 700

Explanation:

S.I. for 1 year = Rs. (854 - 815) = Rs. 39.

S.I. for 3 years = Rs.(39 x 3) = Rs. 117.

Principal = Rs. (815 - 117) = Rs. 698

Compound Interest

In a compound interest calculation, interest being calculated on the then amount, means in each period of time the base of the interest calculation is varying. This is the basic concept of successive variation.

Let Principal = P, Rate = R% per annum, Time = n years.

When interest is compound Annually:

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

Compound Interest: (Amount - Principal)

Principal = P, Rate = R % per annum, Time = n years

1. Amount = $P\left[1+\frac{R}{100}\right]^{n}$ - - - - - - - - - [Interest compounded annually]

1. Amount = $P\left[1+\frac{(R/2)}{100}\right]^{2n}$ - - - - - - - - - [Interest compounded Half-yearly]

1. Amount = $P\left[1+\frac{(R/4)}{100}\right]^{4n}$ - - - - - - - - - [Interest compounded quarterly]

Numerical on population:

a) If population of a city is P_1 and it increases by R % annually, then population after n years is given by:

$$P_2 = P_1 \left[1 + \frac{R}{100} \right]^n$$

b) If population of a city is P1 and it decreases by R % annually, then the population after n years is given by:

$$P_2 = P_1 \left[1 - \frac{R}{100} \right]^n$$

When Rates are different for different years, say $R_1\%$, $R_2\%$, $R_3\%$ for 1^{st}, 2^{nd} and 3^{rd} year respectively.

$$\text{Then, Amount} = P \left(1 + \frac{R_1}{100}\right)\left(1 + \frac{R_2}{100}\right)\left(1 + \frac{R_3}{100}\right).$$

If difference between compound interest and simple interest is given for:

a) Two years

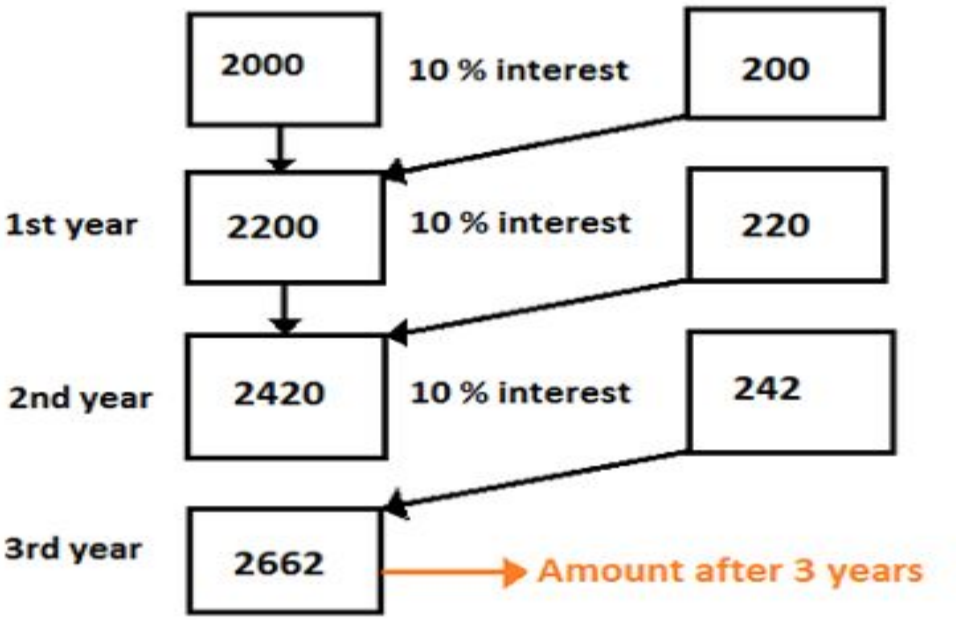
$$C.I. - S.I. = P\left(\frac{R}{100}\right)^2$$

b) Three years

$$C.I. - S.I. = P\left[\frac{R^2}{100^2}\right] \times \left[\frac{(300 + R)}{100}\right]$$

A person borrows Rs. 2000 at 10 % compound interest. Find the total amount paid by him after 3 years.

Explanation:



Find the compound interest on Rs. 5000 for 9 months at 6% per annum, if the interest is reckoned quarterly.

a. Rs. 218.98 b. Rs. 228.39 c. Rs. 250.69 d. Rs. 356.50

Explanation:

Principal = Rs. 5000, Time = 9 months = 3 quarters, Rate = 6 % per annum

Substituting the given values, we get

$$\text{Amount} = P\left[1 + \frac{(6/4)}{100}\right]^3$$

Amount=Rs.5228.39

Compound interest = 5228.39 – 5000 = Rs. 228.39

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

A. 22

B. 33

C. 11

D. 3.5

Explanation:

Let the period be n years

Amount after n years $= 30000 + 4347 = 34347$

$$30000\left(1+\frac{7}{100}\right)^{n} = 34347$$

$$\Rightarrow 30000\left(\frac{107}{100}\right)^{n} = 34347$$

$$\Rightarrow \left(\frac{107}{100}\right)^{n} = \frac{34347}{30000} = \frac{11449}{10000} = \left(\frac{107}{100}\right)^{2}$$

$$\Rightarrow n = 2$$

The population of a city increases 5 % annually but decreases by ¼ % due to emigration. Find the net increase in percent in 3 years.

A. 8.63 % b. 11.89 % c. 13.25 % d. 14.93 %

Explanation:

We are given that, the population of a city increases 5 % annually but decreases by ¼ % due to emigration.

Assume original population of the city = 100

1) Increase in population = 5 %

2) Decrease in population due to emigration = ¼ %

Hence, net annual increase = 5 % - ¼ % = 19/4 %

$$\text{Population in 3 years} = P_2 = P_1 \left[1 + \frac{R}{100} \right]^n$$

$$= 100 \left[1 + \frac{19}{4 \times 100} \right]^3$$

= 114.93

Population after 3 years will be 114.93 and at present it is 100. Therefore,

Increase in population = 114.93 – 100 = 14.93 %

The value of a sewing machine depreciates at the rate of 10 % after every year. If at the end of 3 years, its value is Rs. 8748, then find its purchase price.

a. 8000 b. 10000 c. 12000 d. 15000

Explanation:

We are given that the value of a sewing machine depreciates at the rate of 10 % after every year. After 3 years, its value is Rs. 8748.

$$8748 = P_1 \left[1 - \frac{10}{100} \right]^3$$

P_1 =Rs.12000

The difference between simple and compound interest(compounded annually) on a certain sum of money for 2 years at 4% per annum is ₹1.What is the sum?

A. ₹600

B. ₹645

C. ₹525

D. ₹625

Explanation:

Let the sum be x

Amount after 2 years (when interest is compounded annually)

$$= x\left(1+\frac{4}{100}\right)^2 = x\left(\frac{26}{25}\right)^2$$

Compound interest

$$= x\left(\frac{26}{25}\right)^2 - x = x\left[\frac{676}{625} - 1\right] = \frac{51x}{625}$$

$$\text{Simple interest} = \frac{x \times 4 \times 2}{100} = \frac{2x}{25}$$

Difference between compound interest and simple interest is 1. Therefore,

$$\Rightarrow \frac{51x}{625} - \frac{2x}{25} = 1$$

$$\Rightarrow \frac{51x - 50x}{625} = 1$$

$$\Rightarrow x = 625$$

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

$$\Rightarrow P\left(\frac{1}{25}\right)^2 = 1$$

$$\Rightarrow \frac{P}{25^2} = 1$$

$$\Rightarrow P = 625$$

A sum of money doubles itself at compound interest in 10 years. In how many years will it be eight times?

a. 30 years b. 28 years c. 25 years d. 22.5 years

Explanation:

sum of money doubles itself at compound interest in 10 years. Therefore, C.I. = 2 P

$$P\left[1+\frac{R}{100}\right]^{n}=2P$$

$$\left[1+\frac{R}{100}\right]^{n}=2$$

$$P\left[1+\frac{R}{100}\right]^{n}=8P$$

$$\left[1+\frac{R}{100}\right]^{n}=8=2^{3}$$

$$\left[1+\frac{R}{100}\right]^{n}=\left\{\left[1+\frac{R}{100}\right]^{10}\right\}^{3}$$

$$\left[1+\frac{R}{100}\right]^{n}=\left[1+\frac{R}{100}\right]^{30}$$

Hence, we get n = 30 years

Radhika wants to invest some amount for 3 years in a new scheme which says that the compound rate of interest for three years will be 5%, 12% and 8% respectively. How much investment will yield her Rs 6350.40 at the end of the investment period?

a. Rs. 5000 b. Rs. 5800 c. Rs. 6000 d. Rs. 6500

Explanation:

$$\text{Total Amount} = \text{Rs. } 6350.40 = P\left(1 + \frac{R}{100}\right)^n$$

Rate of interest, R_1 = 5% for 1^{st} year; Time, n_1 = 1 year (1^{st} year)

R_2 = 12% for 2^{nd} year; n_2 = 1 year (2^{nd} year)

R_3 = 8% for 3^{rd} year; n_3 = 1 year (3^{rd} year)

$$\therefore 6350.40 = P\left(1 + \frac{5}{100}\right)^1\left(1 + \frac{12}{100}\right)^1\left(1 + \frac{8}{100}\right)^1$$

$$\therefore 6350.40 = P\left(\frac{105}{100}\right)\left(\frac{112}{100}\right)\left(\frac{108}{100}\right)$$

$$\therefore P = \frac{6350.40 \times 100 \times 100 \times 100}{105 \times 112 \times 108}$$

$$\therefore \mathbf{P = Rs.\ 5000}$$

What annual installment will discharge a debt of Rs. 1035 due in 3 years at 15% SI?

a) 300 b) 400 c) 350 d) 325

Explanation:

Let each instalment be 100

$\Rightarrow$ Amount due $= 100 + 115 + 130 = 345$

ie $345 \longrightarrow 100$

$1035 \longrightarrow ?$ (300)

The SI and CI on a sum for 2 years are Rs. 800 and Rs. 864 respectively. Find the sum and rate% p.a.?

a) 3600, 8% b) 4000, 16% c) 2500, 16% d) 5000, 12%

Explanation:

2yrs SI = 800 ie 400 + 400

2yrs CI = 864 ie 400 + (400 + 64)

∴ 64 Rs is the SI on Rs 400

$\therefore R = \frac{64}{400} \times 100 = 16\%$

To find 'P'

$\frac{P \times 1 \times 16}{100} = 400 \Rightarrow P = 2500$

A man borrowed Rs. 42000 at 10 CI. He repaid the entire amount in 2 equal installments. Find the amount paid in each installment?

a) 23200 b) 23400 c) 24000 d) 24200

Explanation:

42000

at 10% → 4200

46200

Let 'x' be the first instalment

⇒ remaining = (46200 − x)

$\therefore (46200 - x) + \frac{10}{100}(46200 - x) = x$

$\Rightarrow x = 24200$