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# Chapter # 06



# MATHEMATICS

## Of

## CINANCE

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## Exercise # 6.1

### Question 01:

What is the interest on  
Rs 1880.90 for one year at  
 $5\frac{1}{2}\%$ .

Sol:

Price - P - Rs 1880.90

Time - T - 1 Years

Rate - R -  $5\frac{1}{2}\%$   
- 5.5%

S.I = ?

S.I -  $P \times R \times T$ 

$$= 1880.90 \times 5.5\% \times 1$$

$$= 1880.90 \times \frac{5.5}{100} \times 1$$

$$= \text{Rs } 103.45 \text{ Ans.}$$

### Question 02:

Find the interest on Rs 4 Lacs  
invested for 5 years and 6 months at  
4% simple interest per year.

Sol:

P = Rs 400,000

T - 5 Years 6 Months

R - 4%

S.T = ?

$$T = 5 + \frac{6}{12}, 5 + 0.5 = 5.5 \text{ Y}$$

S.I =  $P \times R \times T$ 

$$= 400000 \times \frac{4}{100} \times 5.5$$

$$= \text{Rs } 88000 \text{ Ans.}$$

### Question 03:

A loan of Rs 750,000 is taken for  
3 months at the rate is  $4\frac{1}{4}\%$  per year, what interest to be  
charged by the bank?

Sol:

P = 750,000

T - 3 months -  $\frac{3}{12}$ , 0.25 YearsR,  $4\frac{1}{4}\%$ 

$$= 4 + 0.25 - 4.25\%$$

S.T.  $P \times R \times T$ 

$$= 750000 \times \frac{4.25}{100} \times 0.25$$

$$= \text{Rs } 7968.75 \text{ Ans.}$$

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### Question 04:

A bank lend Rs 12,50,000 for two years. On  $\frac{3}{4}$  of it bank charged 4% simple interest, on the balance bank charged 5% simple interest. What is the total amount of interest bank charged?

Sol:

$$P_1 = \text{Rs } 1250,000 \times \frac{3}{4}$$
$$= 937,500$$

$$R_1 = 4\%$$

$$T = 2 \text{ Years}$$

$$S.I_1 = P_1 \times R_1 \times T$$
$$= 937500 \times \frac{4}{100} \times 2$$
$$= \text{Rs } 75000$$

Remaining

$$P_2 = \text{Rs } 312,500$$

$$R_2 = 5\%$$

$$T = 2 \text{ Years}$$

$$S.T_2 = P_2 \times R_2 \times T$$
$$= 312500 \times \frac{5}{100} \times 2$$
$$= \text{Rs } 31250$$

Total simple Interest

$$S.T = S.T_1 + S.T_2$$
$$= 75000 + 31250$$
$$= \text{Rs } 106,250 \text{ ans.}$$

### Question 05:

A man invested Rs 10,000 at the rate of  $12\frac{1}{2}\%$  and another Rs 20,000 at the rate of  $13\frac{1}{2}\%$  per annum. Find his total annual interest on his investment.

Sol:

$$P_1 = \text{Rs } 10,000$$

$$R_1 = 12\frac{1}{2}\% = 12.5\%$$

$$T = 1 \text{ Year}$$

$$S.T_1 = ?$$

$$P_2 = \text{Rs } 20,000$$

$$R_2 = 13\frac{1}{2}\% = 13.5\%$$

$$T = 1 \text{ Year}$$

$$S.T_2 = ?$$

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$$\begin{aligned} S.I_1 &= P_1 \times R_1 \times T \\ &= 10,000 \times \frac{12.5}{100} \times 1 \\ &= \text{Rs } 1250 \end{aligned}$$

$$\begin{aligned} S.I_2 &= P_2 \times R_2 \times T \\ &= 20,000 \times \frac{13.5}{100} \times 1 \\ &= \text{Rs } 2700 \end{aligned}$$

Total simple Interest

$$\begin{aligned} S.I &= S.I_1 + S.I_2 \\ &= 1250 + 2700 \\ &= \text{Rs } 3950 \text{ Ans.} \end{aligned}$$

Question 06:->07

How long will it take for Rs 1500 invested at 8% simple interest to triple in amount?

Sol:

$$P = 1500$$

$$S.T = (1500 \times 3) - 1500$$

$$= 4500 - 1500 = 3000$$

$$R = 8\%$$

$$T = ?$$

~~$$S.T = P \times R \times T$$~~

~~$$3000 = 1500 \times \frac{8}{100} \times T$$~~

~~$$3000 = 120 \times T$$~~

~~$$3000 = T$$~~

~~$$120$$~~

~~$$T = 25 \text{ Years Ans.}$$~~

Question 07:->06

How long will it take to earn Rs 10,000 as simple interest on a deposit of Rs 75,000 at  $7\frac{1}{2}\%$ ?

Sol:

$$S.T = 10,000$$

$$P = 75,000$$

$$R = 7\frac{1}{2}\% = 7.5\%$$

$$S.T = P \times R \times T$$

$$10,000 = 75,000 \times \frac{7.5}{100} \times T$$

$$10,000 = 5625 \times T$$

$$10,000 = T$$

$$5625$$

$$T = 1.78$$

$$0.78 \times 12$$

$$9.36$$

$$0.36 \times 30$$

$$T = 1 \text{ Year, 9 Months, 11 Days.}$$

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### Question 08:

At what rate Rs 5000 double simple interest 5 Years?

Sol:

$$P = \text{Rs } 5000$$

$$S.T = 5000$$

$$T = 5 \text{ Years}$$

$$R = ?$$

$$S.T = P \times R \times T$$

$$5000 = 5000 \times R \times 5$$

$$5000 = 25000 \times R$$

$$5000 = R$$

$$25000$$

$$R = 0.2$$

$$R = 0.2 \times 100$$

$$\rightarrow 20\% \text{ Ans.}$$

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## Exercise # 6.2

### Question 01:

find Compound Interest due to  
following cases:

- 1) Rs 1000 loaned for 5 years  
at 6% p.a.

Sol:

$$P = 1000$$

$$t = 5 \text{ Years}$$

$$\alpha = 6\% = 0.06$$

$$C.T = ?$$

$$C.I = P \left[ (1+\alpha)^t - 1 \right]$$

$$= 1000 \left[ (1+0.06)^5 - 1 \right]$$

$$= 1000 \left[ (1.06)^5 - 1 \right]$$

$$= 1000 [1.338 - 1]$$

$$= 1000 [0.338]$$

$$= \text{Rs} 338.225 \text{ Ans.}$$

- 2) Rs 80,000 invested for 3 years at  $7\frac{1}{2}\%$  p.a.

Sol:

$$P = 80,000$$

$$t = 3 \text{ Years}$$

$$\alpha = 7\frac{1}{2}\% = 7.5 = 0.075$$

$$C.T = ?$$

$$C.I = P \left[ (1+\alpha)^t - 1 \right]$$

$$= 80000 \left[ (1+0.075)^3 - 1 \right]$$

$$= 80000 \left[ (1.075)^3 - 1 \right]$$

$$= 80000 [1.242 - 1]$$

$$= 80000 [0.242]$$

$$= \text{Rs} 1938.75 \text{ Ans.}$$

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3) Rs 7500 borrowed from the broker for  $4\frac{1}{2}$  years at 4% compounded bi-annually.

Sol:

$$P = 7500$$

$$t = 4\frac{1}{2} = 4.5$$

$$= 4.5 \times 2 = 9$$

$$\alpha = 4\%, \frac{4}{2}, 2\%$$

$$= 0.02$$

$$C.I \text{ (Bi-annually)} = ?$$

$$C.I = P[(1+\alpha)^t - 1]$$

$$= 7500[(1+0.02)^9 - 1]$$

$$= 7500[(1.02)^9 - 1]$$

$$= 7500[1.195 - 1]$$

$$= 7500[0.195]$$

$$= \text{Rs } 1463.19 \text{ Ans.}$$

5) Rs 99000 loaned for  $4\frac{3}{4}$  years at 8.5% compounded monthly.

Sol:

$$P = 99000$$

$$t = 4\frac{3}{4} = 4.75 \text{ years}$$

$$4.75 \times 12 = 57$$

$$\alpha = 8.5\%, \frac{8.5}{12} = 0.708\%$$

$$= 7.08$$

$$C.I = (\text{Monthly}) = ?$$

4) Rs 60000 invested for two years at 12% compounded quarterly.

Sol:

$$P = 600000$$

$$t = 2 \text{ years} = 2 \times 4 = 8$$

$$\alpha = 12\% = \frac{12}{4} = 3\%$$

$$C.I = ?$$

$$C.I = P[(1+\alpha)^t - 1]$$

$$= 600000[(1+0.03)^8 - 1]$$

$$= 600000[(1.03)^8 - 1]$$

$$= 600000[1.2667 - 1]$$

$$= 600000[0.2667]$$

$$= \text{Rs } 160062 \text{ Ans.}$$

$$C.I = P[(1+\alpha)^t - 1]$$

$$= 99000[(1+7.08)^{57} - 1]$$

$$= 99000[(1.0070)^{57} - 1]$$

$$= 99000[1.4952 - 1]$$

$$= 99000[0.4952]$$

$$= 49034.68 \text{ Ans.}$$

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## Question 02:

A man needs to borrow Rs 30,000 for two years. Which of the following loans is more advantageous to him:

- i) 4% simple interest
- ii) 4% per annum compounded semi-annually?

Sol:

$$P = 30,000$$

$$t = 2 \text{ Years}$$

i) simple interest.

2) Compound Interest

$$R = 4\% = 0.04$$

$$S.I. = P \times R \times T$$

$$= 30,000 \times 0.04 \times 2$$

$$S.I. = 2400$$

$$x = 4\% = \frac{4}{2} = 2\% = 0.02$$

$$t = 2 \times 2 = 4$$

$$C.I. = P [(1+x)^t - 1]$$

$$= 30000 [(1+0.02)^4 - 1]$$

$$= 30000 [(1.02)^4 - 1]$$

$$= 30000 [1.0824 - 1]$$

$$= 30000 [0.0824]$$

$$= 2472.96$$

Option (ii) is more advantageous.

## Question 03:

At what rate of compound interest will Rs 60,180 amount to Rs 1,00,000 in 4 years?

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Sol:

$$P - \text{Rs } 60,180$$

$$A - \text{Rs } 100,000$$

$$t = 4 \text{ years}$$

$$\alpha = ?$$

$$A = P(1+\alpha)^t$$

$$100,000 = 60,180(1+\alpha)^4$$

$$100,000 = (1+\alpha)^4$$

$$60,180$$

$$1.66168 = (1+\alpha)^4$$

Second Method

By taking Log on b/s

$$(1.66168)^{1/4} = (1+\alpha)^{4 \times \frac{1}{4}}$$

$$\log 1.66168 = 4 \log(1+\alpha)$$

$$1.135 = 1+\alpha$$

$$0.2205 = 4 \log(1+\alpha)$$

$$1.135 - 1 = \alpha$$

$$0.2205 = \log(1+\alpha)$$

$$\alpha = 0.135$$

4

$$0.055125 = \log(1+\alpha)$$

$$\alpha = 0.135 \times 100$$

By taking Anti-Log on b/s

$$\alpha = 13.5\% \text{ Ans.}$$

Antilog 0.055125. Antilog(log(1+\alpha))

$$1.135 = 1+\alpha$$

$$1.135 - 1 = \alpha$$

$$\alpha = 0.135$$

$$\alpha = 0.135 \times 100$$

$$\alpha = 13.5\% \text{ Ans}$$

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Question 04:

What annual rate of interest compounded quarterly should one obtain in order to double the investment in five years?

Sol:

$$P = 1$$

$$A = 2$$

$$t = 5 \text{ Years} = 5 \times 4 \\ = 20$$

$$\alpha = ?$$

$$A = P(1+\alpha)^t$$

$$2 = 1(1+\alpha)^{20}$$

$$(2)^{\frac{1}{20}} = (1+\alpha)^{\frac{20 \times \frac{1}{20}}{20}}$$

$$(2)^{0.05} = 1+\alpha$$

$$1.035 = 1+\alpha$$

$$1.035 - 1 = \alpha$$

$$\alpha = 0.035$$

$$\alpha = 0.035 \times 100$$

$$\alpha = 3.5\% \rightarrow \text{Quarterly}$$

$$\alpha = 3.5\% \times 4$$

$$\alpha = 14\% \text{ p.a.}$$

Question 05:

A person borrow Rs 3000 at 8% per annum compound interest compounded annually. How much must be repay in all at the end of 4 years?

Sol:

$$P = \text{Rs } 3000$$

$$t = 4 \text{ Years}$$

$$\alpha = 8\% = 0.08$$

$$A = P(1+\alpha)^t$$

$$= 3000(1+0.08)^4$$

$$= 3000(1.08)^4$$

$$= 3000(1.3604)$$

$$= 4081.46 \text{ p.a.}$$

: 80 marks

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Question 06:

A person will receive Rs 5000 six years from now. What is its present value at a compounded discount rate of 8 percent

Sol:

$$A = \text{Rs } 5000$$

$$t = 6 \text{ Years}$$

$$\alpha = 8\% = 0.08$$

$$P = ?$$

$$A = P(1+\alpha)^t$$

$$5000 = P(1+0.08)^6$$

$$5000 = P(1.08)^6$$

$$5000 = P(1.58)$$

$$5000 = P$$

$$1.58$$

$$P = \text{Rs } 3150 \text{ drs.}$$

Question 07:

The capital of a business grows at 12% per annum compounded quarterly. If present capital is Rs 300,000. What will be the capital after 3 years.

Sol:

$$P = \text{Rs } 300000$$

$$\alpha = 12\% = \frac{12}{4} = 3\% = 0.03$$

$$t = 3 \text{ years} = 3 \times 4 = 12$$

$$A = ?$$

$$A = P(1+\alpha)^t$$

$$= 300000 (1+0.03)^{12}$$

$$= 300000 (1.03)^{12}$$

$$= \text{Rs } 427728 \text{ drs.}$$

Question 08:

A man borrowed Rs 50,000 at 6% simple interest and invested the same amount at 6% compounded semi-annually. What would he gain after  $8\frac{1}{2}$  years?

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Sol:

$$P = \text{Rs } 50000$$

$$t = 8 \frac{1}{2} = 8.5$$

$$\alpha = 6\% = 0.06$$

Simple Interest

$$S.I. = P \times R \times T$$

$$= 50000 \times 0.06 \times 8.5$$

$$= \text{Rs } 25500$$

11 minutes

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Compound Interest

$$t = 8.5 \times 2 = 17$$

$$\alpha = \frac{6}{2} = 3\% = 0.03$$

$$C.I. = P [(1+\alpha)^t - 1]$$

$$= 50000 [(1+0.03)^{17} - 1]$$

$$= 50000 [(1.03)^{17} - 1]$$

$$= 50000 [1.6528 - 1]$$

$$= 50000 [0.6528]$$

$$= \text{Rs } 32642$$

$$\text{Gain} = 32642 - 25500$$

$$= \text{Rs } 7142 \text{ dhs.}$$

11 minutes

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Question 09:

In what time will Rs 3000 amount

to Rs 3646.50 at 5% compound interest.

Sol:

$$P = \text{Rs } 3000$$

$$A = \text{Rs } 3646.50$$

$$\alpha = 5\% = 0.05$$

$$t = ?$$

$$A = P(1+\alpha)^t$$

$$3646.50 = 3000(1+0.05)^t$$

$$3646.50 = (1.05)^t$$

$$3000$$

$$1.2155 \cdot (1.05)^t$$

Taking Log on b/s

$$\log 1.2155 = t \log 1.05$$

$$0.08475 = t \times 0.0211$$

$$t = 0.08475$$

$$0.0211$$

$$t = 4 \text{ Years dhs.}$$

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## Question 11:

Sol:

$$P = 80000$$

$$r = 10\% = \frac{10}{4} = 2.5\%$$

$$= 0.025$$

$$t = 5 \frac{1}{2} = 5.5 \times 4 = 22$$

$$A = ?$$

$$A = P(1+r)^t$$

$$= 80000(1+0.025)^{22}$$

$$= 80000(1.025)^{22}$$

$$= \text{Rs } 137725 \text{ days.}$$

## Question 12:

Sol:

$$P = \text{Rs } 15000$$

$$R = 6\% = 0.06$$

$$T = 90 \text{ days} = \frac{90}{360}$$

$$= 0.25$$

$$S.I = P \times R \times T$$

$$= 15000 \times 0.06 \times 0.25$$

$$= 225$$

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$$P = \text{Rs } 15225$$

$$R = 7\% = 0.07$$

$$T = 75 \text{ days} = \frac{75}{360}$$

$$= 0.2083$$

$$S.T = P \times R \times T$$

$$= 15225 \times 0.07 \times 0.2083$$

$$= 222$$

Discounting

$$A = P - S.T$$

$$= 15225 - 222$$

$$= 15003$$

$$A = P + S.I$$

$$= 15000 + 225$$

$$= 15225$$

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## Exercise # 6.3

### Question 11:

Find the amount of an annuity of Rs 10,000 payable at the end of each year for 8 years at the rate of 6% compounded yearly.

Sol:

$$R = 10,000$$

$$t = 8 \text{ years}$$

$$\alpha = 6\% = 0.06$$

$$S = ?$$

$$S = R \left( \frac{(1+\alpha)^t - 1}{\alpha} \right)$$

$$= 10000 \left( \frac{(1+0.06)^8 - 1}{0.06} \right)$$

$$= 10000 \left( \frac{(1.06)^8 - 1}{0.06} \right)$$

$$= 10000 \left( \frac{1.5938 - 1}{0.06} \right)$$

$$= 10000 \left( \frac{0.5938}{0.06} \right)$$

$$= 10000 (9.8897)$$

$$= 98897.00 \text{ Ans.}$$

### Question 12:

Find the amount of an ordinary annuity of Rs 3600 per quarter continue for 4 years at 12% p.a compounded quarterly.

Sol:

$$R = 3600$$

$$t = 4 \text{ years} = 4 \times 4 = 16$$

$$\alpha = 12\% = \frac{12}{4} = 3\% = 0.03$$

$$S = ?$$

$$S = R \left( \frac{(1+\alpha)^t - 1}{\alpha} \right)$$

$$= 3600 \left( \frac{(1+0.03)^{16} - 1}{0.03} \right)$$

$$= 3600 \left( \frac{(1.03)^{16} - 1}{0.03} \right)$$

$$= 3600 \left( \frac{1.6047 - 1}{0.03} \right)$$

$$= 3600 \left( \frac{0.6047}{0.03} \right)$$

$$= 3600 (20.1568)$$

$$= 72564.7 \text{ Ans.}$$

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Question 13:

Sol:

$$R = 10,000$$

$$t = 8 \text{ Years}$$

$$\alpha = 6\% = 0.06$$

$$S = ?$$

$$S = R \left[ \frac{(1+\alpha)^{t+1} - 1}{\alpha} \right] - R$$

$$= 10000 \left[ \frac{(1+0.06)^9 - 1}{0.06} \right] - 10000$$

$$= 10000 \left[ \frac{(1.06)^9 - 1}{0.06} \right] - 10000$$

$$= 10000 \left[ \frac{1.689 - 1}{0.06} \right] - 10000$$

$$= 10000 \left[ \frac{0.689}{0.06} \right] - 10000$$

$$= 10000 (11.49) - 1000$$

$$= 104913.15 \text{ Ans.}$$

Question 14:

Sol:

$$R = 2000$$

$$t = 1 \text{ Year} \times 12 = 1 \times 12 = 12$$

$$\alpha = 12\% = 12 \div 12 = 1\% = 0.01$$

$$S = ?$$

$$S = R \left[ \frac{(1+\alpha)^{t+1} - 1}{\alpha} \right] - R$$

$$= 2000 \left[ \frac{(1+0.01)^{12+1} - 1}{0.01} \right] - 2000$$

$$= 2000 \left[ \frac{(1.01)^{13} - 1}{0.01} \right] - 2000$$

$$= 2000 \left[ \frac{1.1381 - 1}{0.01} \right] - 2000$$

$$= 2000 \left[ \frac{0.1381}{0.01} \right] - 2000$$

$$= 2000 (13.8093) - 2000$$

$$= 25618.66 \text{ Ans.}$$

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Question 15:

Sol:

$$R = 10,000$$

$$S = 73359$$

$$\alpha = 8\% = 0.08$$

$$t = ?$$

$$S = R \left[ \frac{(1+\alpha)^t - 1}{\alpha} \right]$$

$$73359 = 10000 \left[ \frac{(1+0.08)^t - 1}{0.08} \right]$$

$$73359 = (1.08)^t - 1$$

$$10000 \quad 0.08$$

$$7.3359 = (1.08)^t - 1$$

$$0.08$$

$$7.3359 \times 0.08 = (1.08)^t - 1$$

$$0.586872 + 1 = (1.08)^t$$

$$1.586872 = (1.08)^t$$

Taking  $\log$  on b/s

$$\log 1.586872 = t \log 1.08$$

$$0.2005 = t \times 0.0334$$

$$0.2005 \div 0.0334$$

t = 6 payments. Ans.

Question 16:

Sol:

$$R = 1000 \text{ p.m}$$

$$\alpha = 12\% = 12 \div 12 = 1\% = 0.01$$

$$t = 10 \text{ years} = 10 \times 12$$

$$= 120$$

$$S = ?$$

$$S = R \left[ \frac{(1+\alpha)^{t+1} - 1}{\alpha} \right] - R$$

$$= 1000 \left[ \frac{(1+0.01)^{120+1} - 1}{0.01} \right] - 1000$$

$$0.01$$

$$= 1000 \left[ \frac{(1.01)^{121} - 1}{0.01} \right] - 1000$$

$$0.01$$

$$= 1000 \left[ \frac{3.333 - 1}{0.01} \right] - 1000$$

$$0.01$$

$$= 1000 (233.339) - 1000$$

$$= 232339 \text{ Ans.}$$

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Question 17:

Sol:

$$R = 7800$$

$$S = 77200$$

$$t = 8 \text{ years}$$

$$\alpha = ?$$

$$S = R \left[ \frac{(1+\alpha)^t - 1}{\alpha} \right]$$

$$77200 = 7800 \left[ \frac{(1+\alpha)^8 - 1}{\alpha} \right]$$

$$77200 = (1+\alpha)^8 - 1$$

$$7800 \quad \alpha$$

$$9.8974 = \frac{(1+\alpha)^8 - 1}{\alpha}$$

By Hit and Trial Method

$$\text{At } \alpha = 8\% X$$

$$= (1+0.08)^8 - 1 = (1.08)^8 - 1$$

$$= 0.08 \quad 0.08$$

$$= 1.8509 - 1 = 0.8509$$

$$0.08 \quad 0.08$$

$$= 10.6366 X$$

Not proved

Now,

$$\text{At } \alpha = 6\% \checkmark$$

$$= (1+0.06)^8 - 1 = (1.06)^8 - 1$$

$$0.06 \quad 0.06$$

$$= 1.5938 - 1 = 0.5938$$

$$0.06 \quad 0.06$$

$$\alpha = 9.8974 \checkmark \text{ Ans}$$

$$\text{At } \alpha = 10\% X$$

$$= (1+0.1)^8 - 1 = (1.1)^8 - 1$$

$$0.1 \quad 0.1$$

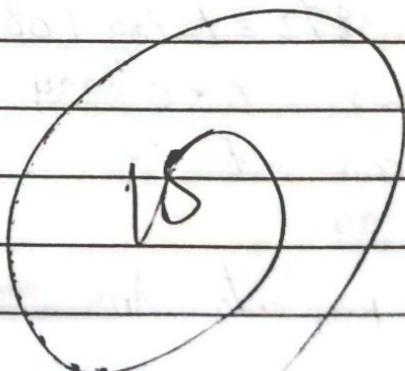
$$= 2.143 - 1 = 1.143$$

$$0.1 \quad 0.1$$

$$= 11.435 X$$

Not proved

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