CA FOUNDATION JAN 2026

QUANTITATIVE APTITUDE

MARATHON


Finance

Simple int

$I = P.r.t$

$A = P + I$

or

$A = P(1 + rt)$

Double	Triple	n times
$r = \frac{1}{t}$	$r = \frac{2}{t}$	$r = \frac{(n-1)}{t}$

Compound Int

$A = P\left(1 + \frac{r}{m}\right)^{t \times m}$

$CI = A - P$

or

$CI = P\left\{\left(1 + \frac{r}{m}\right)^{t \times m} - 1\right\}$

$r_e = \left(1 + \frac{r}{m}\right)^{m} - 1$

(Effective Rate)

Value of Asset after t years of use (scrap value) $= \text{Cost}\left[1 - \text{dep.}\right]^{\text{time}}$

for 2 years

$$CI - SI = P r^2$$

for 3 years

$$CI - SI = P r^2 (r+3)$$

#

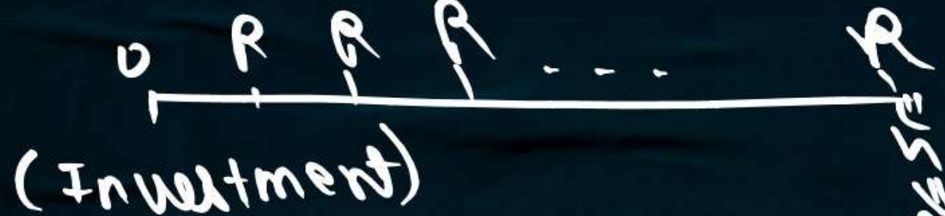
$$P.V. = \frac{F.V.}{\left(1 + \frac{r}{m}\right)^{t \times m}}$$

Annuity

→ Same Regular payment
→ Same interval

Regular Annuity (Ordinary)

(Payment ending of each period)



$$F.V. = R\left\{\frac{(1+i)^n - 1}{i}\right\}$$

(Sinking fund)

Immediate (Due)

(in the beginning of each period)

$$F.V. = R\left\{\frac{(1+i)^n - 1}{i}\right\}.(1+i)$$

Regular

$$P.V. = R\left\{\frac{1-(1+i)^{-n}}{i}\right\}$$

Loan / Leasing

$$= \frac{(1+i)}{i}$$

→ ÷ → = → n times → ST → × R

Immediate Annuity

$$PV = R\left\{\frac{1-(1+i)^{-n}}{i}\right\}.(1+i)$$

NPV = P.V.(Inflow) − PV(outflow)

Perpetuity

Regular: $PV = \frac{R}{i}$

Due: $PV = \frac{R}{i}(1+i)$

Growing Perpetuity

$$PV = \frac{R}{i-g}$$

Valuation of Bond

Value of Bond ?

Value of Bond = P.V. of Interest (Annuity) + P.V. of maturity amount (No Annuity)

CAGR

$$= \left[\frac{\text{Current value}}{\text{Back value}}\right]^{\frac{1}{\Delta T}} - 1$$

Real Rate of Return = Nominal Rate − Inflation

Questions -

A certain sum of money was put at S.I. for 2.5 years at a certain rate of S.I. p.a. Had it been put at 4% higher rate, it would have fetched ₹500 more. Find the sum of money.

(a) ₹4000

(b) ₹5000

(c) ₹6000

(d) None of these

$P = ?$ $r\% = ?$ $t = 2.5$ years, $SI_1 = ?$

$P = ?$ $(r+4)\% = ?$, $t = 2.5$ yrs, $SI_2 = ?$

$SI_2 - SI_1 = 500$

$P = ?$, $T = 2.5$ years, $r = 4\%$, $SI = ₹500$

$SI = P \times r \times t$

$500 = P \times 0.04 \times 2.5$

$\frac{500}{0.04 \times 2.5} = P$

$5000 = P$

Questions -

₹850 becomes ₹1250 in 5 years at a simple rate of interest. How much would be its amount after 4 years if the rate of interest is increased by 5%?

(a) ₹1230

(b) ₹1320

(c) ₹1340

(d) None of these

$P = 850$

$A = 1250$

$T = 5$ years

$SI = P \times r \times t$

$400 = 850 \times r \times 5$

$\frac{400}{850 \times 5} = r$

$0.0941 = r$

or

9.41%

$T = 4$ years

$r = 14.41\%$

$A = ?$

$SI = P \times r \times t$

$= 850 \times 14.41\% \times 4$

$SI = 490$

$A = P + I$

$= 850 + 490$

$= 1340$

Questions -

The S.I. on a sum of money is $\frac{4}{9}$ of the principal, and the number of years is equal to the rate of interest per annum. Find the rate of interest per annum?

(a) 5%

(b) $\frac{20}{3}\%$

(c) $\frac{22}{7}\%$

(d) 6%

Rate of int = No of years

$r = t$

$S.I. = \frac{4}{9}P$

$P\left(\frac{r}{100}\right)t = \frac{4}{9}P$

$\frac{rt}{100} = \frac{4}{9}$

$rt = \frac{400}{9}$

$r \cdot r = \frac{400}{9}$

$r^2 = \frac{400}{9}$

$r = \frac{20}{3}\%$

Questions -

If the difference of Simple Interest (S.I) and Compound Interest (C.I) is ₹72 at 12% for 2 years, calculate the amount.

(a) ₹8,000

(b) ₹6,000

(c) ₹5,000

(d) ₹7,750

$$CI - SI = 72$$

$$P r^2 = 72$$

$$P(0.12)^2 = 72$$

$$P = \frac{72}{(0.12)^2} = 5000$$

Questions -

If a simple interest on a sum of money at 6% p.a. for 7 years is equal to twice of simple interest on another sum for 9 years at 5% p.a., the ratio will be:

(a) 2 : 15

(b) 7 : 15

(c) 15 : 7

(d) 1 : 7

$$SI_1 = 2(SI_2)$$

$$P_1 \times \frac{6}{100} \times 7 = 2\left[P_2 \times \frac{5}{100} \times 9\right]$$

$$P_1 \times (42) = P_2 (90)$$

$$\frac{P_1}{P_2} = \frac{90}{42} = \frac{45}{21} = \frac{15}{7}$$

Questions -

By mistake a clerk calculated the simple interest on principal for 5 months at 6.5% p.a. instead of 6 months at 5.5% p.a. If the error in calculation was ₹25.40. The original sum of principal was ___.

(a) ₹60,690

(b) ₹60,960

(c) ₹90,660

(d) ₹90,690

$SI_1 = P\left(\frac{5}{12}\right)\left(\frac{6.5}{100}\right) = P(0.0270833333)$

$SI_2 = P\left(\frac{6}{12}\right)\left(\frac{5.5}{100}\right) = P(0.0275)$

$SI_2 - SI_1 = 25.40$

$P(0.0275) - P(0.02708) = 25.40$

$P(0.00041666) = 25.40 \Rightarrow P = 60960$

Questions -

By mistake a clerk calculated the simple interest on principal for 5 months at 6.5% p.a. instead of 6 months at 5.5% p.a. If the error in calculation was ₹25.40. The original sum of principal was ____.

(a) ₹60,690

(b) ₹60,960

(c) ₹90,660

(d) ₹90,690

$60690 \times \frac{5}{12} \times 6.5\% = 1643.6875$

$60690 \times \frac{6}{12} \times 5.5\% = 1668.975$

25.288

$60960 \times \frac{5}{12} \times 6.5\% = 1651$

$60960 \times \frac{6}{12} \times 5.5\% = 1676.4$

25.4

Questions -

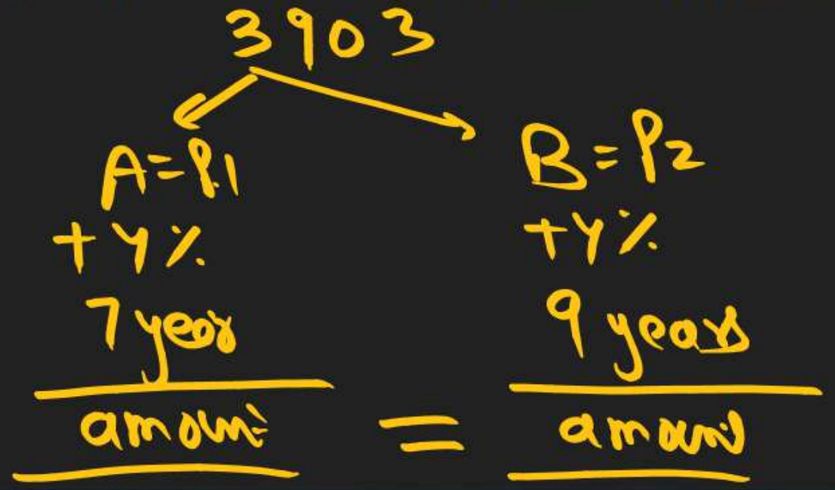
The partners A and B together lent ₹3,903 at 4% per annum interest compounded annually. After a span of 7 years, A gets the same amount as B gets after 9 years. The share of A in the sum of ₹3,903 would have been:

(a) ₹1,875

(b) ₹2,280

(c) ₹2,028

(d) ₹2,820



$P_1[1+0.04]^7 = A$ & $P_2[1+0.04]^9 = A$

$P_1 = \frac{A}{(1.04)^7}$ & $P_2 = \frac{A}{(1.04)^9}$

$P_1 + P_2 = 3903$

$\frac{A}{(1.04)^7} + \frac{A}{(1.04)^9} = 3903$

$A\left[\frac{1}{(1.04)^7} + \frac{1}{(1.04)^9}\right] = 3903$

$A = 2668.70$

Now $P_1 = \frac{2668.70}{(1.04)^7} = 2028$

Questions -

The partners A and B together lent ₹3,903 at 4% per annum interest compounded annually. After a span of 7 years, A gets the same amount as B gets after 9 years. The share of A in the sum of ₹3,903 would have been:

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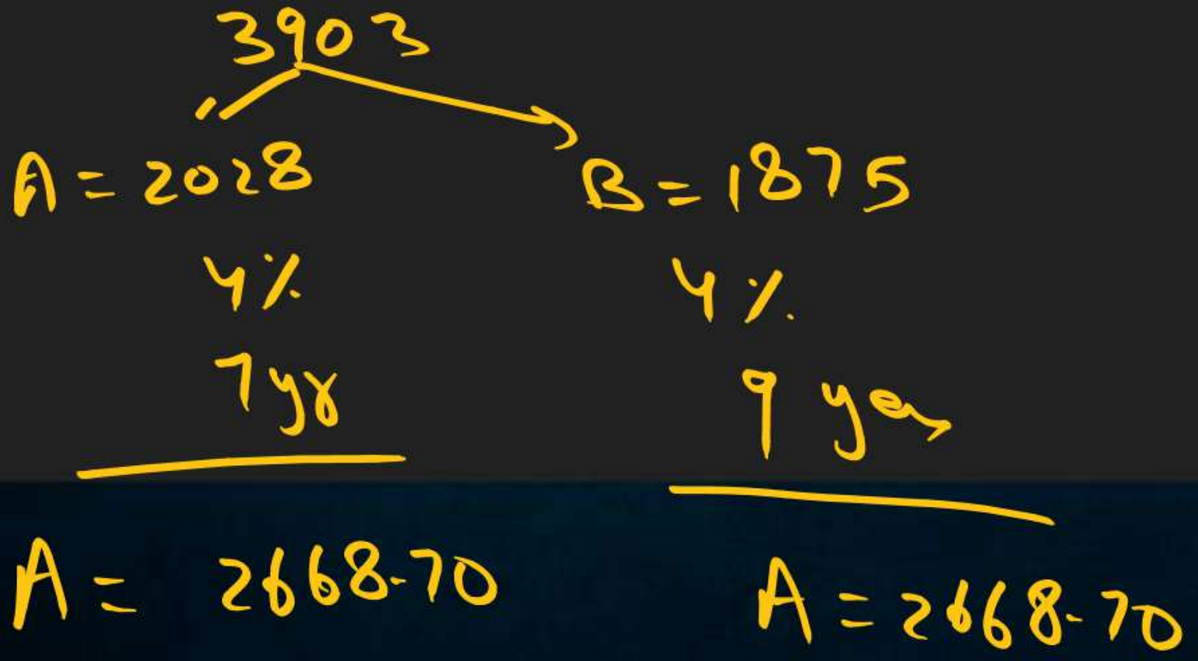


Questions -

If ₹1,000 be invested at interest rate of 5% and the interest be added to the principal every 10 years, then the number of years in which it will amount to ₹2,000 is:

(a) $16\frac{2}{3}$ years

(b) $6\frac{1}{4}$ years

(c) 16 years

(d) $6\frac{2}{3}$ years

$P = 1000$

$r = 5\%$ SI

$A = 2000$

$t = ?$

In first 10 years

$SI = 1000 \times 5\% \times 10yr$

$= ₹500$

New Principle = 1000 + 500 = ₹1500

& $A = 2000$ & $r = 5\%$

$SI = P r t$

$₹500 = 1500(0.05)(t)$

$6.66yr = t$

Total time = 10yr + 6.66y = 16.66 years

Questions -

A man invests an amount of ₹15,860 in the names of his three sons A, B, and C in such a way that they get the same interest after 2, 3, and 4 years respectively. If the rate of interest is 5%, then the ratio of the amount invested in the name of A, B, and C is:

(a) 6: 4: 3

(b) 3: 4: 6

(c) 30: 12: 5

(d) None of the above

$I_1 = I_2 = I_3$

$P_1\left(\frac{5}{100}\right)(2) = P_2\left(\frac{5}{100}\right)(3) = P_3\left(\frac{5}{100}\right)(4)$

$2P_1 = 3P_2 = 4P_3$

$P_1 : P_2 : P_3 = \frac{1}{2} : \frac{1}{3} : \frac{1}{4}$

$= 6 : 4 : 3$

$SI = P \times t$

Questions -

The effective rate of return for 24% per annum convertible monthly is given as:

(a) 24% ✗

(b) 26.82%

(c) 18% ✗

(d) 24.24%

$$r_e = \left(1 + \frac{r}{m}\right)^m - 1$$

$$= \left[1 + \frac{0.24}{12}\right]^{12} - 1$$

$$= (1.02)^{12} - 1$$

$$= 0.2682$$

Effective Rate Depends on → Nominal Rate
→ Conversion Period

Questions -

$1\frac{1}{2} = 1 + \frac{1}{2} = 1 + 0.5 = 1.5$

What is the compound interest (in ₹) on a sum of ₹ 12,600 for $1\frac{1}{2}$ years at 20% per annum if the interest is compounded half yearly? *(Nearest to a rupee)*

(a) ₹ 4,271

(b) ₹ 4,171

(c) ₹ 4,711

(d) ₹ 4,117

$P = 12600$

$T = 1\frac{1}{2} = 1.5$ years

$r = 20\%$ half yearly

$= 12600\left[(1.10)^3 - 1\right]$

$= 4170.6$

$CI = P\left\{\left(1 + \frac{r}{m}\right)^{t \times m} - 1\right\}$

$= 12600\left\{\left(1 + \frac{0.20}{2}\right)^{1.5 \times 2} - 1\right\}$

$A = P\left(1 + \frac{r}{m}\right)^{t \times m}$

$= 12600\left(1 + \frac{0.20}{2}\right)^{1.5 \times 2}$

$= 12600\,(1.10)^3$

$= 16770.6$

$CI = A - P$

4170.6

Questions -

If the nominal rate of growth is 17% and inflation is 9% for five years, let P be the Gross Domestic Product (GDP) amount at the present year. Then the projected real GDP after 6 years is:

(a) $1.587P$

(b) $1.921P$

(c) $1.403P$

(d) $2.51P$

Real Rate = Nominal Rate − Inflation

= 17% − 9%

= 8%

GDP After 6 years = $P[1+0.08]^6$

= $P(1.586874)$

Questions -

$CI - SI = 2067.2 - 1920 = 147.2$

What is the difference (in ₹) between the simple interest and the compound interest on a sum of ₹8,000 for $2\frac{2}{5}$ years at the rate of 10% p.a. when the interest is compounded yearly?

a)136.12
b)129.50
c)151.75
d)147.20

$P = 8000$

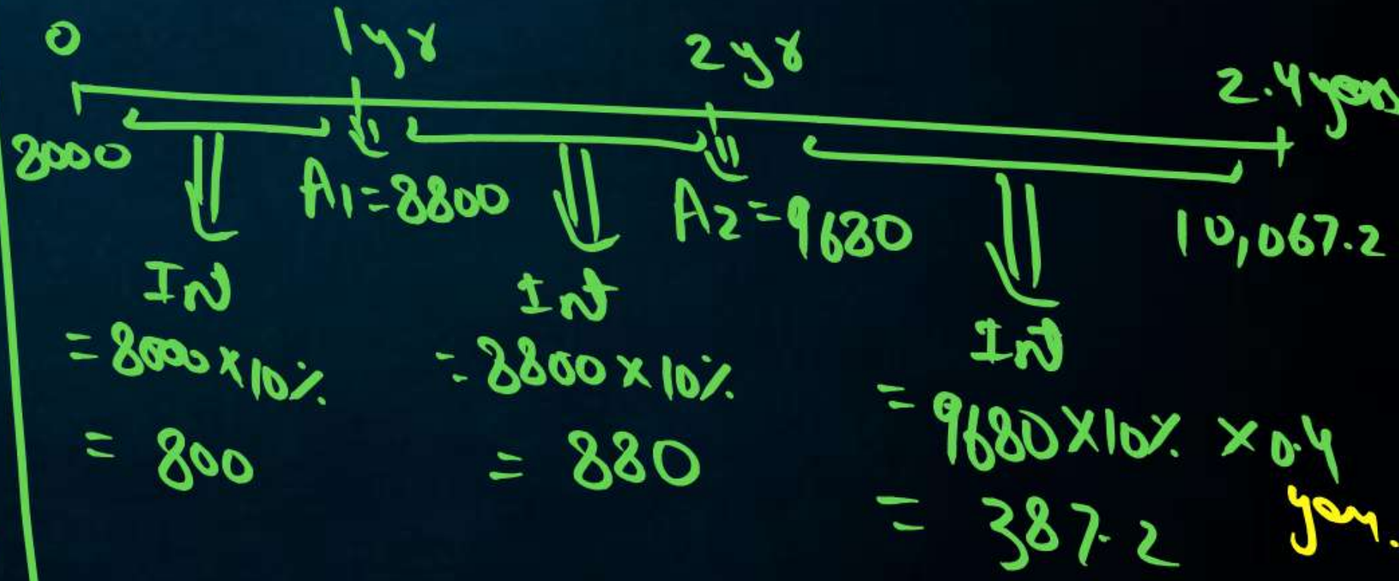
Time = 2.4 years

$r = 10\%$ p.a.

$SI = P \times r \times t$

$= 8000 \times 0.10 \times 2.4$

$= 1920$



$CI = 10067.2 - 8000$

$= 2067.2$

Eg $P = 5000$

$r = 10\%$ Annually.

$T = 3.5$ years

$A = ?$ & $CI = ?$

Sol:

$$A = 5000\left\{1 + 0.10\right\}^{3.5}$$

$$= 5000\,(1.10)^{3.5}$$

$$= 6979.755$$

$6655 \times 10\% \times 0.5\,yr$

$= 332.75$

$CI = 6987.75 - 5000$

$= 1987.75$

Questions -

A machine worth ₹4,90,740 is depreciated at 15% on its opening value each year. When will its value reduce to ₹2,00,750?

(a) 5 years 5 months
(b) 5 years 6 months
(c) 5 years 7 months
(d) 5 years 8 months

$$SV = C(1-d)^t$$

$$2,00,750 = 490740(1-0.15)^t$$

$$0.409076 = (0.85)^t$$

$$\log(0.409076) = t \log(0.85)$$

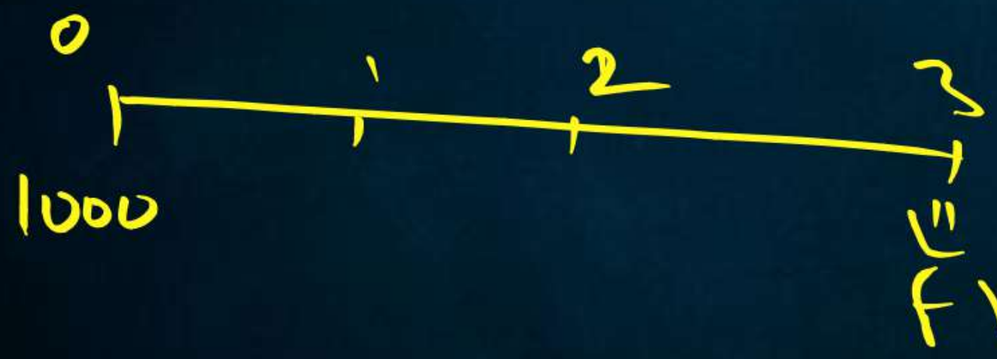
$$t = \frac{\log(0.409076)}{\log(0.85)} = \frac{-0.3882}{-0.0105} = 5.50 \text{ years}$$

5 yrs + 6 month.

Questions -

You invest ₹1000 in a three-year investment that pays you 6% per annum. Calculate the future value of the investment.

(a) ₹1191.1 (b) ₹1200.5 (c) ₹900.8 (d) ₹1000



$$A = 1000[1+0.06]^3$$

$$= 1191$$

Questions -

Find the present value of ₹2500 due after 6 years at the rate of 8% per annum compounded annually.

(a) ₹1576
(b) ₹1680
(c) ₹1850
(d) ₹2000

$$PV = \frac{FV}{\left(1+\frac{r}{m}\right)^{t\times m}}$$

→ 1.08
→ ÷
→ = 6 times
→ ×2500

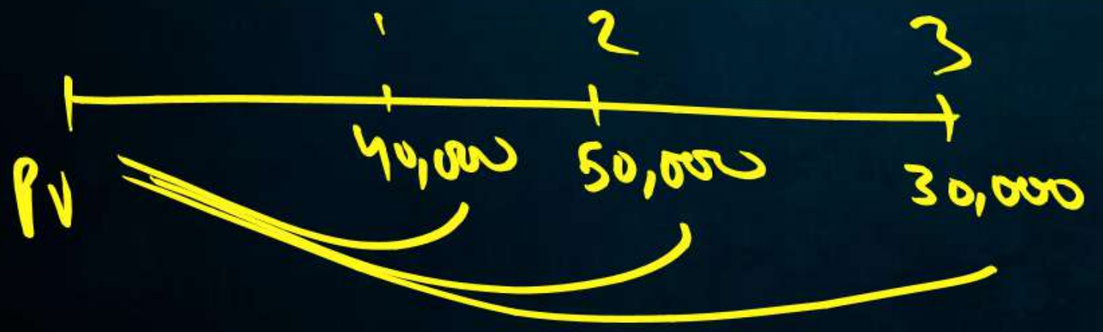
$$= \frac{2500}{\left[1+\frac{0.08}{1}\right]^{6\times 1}} = \frac{2500}{(1.08)^6} \approx 1575.42$$

A project is expected to provide cash inflows as follows for 3 years :

Year	:	1	2	3
Cash Inflows (₹)	:	40,000	50,000	30,000

The company's cost of capital or required rate of return is 15%. What is the present value of cash inflows of the company ?

(A) ₹ 1,02,840
(B) ₹ 99,240
(C) ₹ 1,12,640
(D) ₹ 92,315



$$= \frac{40,000}{(1.15)^1} + \frac{50,000}{(1.15)^2} + \frac{30,000}{(1.15)^3} = 92315$$

Questions -

Compute the net present value for a project with a net investment of **₹1,50,000** and net cash flows of: **₹80,000** in year one **₹85,000** in year two & **₹60,000** in year three The company's cost of capital is **10%**. What is the net present value (NPV)?

a) ₹38,050
b) ₹28,500
c) ₹57,300
d) ₹48,563

$$NPV = \frac{80,000}{(1.10)^1} + \frac{85000}{(1.10)^2} + \frac{60,000}{(1.10)^3} - 1,50,000$$

$$= = 1,88,054 - 1,50,000$$

$$= 38054$$

Questions -

₹500 is invested at the end of each month in an account paying interest 12% per year compounded monthly. What is the future value of this annuity after the 9th payment?

(a) ₹4000 (b) ₹4684.36 (c) ₹5526.64 (d) None of these

$i = \frac{r}{m} = \frac{0.12}{12} = 0.01$ & n = Total installments $= t \times m = 9$

$$FV = R\left\{\frac{(1+i)^n - 1}{i}\right\}$$

$$= 500\left\{\frac{(1+0.01)^9 - 1}{0.01}\right\}$$

$n = t \times m$

$= \left(\frac{9}{1}\right) \times 1$

$n = 9$

Questions -

How much approximate amount should you save annually to accumulate ₹ 20,00,000 by the end of 12 years, if the saving earns an interest of 14 percent compound annually ?

Sinking Fund

[Given that $(1.14)^{12} = 4.8179$]

(A) ₹ 5,23,848

(B) ₹ 4,15,118

(C) ₹ 73,339

(D) ₹ 1,11,200

FV = 20 lakh

$$R\left\{\frac{(1+0.14)^{12}-1}{0.14}\right\} = 20 \text{ lakh}$$

$$R\{27.2707\} = 20\text{l}$$

$$R = \frac{20,00,000}{27.2707}$$

$$= 73,338$$

Questions -

$i = \frac{r}{m} = \frac{0.124}{12} = 0.01033$ & $n = t \times m = 3 \times 12 = 36$

Raju will pay instalments of ₹ 3,150 per month for the next 3 years towards his loan at an interest rate 12.4%, discounted monthly, what was the approximate amount of loan taken initially ?

[Given that $(1.01033)^{36} = 1.448$] $\Rightarrow (1.01033)^{-36} = \frac{1}{1.448} = 0.6906$

(A) ₹ 9,742.29

(B) ₹ 13,683.60

(C) ₹ 94,345.17

(D) ₹ 74,158.24

$$PV = R\left\{\frac{1-(1+i)^{-n}}{i}\right\}$$

$$= 3150\left\{\frac{1-(1.01033)^{-36}}{0.01033}\right\} = 3150\left\{\frac{1-(0.6906)}{0.01033}\right\}$$

94345

Questions -

Sam invested ₹12,000 for 10 years in a financial company. At the end of the 10th year his investment value is ₹18,000. Then the Compound Annual Growth Rate (CAGR) is $(x)^{1/n} = 1.0413$.

(A) 41.40%

(B) 4.13%

(C) 11.56%

(D) 12.06%

Base = 12000

current = 18000

Time = 10 years

$$CAGR = \left(\frac{18000}{12000}\right)^{\frac{1}{10}} - 1$$

$$= (1.5)^{\frac{1}{10}} - 1$$

$$= 1.0413 - 1 = 0.0413 = 4.13\%$$

$x^{1/n}$

→ √ 12 times

→ −1

→ ÷ n

→ +1

→ X = 12 times

Questions -

Time = 2023 − 2019 = 4

The Earning Per Share (EPS) of a company for five years is given below :

Year	2019	2020	2021	2022	2023
EPS	40	25	40	60	90

Calculate the Compounded Annual Growth Rate (CAGR) of EPS.

(A) 23.47%
(B) 24.47%
(C) 22.47%
(D) 21.47%

$$CAGR = \left(\frac{90}{40}\right)^{\frac{1}{4}} - 1$$

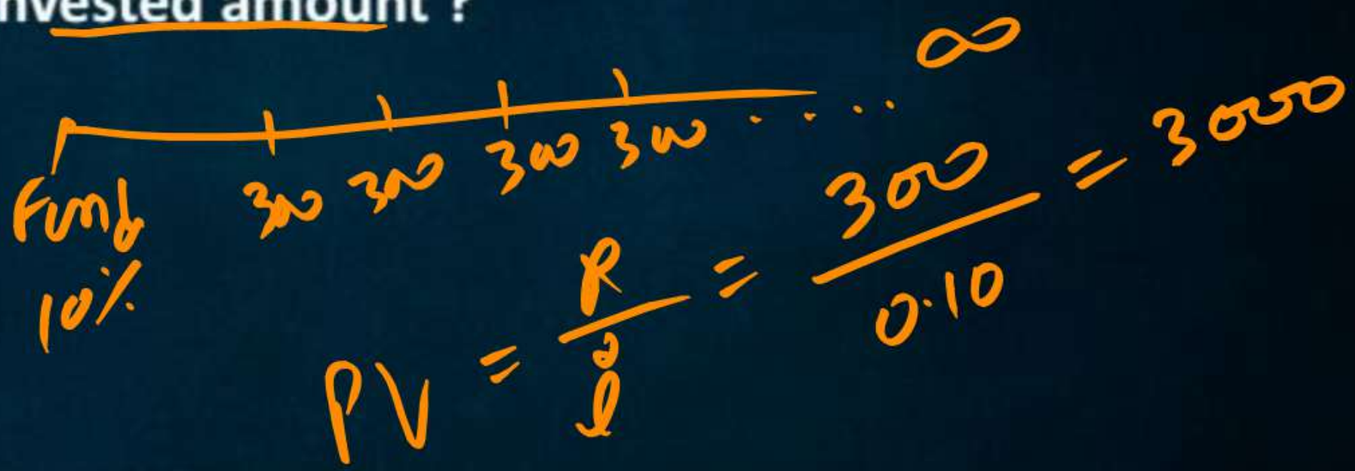
$$= (2.25)^{\frac{1}{4}} - 1$$

$$= 1.2247 - 1$$

Questions -

A person desires to create a fund to be invested at 10% compound interest per annum to provide for a prize of ₹300 every year. What was the invested amount ?

(a) ₹2,000
(b) ₹2,500
(c) ₹3,000
(d) None of these



QUESTION

A fund pays ₹10,000 in the first year, and the payment grows by 7% every year forever. If the discount rate is 11%, the present value is:

a)1,50,000
b)2,00,000
c)2,40,000
d)None

$$PV = \frac{R}{i - g}$$

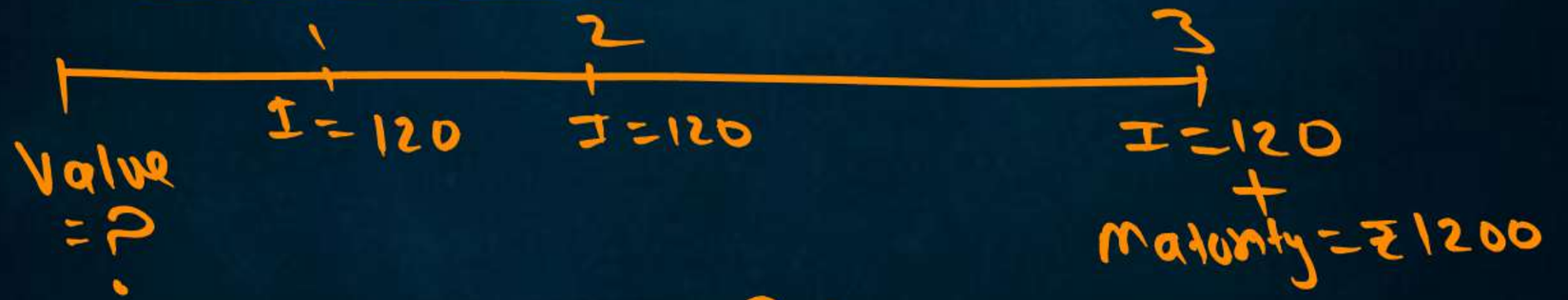
$$= \frac{10,000}{0.11 - 0.07}$$

$$= 2,50,000$$

QUESTION

An investor intends to purchase a **3-year**, ₹1,200 par value bond having a **10% nominal interest rate** (annual coupon).
At what price may the bond be purchased now if it **matures at par** and the investor requires a **16% rate of return**?

Options:
a) ₹1,107
b) ₹1,137
c) ₹1,038
d) ₹1,382



$$\text{Value} = 120\left\{\frac{1-(1.16)^{-3}}{0.16}\right\} + \frac{1200}{(1+0.16)^3}$$

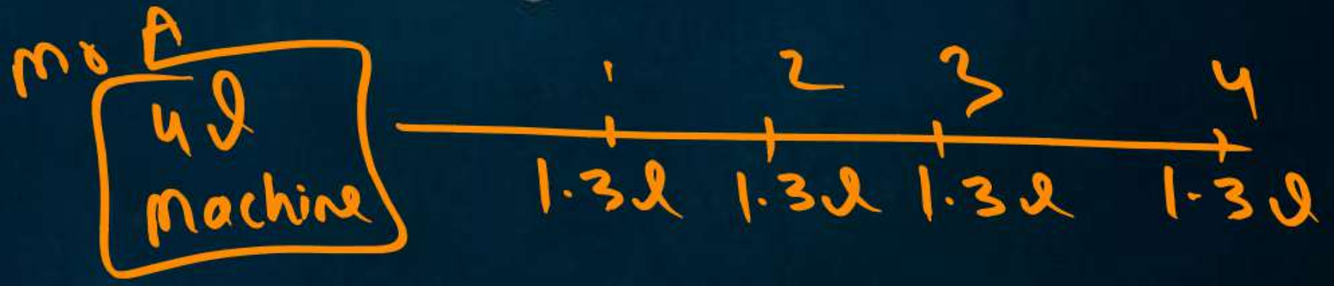
$$= 269.50 + 768.78$$

$$= 1038$$

₹1200
3 years
10%

Mr. A leases out a machine worth ₹4,00,000 to Mr. B for 4 years. The lease rental is fixed at ₹1,30,000 per annum, payable at the end of each year. If the prevailing interest rate is 13% per annum compounded annually, to whom is this agreement favorable?

A) Mr. A
B) Mr. B
C) Favorable to both
D) Not favorable for either



Cost > Rent

Sol: PV of all Rent

$$= 1,30,000\left\{\frac{1-(1.13)^{-4}}{0.13}\right\}$$

$$= 3,86,681$$

QUESTION

Mr. A leases out a machine worth ₹35,00,000 to Mr. B for 6 years. The lease rental is fixed at ₹9,20,000 per annum, payable at the end of each year. If the prevailing interest rate is 12% per annum compounded annually, to whom is this agreement favorable?

A) Mr. A
B) Mr. B
C) Favorable to both
D) Not favorable for either

Cost < Rent

$$PV = 9,20,000\left\{\frac{1-(1.12)^{-6}}{0.12}\right\}$$

$$= 37,82,494$$

Questions -

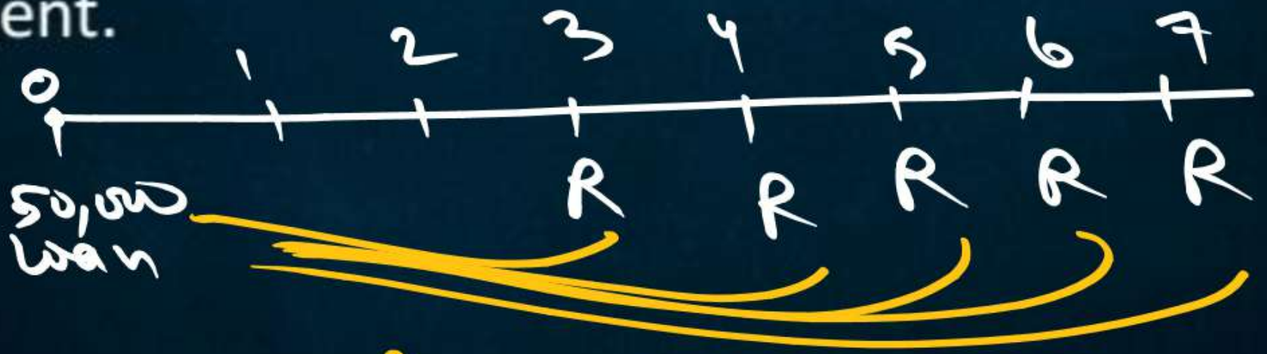
A loan of ₹50,000 is taken at **10% per annum compounded annually**. The loan is to be repaid by **5 equal annual instalments**, payable at the end of each year, but the **first instalment is paid at the end of 3 years**. Find the amount of each instalment.

(a) ₹14,820

(b) ₹15,957

(c) ₹17,500

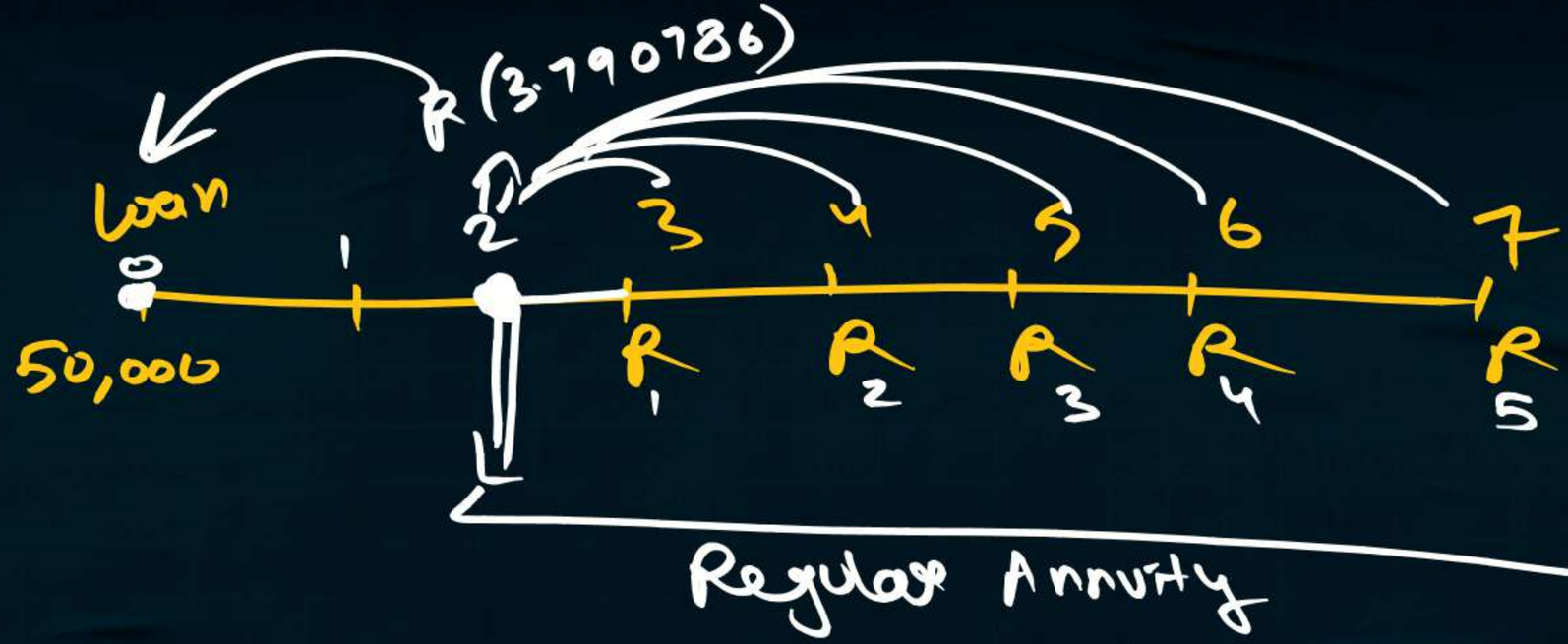
(d) ₹18,250



$$50{,}000 = \frac{R}{(1.10)^3} + \frac{R}{(1.10)^4} + \frac{R}{(1.10)^5} + \frac{R}{(1.10)^6} + \frac{R}{(1.10)^7}$$

$$50{,}000 = R\{0.7513 + 0.6830 + 0.62092 + 0.5644 + 0.5131\}$$

$$50{,}000 = R\{3.1328\} \Rightarrow R = 15959$$



PV at the end of 2nd year $= R\left\{\dfrac{1-(1.10)^{-5}}{0.10}\right\}$

$= R\,(3.790786)$

Now

$$\text{Loan} = \frac{R\,(3.790786)}{(1+0.10)^2}$$

$$50{,}000 = R\,(3.13288) \Rightarrow R = 15{,}959.74$$

Questions -

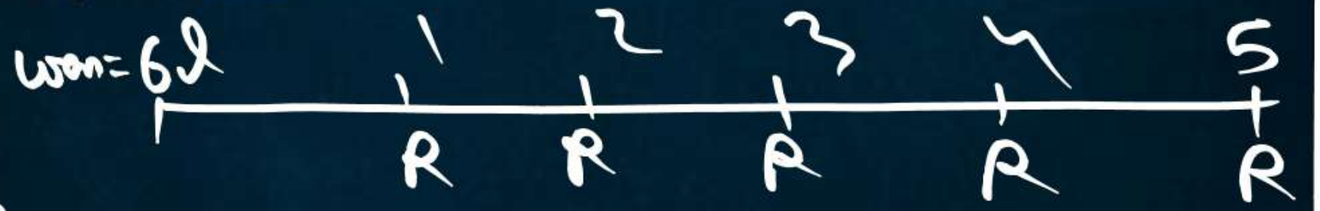
Aisha borrows ₹6,00,000 from a bank at **12% per annum for 5 years**, to be repaid in **equal annual instalments** . What is the **total interest paid by her during the loan period**?

(a) ₹1,66,446

(b) ₹2,00,000

(c) ₹2,32,229

(d) None



$$600{,}000 = R\left\{\frac{1-(1.12)^{-5}}{0.12}\right\}$$

$$600{,}000 = R(3.6047)$$

$$R = 1{,}66{,}445$$

total amount paid

$= 1{,}66{,}445 \times 5$

$= 8{,}32{,}229$

(-) Loan = 600000

2,32,229

Questions -

Juicer A with a useful life of seven years costs ₹15,000 while another Juicer B with a useful life of five years costs ₹12,000. The first juicer saves labour expenses of ₹3,000 annually and the second one saves labour expenses of ₹3,200 annually. Determine the preferred course of action. Assume cost of borrowing as 10% compounded per annum.

(a) Buying Juicer A is the preferred course of action.

(b) Buying Juicer B is the preferred course of action.

(c) Both options are equally preferred.

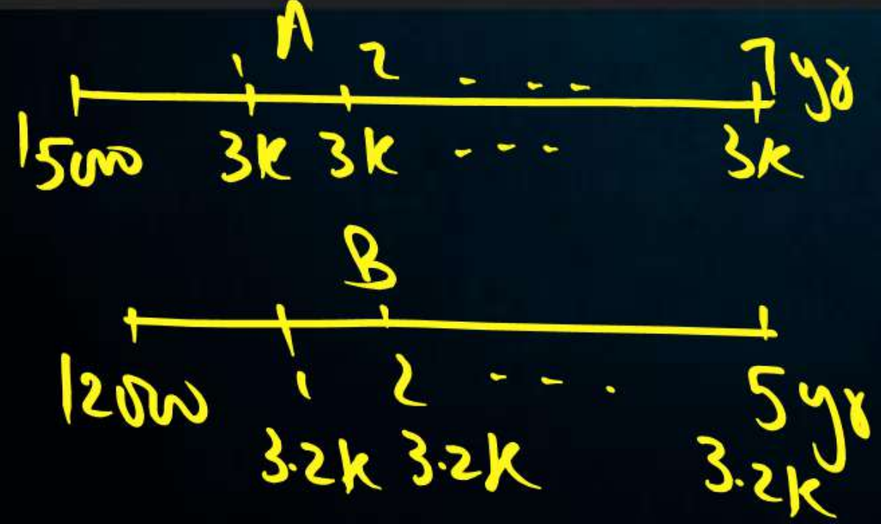
(d) It cannot be determined based on the given information.

$$NPV_A = 3000\left\{\frac{1-(1.10)^{-7}}{0.10}\right\} - 15000$$

$$= -394.74$$

$$NPV_B = 3200\left\{\frac{1-(1.10)^{-5}}{0.10}\right\} - 12000$$

$$= +1130$$



Equation & Inequalities

Quadratic Equation

$ax^2 + bx + c = 0$ where $a \neq 0$

α & β are two Roots

$x = \alpha$ & $x = \beta$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$\alpha + \beta = -\frac{b}{a}$

$\alpha\beta = \frac{c}{a}$

$\alpha^2 + \beta^2 = (\alpha+\beta)^2 - 2\alpha\beta$

$\alpha^3 + \beta^3 = (\alpha+\beta)(\alpha^2 + \beta^2 - \alpha\beta)$

$$(\alpha+\beta)^3 = \alpha^3+\beta^3+3\alpha\beta(\alpha+\beta)$$

$$\# \quad \alpha^3+\beta^3 = (\alpha+\beta)^3 - 3\alpha\beta(\alpha+\beta)$$

$$\# \quad \alpha-\beta = \frac{\sqrt{D}}{a} = \frac{\sqrt{b^2-4ac}}{a}$$

If one Root is reciprocal of other.
then $a = c$

If one Root is $p+\sqrt{q}$
then other root $p-\sqrt{q}$

If α & β are Roots

Quadratic Equation

$x^2 - (\text{Sum of zeroes})x + \text{Product of zeroes} = 0$

$x^2 - (\alpha+\beta)x + \alpha\beta = 0$

Discriminant $(D) = b^2 - 4ac$

If $D > 0$
Real & Different Roots

If $D = 0$
Roots Real & equal

If $D < 0$
then Roots are imaginary

Cubic Equation

$$ax^3 + bx^2 + cx + d = 0 \quad \text{where } a \neq 0$$

$$\alpha + \beta + \gamma = -\frac{b}{a}$$

$$\alpha\beta + \beta\gamma + \alpha\gamma = \frac{c}{a}$$

$$\alpha\beta\gamma = -\frac{d}{a}$$

Questions -

A number consists of two digits. The digit in the ten's place is 3 times the digit in the unit's place. If 54 is subtracted from the number, the digits are reversed. The number is

(a) 39

(b) 92

(c) 93

(d) 94

Questions -

The wages of 8 men and 6 boys amount to ₹33. If 4 men earn ₹4.50 more than 5 boys, determine the wages of each man and boy.

(a) (₹0.50, ₹3)

(b) (₹3, ₹1.50)

(c) (₹2.50, ₹2)

(d) (₹2, ₹2.50)

$8m + 6B = 33$

$4m - 5B = 4.50$

Questions -

The demand and supply equations for a certain commodity are $4q + 7p = 17$ and $p = \frac{q}{3} + \frac{7}{4}$ respectively, where p is the market price and q is the quantity. The equilibrium price and quantity are

(a) $2, \frac{3}{4}$

(b) $3, \frac{3}{4}$

(c) $5, \frac{3}{4}$

(d) None of these

$7p + 4q = 17$

$P = \frac{q}{3} + \frac{7}{4}$

$P = 2 \quad q = 3/4$

$\left(\frac{3}{4}\right) + \frac{7}{4}$

$= \frac{1}{4} + \frac{7}{4}$

$= \frac{8}{4}$

$= 2$

Questions -

If the roots of the quadratic equation $2x^2 + 5x - 3 = 0$ are α and β, what is the value of $|\alpha - \beta|$?

(a) $\frac{3}{2}$

(b) $\frac{7}{2}$

(c) $\frac{5}{2}$

(d) $\frac{1}{2}$

$a = 2, \quad b = 5, \quad c = -3$

$2x^2 + 5x - 3 = 0$

$\alpha - \beta$

$= \frac{\sqrt{b^2 - 4ac}}{a}$

$= \frac{\sqrt{(5)^2 - 4(2)(-3)}}{2}$

$= \frac{\sqrt{25 + 24}}{2}$

$= \frac{\sqrt{49}}{2}$

$= \frac{7}{2}$

Questions -

If the ratio of the roots of the equation $4x^2 - 6x + p = 0$ is $1 : 2$, then the value of p is

(a) 1

(b) 2

(c) −2

(d) −1

$4x^2 - 6x + p = 0$

$a = 4, b = -6$ & $c = p$

$\alpha : \beta = 1 : 2$

$\alpha = k$ & $\beta = 2k$

$\alpha + \beta = -\frac{b}{a}$

$k + 2k = -\frac{(-6)}{4}$

$3k = \frac{3}{2} \Rightarrow k = \frac{1}{2}$

$\alpha\beta = \frac{c}{a}$

$(k)(2k) = \frac{p}{4}$

$2k^2 = \frac{p}{4}$

$8k^2 = p$

$8\left(\frac{1}{2}\right)^2 = p$

$2 = p$

Questions -

One root of the equation $x^2 - 2(5+m)x + 3(7+m) = 0$ is the reciprocal of the other. Find the value of m.

(a) $-\frac{20}{3}$

(b) 7

(c) $\frac{1}{7}$

(d) $\frac{1}{17}$

one Root is Reciprocal of other

$a = c$

$(1) = 3(7+m)$

$1 = 21 + 3m$

$-20 = 3m$

$-\frac{20}{3} = m$

Questions -

If roots of the equation $x^2 + x + r = 0$ are α and β and $\alpha^3 + \beta^3 = -6$, find the value of r.

(a) $-\frac{5}{3}$

(b) $\frac{7}{3}$

(c) $-\frac{4}{3}$

(d) 1

$x^2 + x + r = 0$

$a = 1, b = 1, c = r$

$\alpha + \beta = -\frac{b}{a} = -\frac{1}{1} = -1$

$\alpha\beta = \frac{c}{a} = \frac{r}{1} = r$

$\alpha^3 + \beta^3 = (\alpha + \beta)^3 - 3\alpha\beta(\alpha + \beta)$

$-6 = (-1)^3 - 3r(-1)$

$-6 = -1 + 3r$

$-5 = 3r$

$-\frac{5}{3} = r$

Questions -

If $\alpha + \beta = -2$ and $\alpha\beta = -3$ where α and β are the roots of the equation, which is

(a) $x^2 - 2x - 3 = 0$

(b) $x^2 + 2x - 3 = 0$

(c) $x^2 + 2x + 3 = 0$

(d) $x^2 - 2x + 3 = 0$

$\alpha + \beta = -2$

$\alpha\beta = -3$

$x^2 - (\alpha + \beta)x + \alpha\beta = 0$

$x^2 - (-2)x + (-3) = 0$

$x^2 + 2x - 3 = 0$

Questions -

Imp

If the roots of the equation $2x^2 + 8x - m^3 = 0$ are equal, then the value of m is

(a) −3 ✗

(b) −1 ✗

(c) 1 ✗

(d) −2

Roots are Equal

$D = 0$

$b^2 - 4ac = 0$

$(8)^2 - 4(2)(-m^3) = 0$

$64 + 8m^3 = 0$

$8m^3 = -64$

$m^3 = -8$

Questions -

For what value of k the given equation has real roots:

$x^2 - 10x + k = 0$

(a) $k \leq 25$

(b) $k \geq 25$

(c) $k \leq 100$

(d) None of these

$D > 0$ & $D = 0$

for Real Roots

$D \geq 0$

$b^2 - 4ac \geq 0$

$b^2 \geq 4ac$

$(-10)^2 \geq 4(1)(k)$

$100 \geq 4k$

$25 \geq k$

Questions -

If a and b are the roots of the equation $2x^2 - 7x + 3 = 0$, then the value of $\frac{a}{b} + \frac{b}{a}$

(a) $\frac{15}{4}$ (b) $\frac{37}{6}$ (c) $\frac{28}{5}$ (d) None of the above

$2x^2 - 7x + 3 = 0$

$a = 2, b = -7, c = 3$

$\alpha + \beta = -\frac{b}{a} = -\frac{(-7)}{2} = 3.5$

$\alpha\beta = \frac{c}{a} = \frac{3}{2} = 1.5$

$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$

$= (3.5)^2 - 2(1.5) = 9.25$

$\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$

$= \frac{\alpha^2 + \beta^2}{\alpha\beta}$

$= \frac{9.25}{1.5}$

$= 6.16$

Questions -

The value of $x = 2 + \cfrac{1}{2 + \cfrac{1}{2 + \cfrac{1}{2 + \cfrac{1}{\cdots}}}}$

is

(a) $1 + \sqrt{2}$ = 2.4142

(b) $2 + \sqrt{5}$ = 4.23

(c) $1 \pm \sqrt{2}$

(d) None of these

$$x = 2 + \frac{1}{x}$$

$$x = 2 + \frac{1}{x}$$

$$x = \frac{2x+1}{x}$$

$$x^2 = 2x + 1$$

$$x^2 - 2x - 1 = 0$$

$a = 1, b = -2, c = -1$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-1)}}{2(1)}$$

$$= \frac{2 \pm \sqrt{8}}{2}$$

$$x = \frac{2 + \sqrt{8}}{2}$$

$$= 2.4142$$

$$x = \frac{2 - \sqrt{8}}{2}$$

✗

Questions -

The value of

$$\sqrt{1+\sqrt{1+\sqrt{1+\cdots}}}$$

is

(a) $\frac{1+\sqrt{5}}{2}$

(b) $\sqrt{2}$

(c) $1+\sqrt{2}$

(d) None of these

$$x = \sqrt{1+\sqrt{1+\sqrt{1+\cdots}}}$$

$$x = \sqrt{1+x}$$

$$x^2 = 1+x$$

$$x^2 - x - 1 = 0$$

$$a=1, b=-1, c=-1$$

$$x = \frac{-(-1)+\sqrt{(-1)^2-4(1)(-1)}}{2(1)} = \frac{+1+\sqrt{5}}{2}$$

Questions -

m ≠ 0

The three roots of the equation

$ax^3+bx^2+cx+d=0$

$$x^3 + 9x^2 - x - 9 = 0$$

$a=1,\ b=9,\ c=-1,\ d=-9$

are

(a) $1, -1, -9$

(b) $1, -1, 9$

(c) $1, 1, 9$

(d) $-1, -1, -9$

$\alpha+\beta+\gamma = -\frac{b}{a} = -\frac{9}{1} = -9$

Questions -

The roots of the equation

$$y^3 - 4y^2 - 9y + 36 = 0$$

are

(a) $1, 3, 4$ ✗

(b) $3, 3, 4$ ✗

(c) $-3, -3, 4$ ✗

(d) $3, -3, 4$

$a = 1, b = -4, c = -9, d = 36$

$\alpha + \beta + \gamma = -\frac{b}{a} = -\frac{(-4)}{1} = 4$

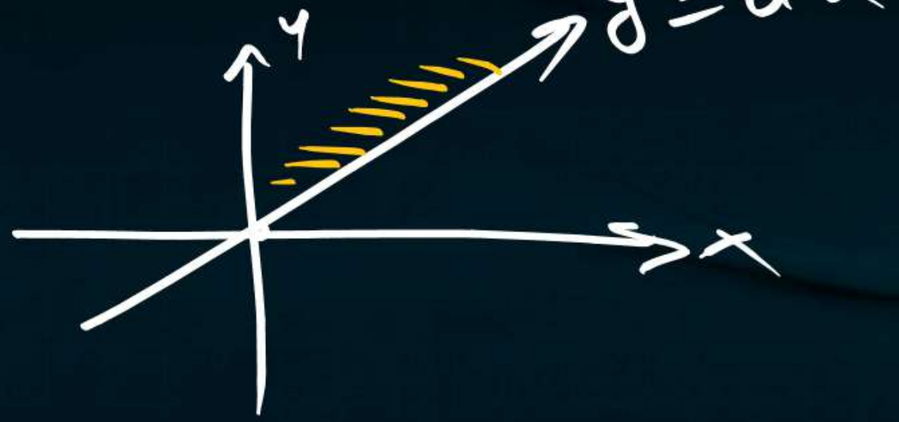
$x^3 + 3x + 5 = 0$

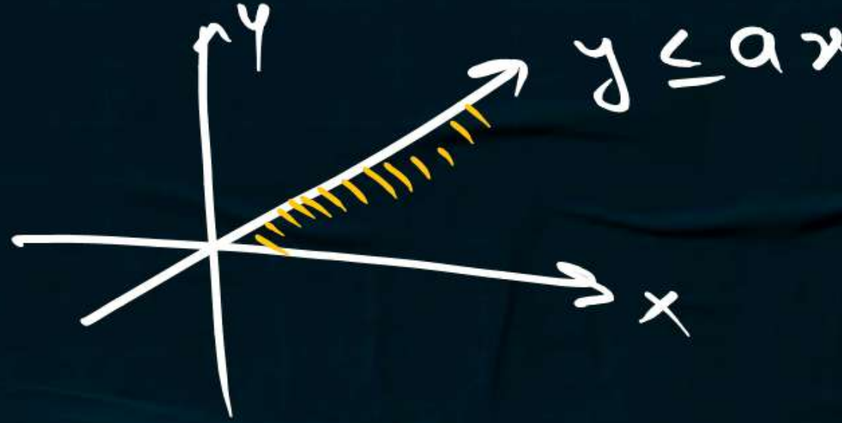
$a = 1, b = 0, c = 3, d = 5$

$\alpha + \beta + \gamma = -\frac{0}{1} = 0$

At least $\geq$

At most $\leq$





A company produce two type of product A & B which require processing in two machines. First machine can be used up to 15 hrs. and second can be used at most 12 hrs. in a day. The product A requires 2 hrs. on machine 1 & 3 hrs. on machine 2. The product B requires 3 hrs. on machine 1 & 1 hour on machine 2. This can be expressed as :

(A) $2x_1 + 3x_2 \le 15$

$3x_1 + x_2 \le 12$

(B) $2x_1 + 3x_2 \le 15$

$3x_1 + x_2 \le 15$

(C) $3x_1 + 2x_2 \le 15$

$2x_1 + x_2 \le 12$

(D) $2x_1 + 3x_2 \le 12$

$3x_1 + x_2 \le 15$

	A	B	
m_1	$2x_1$	$3x_2$	≤ 15
m_2	$3x_1$	$1x_2$	≤ 12

$2x_1 + 3x_2 \le 15$

$3x_1 + x_2 \le 12$

$x_1 \ge 0$

$x_2 \ge 0$

Questions -

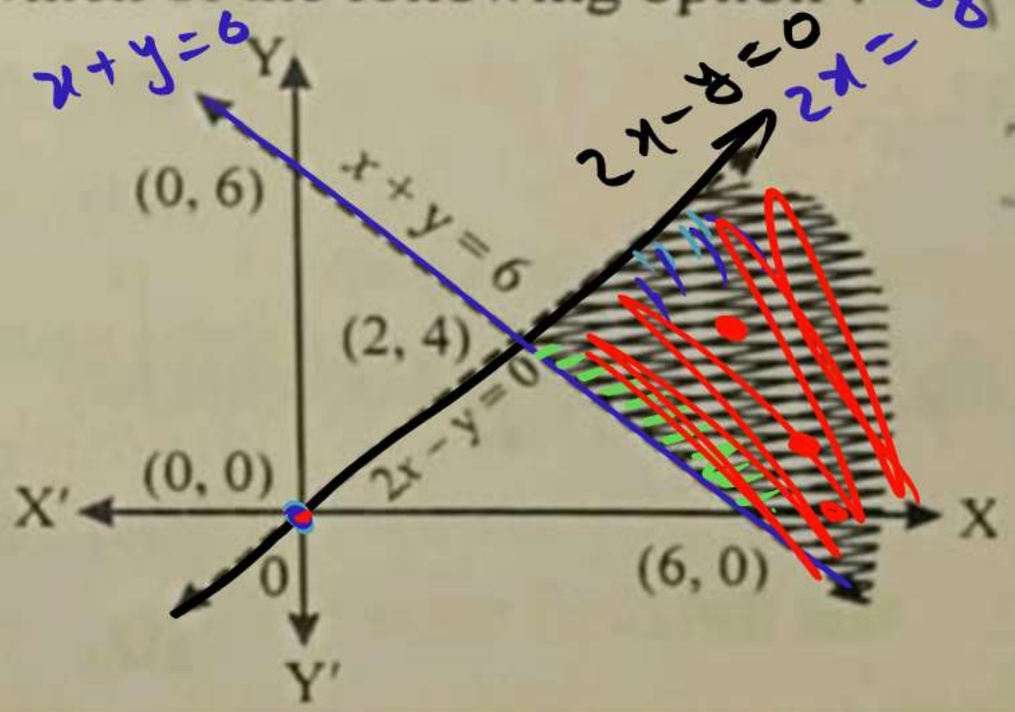
The shaded area is represented by which of the following option ?

(A) $x + y < 6; 2x - y > 0; x < 0$

(B) $x + y > 6; 2x - y > 0; x > 0$

(C) $x + y > 6; 2x - y < 0; x > 0$

(D) $x + y > 6; 2x - y > 0; x < 0$



$2x - y = 0$

$2x = y$

$2x \geq y$

$2x - y \geq 0$

$x + y = 6$

$x + y \geq 6$

Questions -

A company is planning to launch a new product and decides to hire marketing executives and sales executives for the project. If the company cannot employ more than 12 executives, which of the following inequalities correctly relates the number of marketing executives (x) and sales executives (y) that the company can hire?

(a) $x + y \leq 12$

(b) $2x + 3y \leq 12$

(c) $3x + 2y \leq 12$

(d) $4x + 4y \leq 12$

$x \geq 0$

$y \geq 0$

$x + y \leq 12$

$x \geq 0 \& y \geq 0$

Questions -

Solve: $\frac{3x-2}{4} \geq \frac{2x+1}{3}$

Options:

(A) $x \geq 10$ (B) $x \leq 10$ (C) $x \geq -10$ (D) $x \leq -10$

$$\frac{3x-2}{4} \geq \frac{2x+1}{3}$$

$$3(3x-2) \geq 4(2x+1)$$

$$9x-6 \geq 8x+4$$

$$x \geq 10$$

Questions -

Which of the followings is a solution of the inequality $\frac{5x}{3} \leq \frac{x}{6} - 5$?

(A) $(-\infty, -\frac{10}{3}]$

(B) $(-\infty, -\frac{10}{3})$

(C) $(-\infty, -\frac{8}{3}]$

(D) $(-\infty, -\frac{8}{3})$

$\frac{5x}{3} \leq \frac{x}{6} - 5$

$\frac{5x}{3} \leq \frac{x-30}{6}$

$30x \leq 3x - 90$

$27x \leq -90$

$x \leq -\frac{90}{27}$

$x \leq -\frac{10}{3}$

$(-\infty, -\frac{10}{3}]$

$x < -\frac{10}{3}$

$(-\infty, -\frac{10}{3})$

Questions -

A person invests ₹x in Scheme A and ₹y in Scheme B.

The total investment **cannot exceed ₹1,00,000**, and the investment in Scheme A must be **at least ₹40,000**.

Which of the following pairs of inequalities represent the situation?

(A) $x + y \leq 100000, x \geq 40000$

(B) $x + y \geq 100000, x \leq 40000$

(C) $x + y < 100000, x > 40000$

(D) $x + y = 100000, x \geq 40000$

A ↓ ₹ x

B ↓ ₹ y

$x + y \leq 100000$ & $x \geq 40,000$

Questions -

An employer recruits experienced (x) and fresh workmen (y)

On the average experienced person does 5 units of work while a fresh one 3 units of work daily but the employer has to maintain an output of at least 30 units of work per day. This situation can be expressed as

(a) $5x + 3y \leq 30$ (b) $5x + 3y > 30$ (c) $5x+3y\geq 30\ x \geq 0, y \geq 0$ (d) none of these

exp x → 5 units

fresher : y → 3 units

$5x + 3y \geq 30$

Questions -

An employer recruits experienced (x) and fresh workmen (y). The rules and regulations demand that the employer should employ not more than 5 experienced hands to 1 fresh one and this fact can be expressed as

(a) $y \geq x$

b) $5y \leq x$

(c) $5y \geq x$

(d) none of these

exp = x & fresh = y

$\frac{e}{f} \leq \frac{5}{1}$

$x \leq 5y$

a) $y \geq x$

$1 \geq x$

b) $5y \leq x$

$5(1) \leq x$

$y = 1$

$x \leq 5$

(c) $5y \geq x$

$5(1) \geq x$

$5 \geq x$

$x \leq 5$