Grade : 8
Topic : compound interest

Compound Interest class 8 practice set 14.2 Question 1. On the construction work of a flyover bridge there were 320 workers initially. The number of workers were increased by 25% every year. Find the number of workers after 2 years.

Solution:

Here, P = Initial number of workers = 320

R = Increase in the number of workers per year = 25%

N = 2 years

A = Number of workers after 2 years

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

$$= 320\left[1+\frac{25}{100}\right]^2$$

$$= 320\left[\frac{100+25}{100}\right]^2$$

$$= 320\left[\frac{125}{100}\right]^2$$

$$= 320\left[\frac{25\times 5}{25\times 4}\right]^2$$

$$= 320\left[\frac{5}{4}\right]^2$$

$$= 320\left[\frac{25}{16}\right]$$

$$= 20\times 25$$

$$= 500$$

∴ The number of workers after 2 years would be 500.

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Question 2.
A shepherd has 200 sheep with him. Find the number of sheeps with him after 3 years if the increase in number of sheeps is 8% every year.
Solution:
Here, P = Present number of sheeps = 200
R = Increase in number of sheeps per year = 8%
N = 3 years
A = Number of sheeps after 3 years

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

$$= 200\left[1+\frac{8}{100}\right]^3$$

$$= 200\left[\frac{100+8}{100}\right]^3$$

$$= 200\left[\frac{108}{100}\right]^3$$

$$= 200\left[\frac{27\times 4}{25\times 4}\right]^3$$

$$= 200\left[\frac{27}{25}\right]^3$$

$$= 200 \times \frac{27}{25} \times \frac{27}{25} \times \frac{27}{25}$$

$$= 8 \times 27 \times \frac{27}{25} \times \frac{27}{25}$$

$$= \frac{0.32}{25} \times 27 \times 27 \times 27$$

$$= 0.0128 \times 27 \times 27 \times 27$$

$$= 251.9424$$

$$= 252$$

∴ The number of sheeps with the shepherd after 2 years would be 252 (approx).

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8th Class Math Practice Set 14.2 Question 3.
In a forest there are 40,000 trees. Find the expected number of trees after 3 years if the objective is to increase the number at the rate 5% per year.
Solution:
Here, P = Present number of trees in the forest = 40,000
R = Increase in the number of trees per year = 5%
N = 3 years
A = Number of trees after 3 years

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

$$= 40000\left[1+\frac{5}{100}\right]^3$$

$$= 40000\left[\frac{100+5}{100}\right]^3$$

$$= 40000\left[\frac{105}{100}\right]^3$$

$$= 40000\left[\frac{21\times 5}{20\times 5}\right]^3$$

$$= 40000\left[\frac{21}{20}\right]^3$$

$$= 40000 \times \frac{21}{20}\times\frac{21}{20}\times\frac{21}{20}$$

$= 5 \times 21 \times 21 \times 21$
$= 5 \times 9261$
$= 46{,}305$
∴ The expected number of trees in the forest after 3 years is 46,305.

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The cost price of a machine is Rs 2,50,000. If the rate of depreciation is 10% per year, find the depreciation in price of the machine after two years.

Solution:

Here, P = Cost price of machine = Rs 2,50,000

R = Rate of depreciation per year = 10%

N = 2 years

A = Depreciated price of the machine after 2 years

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

$$= 2,50,000\left[1+\frac{(-10)}{100}\right]^2$$

$$= 2,50,000\left[1-\frac{10}{100}\right]^2$$

$$= 2,50,000\left[\frac{100-10}{100}\right]^2$$

$$= 2,50,000\left[\frac{90}{100}\right]^2$$

$$= 2,50,000\left[\frac{9}{10}\right]^2$$

$$= 2,50,000\left[\frac{81}{100}\right]$$

= 2,500 × 81

= Rs 2,02,500

Depreciation in price = Cost price (P) – Depreciated price (A)

= 2,50,000 – 2,02,500

= Rs 47,500

∴ The depreciation in price of the machine after 2 years would be Rs 47,500.

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A loan of Rs 15,000 was taken on compound interest. If the rate of compound interest is 12 p.c.p.a. find the amount to settle the loan after 3 years.

Solution:

Here, P = Rs 15,000, R = 12 p.c.p.a, and
N = 3 years

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

$$\therefore \quad A = 15000\left[1+\frac{12}{100}\right]^3$$

$$= 15000\left[\frac{100+12}{100}\right]^3$$

$$= 15000\left[\frac{112}{100}\right]^3$$

$$= 15000\left[\frac{28\times 4}{25\times 4}\right]^3$$

$$= 15000\left[\frac{28}{25}\right]^3$$

$$= 15000 \times \frac{28}{25} \times \frac{28}{25} \times \frac{28}{25}$$

$$= \frac{24}{25} \times 28 \times 28 \times 28$$

$$= 0.96 \times 21952$$

$$= ₹\ 21{,}073.92$$

∴ The amount required to settle the loan after 3 years is Rs 21,073.92.

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A principal amounts to Rs 13,924 in 2 years by compound interest at 18 p.c.p.a. Find the principal.

Solution:

Here, A = Rs 13,924, R = 18 p.c.p.a., and N = 2 years

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

$$\therefore \quad 13924 = P\left[1+\frac{18}{100}\right]^2$$

$$\therefore \quad 13924 = P\left[\frac{100+18}{100}\right]^2$$

$$\therefore \quad 13924 = P\left[\frac{118}{100}\right]^2$$

$$\therefore \quad 13924 = P\left[\frac{59\times 2}{50\times 2}\right]^2$$

$$\therefore \quad 13924 = P\left[\frac{59}{50}\right]^2$$

$$\therefore \quad 13924 = P\times\frac{59}{50}\times\frac{59}{50}$$

$$\therefore \quad \frac{13924\times 50\times 50}{59\times 59} = P$$

$$\therefore \quad P = \frac{236\times 50\times 50}{59\times 1}$$

$\therefore$ P = 4 x 50 x 50

$\therefore$ P = Rs 10,000

$\therefore$ The principal is Rs 10,000.

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Find the difference between simple interest and compound interest on Rs 20,000 in 2 years at 8 p.c.p.a.

Solution:

Here, P = Rs 20,000, R = 8 p.c.p.a.,

N = 2 years

i. Simple interest (I)

$$I = \frac{PNR}{100}$$

$$\therefore \quad I = \frac{20{,}000 \times 2 \times 8}{100} = ₹\ 3200$$

Simple interest (I) = Rs 3200

ii. Compound Interest (I):

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

$$= 20000\left[1+\frac{8}{100}\right]^2$$

$$= 20000\left[\frac{100+8}{100}\right]^2$$

$$= 20000\left[\frac{108}{100}\right]^2$$

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$$= 20000 \left[\frac{27}{25}\right]^2$$

$$= 20000 \times \frac{27}{25} \times \frac{27}{25}$$

= 32 × 27 × 27
= Rs 23,328
Compound interest (I)
= Amount (A) – Principal (P)
= 23,328 – 20,000
= Rs 3328 ,..(ii)

iii. Difference
= Compound interest – Simple interest
= 3328 – 3200 ... [Form (i) and (ii)]
= Rs 128
∴ The difference between compound interest and simple interest is Rs 128.