Class XII Session 2024-25
Subject - Applied Mathematics
Sample Question Paper - 2

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This question paper contains five sections A, B, C, D and E. Each section is compulsory.
2. Section - A carries 20 marks weightage, Section - B carries 10 marks weightage, Section - C carries 18 marks weightage, Section - D carries 20 marks weightage and Section - E carries 3 case-based with total weightage of 12 marks.
3. **Section – A:** It comprises of 20 MCQs of 1 mark each.
4. **Section – B:** It comprises of 5 VSA type questions of 2 marks each.
5. **Section – C:** It comprises of 6 SA type of questions of 3 marks each.
6. **Section – D:** It comprises of 4 LA type of questions of 5 marks each.
7. **Section – E:** It has 3 case studies. Each case study comprises of 3 case-based questions, where 2 VSA type questions are of 1 mark each and 1 SA type question is of 2 marks. Internal choice is provided in 2 marks question in each case-study.
8. Internal choice is provided in 2 questions in Section - B, 2 questions in Section – C, 2 questions in Section - D. You have to attempt only one of the alternatives in all such questions.

Section A

1. If A and B are symmetric matrices, then ABA is: **[1]**

a) diagonal matrix b) skew-symmetric matrix

c) scalar matrix d) symmetric matrix

2. For testing the significance of difference between the means of two independent samples, the degree of freedom (v) is taken as: **[1]**

a) $n_1 - n_2 + 2$ b) $n_1 - n_2 - 2$

c) $n_1 + n_2 - 1$ d) $n_1 + n_2 - 2$

3. Present value of annuity of ₹ 500 each paid at the end of each year for 3 years at 4% p.a. is [Use $(1.04)^{-3} = 0.888$] **[1]**

a) ₹ 1450 b) ₹ 1400

c) ₹ 1350 d) ₹ 1550

4. The intermediate solutions of constraints must be checked by substituting them back into **[1]**

a) Objective function b) Not required

c) Constraint equations

d) required

5. If A = $\begin{bmatrix} 2 & -1 & 3 \\ -4 & 5 & 1 \end{bmatrix}$ and B = $\begin{bmatrix} 2 & 3 \\ 4 & -2 \\ 1 & 5 \end{bmatrix}$, then: **[1]**

a) only AB is defined

b) only BA is defined

c) AB and BA both are defined

d) AB and BA both are not defined

6. A coin is tossed 4 times. The probability that at least one head turns up, is **[1]**

a) $\frac{2}{16}$

b) $\frac{15}{16}$

c) $\frac{1}{16}$

d) $\frac{14}{16}$

7. A card is drawn from an ordinary pack of 52 cards and a gambler bets that it is a heart or a king card. What are the odds against his winning this bet? **[1]**

a) 4:1

b) 4:9

c) 1:4

d) 9:4

8. The solution of the differential equation $\frac{dx}{x} + \frac{dy}{y}$ = 0 is: **[1]**

a) $\frac{1}{x} + \frac{1}{y}$ = C

b) x + y = C

c) log x log y = C

d) xy = C

9. In a 500 m race, the ratio of speeds of two contestants A and B is 3 : 4. If A gets a start of 140 m, then he wins by: **[1]**

a) 10 m

b) 60 m

c) 20 m

d) 40 m

10. If A is a square matrix such that A^2 = A, then $(I + A)^3$ - 7A is equal to **[1]**

a) I - A

b) 3A

c) A

d) I

11. (18 $\times$ 10) (mod 7) is **[1]**

a) 3

b) 4

c) 5

d) 2

12. The solution set of the inequation |x + 2| $\leq$ 5 is **[1]**

a) (-7, 5)

b) |x| $\leq$ 5

c) [-5, 5]

d) [-7, 3]

13. A boat goes 12 km upstream in 48 minutes. If the speed of the stream is 2 km/hr, the speed of boat in still water is **[1]**

a) 6.5 km/hr

b) 13 km/hr

c) 8.5 km/hr

d) 17 km/hr

14. The maximum value of Z = 4x + 2y subjected to the constraints 2x + 3y $\leq$ 18, x + y $\geq$ 10; x, y $\geq$ 0 is **[1]**

a) none of these

b) 36

c) 40

d) 20

15. Region represented by $x \geq 0$, $y \geq 0$ lies in **[1]**

a) IV quadrant
b) II quadrant
c) III quadrant
d) I quadrant

16. If the calculated value of $|t| < t_v(\alpha)$, then the null hypothesis is: **[1]**

a) neither accepted nor rejected
b) rejected
c) cannot be determined
d) accepted

17. $\int (x - 1)e^{-x}\, dx$ is equal to **[1]**

a) $(x + 1)\, e^{-x} + C$
b) $-xe^{-x} + C$
c) $(x - 2)\, e^{-x} + C$
d) $xe^{-x} + C$

18. The straight line trend is represented by the equation: **[1]**

a) $y_c = a - bx$
b) $y_c = na - b\Sigma x$
c) $y_c = a + bx$
d) $y_c = na + b\Sigma x$

19. **Assertion (A)**: The matrix A = $\begin{bmatrix} 3 & -1 & 0 \\ \frac{3}{2} & 3\sqrt{2} & 1 \\ 4 & 3 & -1 \end{bmatrix}$ is rectangular matrix of order 3. **[1]**

Reason (R): If A = $[a_{ij}]_{m \times 1}$, then A is column matrix.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

20. **Assertion (A):** The function $f(x) = (x + 2)\, e^{-x}$ is increasing in the interval $(-1, \infty)$. **[1]**

Reason (R): A function f(x) is increasing, if $f'(x) > 0$.

a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
c) Assertion (A) is true and Reason (R) is false.
d) Assertion (A) is false and Reason (R) is true.

Section B

21. The revenues of company over a period are given as follows: **[2]**

Year	**2015**	**2016**	**2017**	**2018**
Revenue (in thousands ₹)	100	115	150	200

Calculate CAGR over the 3-year period spanning the end of 2015 to the end of 2018. [Given: $(2)^{\frac{1}{3}}$ = 1.26]

22. Find the difference between simple and compound interest on a sum of ₹ 10,000 at 7% for 3 years. [Use $(1.07)^3$ = 1.225] **[2]**

OR

A banker credits the fixed deposit account of a depositor on a continuous basis. As a result, the effective rate of interest earned by a depositor is 9.43%. Find out the rate of interest that is allowed by the banker. What is the effective rate of interest if it is compounded on quarterly basis?

23. Evaluate: **[2]**

$\int_0^1 x(1-x)^n\,dx$

24. Find x, y, z and w such that $\begin{bmatrix} x-y & 2z+w \\ 2x-y & 2x+w \end{bmatrix} = \begin{bmatrix} 5 & 3 \\ 12 & 15 \end{bmatrix}$ **[2]**

OR

Evaluate the determinant $D = \begin{vmatrix} 2 & 3 & -2 \\ 1 & 2 & 3 \\ -2 & 1 & -3 \end{vmatrix}$ by expanding it along first column.

25. In what ratio must a person mix two sugar solutions of 30% and 50% concentration respectively so as to get a solution of 45% concentration? **[2]**

Section C

26. Solve the initial value problem: $e^{\frac{dy}{dx}}$ = x + 1; y(0) = 3 **[3]**

OR

Determine the order and the degree (when defined) differential equations:

$5\frac{d^2y}{dx^2} = \left(1+\left(\frac{dy}{dx}\right)^2\right)^{\frac{1}{4}}$

27. Riya invested ₹ 20,000 in a mutual fund in year 2016. The value of mutual fund increased to ₹ 32,000 in year 2021. Calculate the compound annual growth rate of her investment. [Given, log(1.6) = 0.2041, antilog (0.04082) = 1.098] **[3]**

28. Suppose when x units of a commodity are produced, the demand is p = 45 - x^2 rupees per unit, and the marginal cost is MC = 6 + $\frac{1}{4}x^2$, Assume there is no overhead i.e. C(0) = 0. Find: **[3]**

i. the total revenue and the marginal revenue.

ii. the value of x (to the nearest unit) that maximizes profit.

iii. the consumer's surplus at the value of x where profit is maximized (use the exact value of x).

29. The random variable X can take only the values 0,1, 2, 3. Given that P(X = 0) = P(X = 1) = p and P(X = 2) = P(X = 3) such that $\Sigma p_i x_i^2 = 2\Sigma p_i x_i$, find the value of p. **[3]**

OR

If the sum and the product of the mean and variance of Binomial Distribution are 1.8 and 0.8 respectively, find the probability distribution and the probability of at least one success.

30. The profit of a paper hag manufacturing company (in lakhs of rupees) during each month of a year are: **[3]**

Month	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
Profit	1.2	0.8	1.4	1.6	2.0	2.4	3.6	4.8	3.4	1.8	0.8	1.2

Plot the given data on a graph sheet. Calculate the four monthly moving averages and plot these on the same graph sheet.

31. A group of 5 patients treated with medicine A weigh 10, 8, 12, 6, 4 kg. A second group of 7 patients treated with medicine B weigh 14, 12, 8, 10, 6, 2, 11 kg. Comment on the rejection of hypothesis with 5% level of significance. **[3]**

[Given: $t_{(10, 0.05)}$ = 1.812]

Section D

32. Maximise Z = 8x + 9y subject to the constraints given below: **[5]**

$2x + 3y \leq 6; 3x - 2y \leq 6; y \leq 1; x, y \geq 0$

OR

A box manufacturer makes large and small boxes from a large piece of cardboard. The large boxes require 4 sq. metre per box while the small boxes require 3 sq. metre per box. The manufacturer is required to make at least three large boxes and at least twice as many small boxes as large boxes. If 60 sq. metre of carboard is in stock, and if the profits on the large and small boxes are ₹3 and ₹2 per box, how many of each should be made in order to maximize the total profit?

33. A company manufactures cassettes and its cost and revenue functions for a week are $C = 300 + \frac{3}{2}x$ and $R = 2x$ respectively, where x is the number of cassettes produced and sold in a week. How many cassettes must be sold for the company to realize a profit? **[5]**

34. A die is tossed twice. A success is getting an odd number on a random toss. Find the variance of the number of successes. **[5]**

OR

A fair coin is tossed four times, and a person win ₹ 1 for each head and lose ₹ 1.50 for each tail that turns up. From the sample space calculate how many different amounts of money you can have after four tosses and the probability of having each of these amounts.

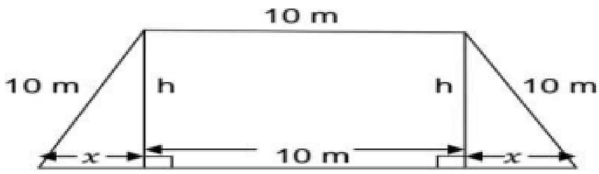
35. It is known that, if the interest is compounded continuously, the principal changes at the rate equal to the product of the rate of bank interest per annum and the principal. **[5]**

a. If the interest is compounded continuously at 5% p.a., in how many years will ₹ 100 double?
b. At what interest rate will ₹ 100 double itself in 10 years?
[Given: $\log_e 2 = 0.6931$]

Section E

36. **Read the text carefully and answer the questions:** **[4]**

The front gate of a building is in the shape of a trapezium as shown below. Its three sides other than base are 10m each. The height of the gate is h meter. On the basis of this information and figure given below answer the following questions:



(a) How will you show the area A of the gate expressed as a function of x?

(b) What is the value of $\frac{dA}{dx}$?

(c) For which positive value of x, $\frac{dA}{dx} = 0$?

OR

At the value of x where $\frac{dA}{dx} = 0$, area of trapezium is maximum then what is the maximum area of trapezium?

37. **Read the text carefully and answer the questions:** **[4]**

Loans are an integral part of our lives today. We take loans for a specific purpose - for buying a home, or a car, or sending kids abroad for education - loans help us achieve some significant life goals. That said, when we talk about loans, the word “EMI", eventually crops up because the amount we borrow has to be returned to the lender with interest.

Suppose a person borrows ₹1 lakh for one year at the fixed rate of 9.5 percent per annum with a monthly rest. In this case, the EMI for the borrower for 12 months works out to approximately ₹8,768.

Example:

In year 2000, Mr. Tanwar took a home loan of ₹3000000 from State Bank of India at 7.5% p.a. compounded monthly for 20 years.

(a) Find the equated monthly installment paid by Mr. Tanwar.

(b) Find interest paid by Mr. Tanwar in 150th payment.

(c) Find Principal paid by Mr. Tanwar in 150th payment.

OR

Find principal outstanding at the beginning of 193th month.

38. The sales figures for two-car dealers during January showed that dealer A sold 5 Luxury, 3 premium and 4 standard cars, while dealer B sold 7 luxury, 2 premium and 3 standard cars. Total sales over 2-month period of January - February revealed that dealer A sold 8 luxury, 7 premium and 6 standard cars. In the same 2-month period, dealer B sold 10 luxury, 5 premium and 7 standard cars. Write 2×3 matrices summarizing sales data for January and the 2-month period for each dealer. Hence, find the sales in February for each year. **[4]**

OR

A total amount of ₹7000 is deposited in three different savings bank accounts with annual interest rates of 5%, 8% and $8\frac{1}{2}\%$ respectively. The total annual interest from these three accounts is ₹550. Equal amounts have been deposited in the 5% and 8% savings accounts. Find the amount deposited in each of the three accounts, with the help of matrices.

Solution

Section A

1.

(d) symmetric matrix

Explanation: A’ = A & B’ = B

(ABA)’ = A’ (AB)’

= A’B’A’

= ABA

Therefore ABA is symmetric matrix

2.

(d) $n_1 + n_2 - 2$

Explanation: $n_1 + n_2 - 2$

3.

(b) ₹ 1400

Explanation: As PV = $\frac{500}{0.04}$ $[1-(1.04)^{-3}]$

= 12500[1 - 0.888]

= 12500 $\times$ 0.112 = ₹ 1400

4.

(c) Constraint equations

Explanation: Constraint equations

5.

(c) AB and BA both are defined

Explanation: AB and BA both are defined

6.

(b) $\frac{15}{16}$

Explanation: n = 4, p = q = $\frac{1}{2}$

$P(X \geq 1) = 1 - P(X = 0)$

$P(X \geq 1) = 1 - \left(\frac{1}{2}\right)^4$

$P(X \geq 1) = \frac{15}{16}$

7.

(d) 9:4

Explanation: Let events A: a heart is drawn

Event B: a King card is drawn.

The probability of winning the bet = P (A or B)

P (A or B) = P(A) + P(B) - P(A∩B)

= $\frac{13}{52}$ + $\frac{4}{52}$ - $\frac{1}{52}$ (There is one king of heart)

= $\frac{13+4-1}{52}$ $\frac{16}{52}$ = $\frac{4}{13}$

∴ Probability of losing the bet = 1 - $\frac{4}{13}$ = $\frac{9}{13}$

The odds against an event are the ratio of the number of ways the event cannot happen to the number of ways it can happen.

∴ the odds against drawing a heart or a king are $\frac{9}{13}$: $\frac{4}{13}$ = 9 : 4.

8.

(d) xy = C

Explanation: xy = C

9.

(c) 20 m

Explanation: To reach the winning post A will have to cover a distance of (500 - 140) m = 360 m

While A covers 3 m, B covers 4 m.

While A covers 360 m, B covers = $\frac{4\times360}{3}$ = 480 m

$\therefore$ A wins by 20 m.

10.

(d) I

Explanation: Given that $A^2 = A$

Calculating value of $(I + A)^3 - 7A$:

$(I + A)^3 - 7A = I^3 + A^3 + 3I^2A + 3IA^2 - 7A$

$= I + A^2 \cdot A + 3A + 3A + 3A^2 - 7A$ ($I^n = I$ and $I \cdot A = A$)

$= I + A \cdot A + 3A + 3A - 7A$ ($A^2 = A$)

$= I + A + 3A + 3A - 7A$

Hence, $(I + A)^3 - 7A = I$

11.

(c) 5

Explanation: $(18 \times 10) \pmod 7 = 18 \pmod 7 \times 10 \pmod 7$

$= 4 \pmod 7 \times 3 \pmod 7$

$= 12 \pmod 7 = 5$

12.

(d) [-7, 3]

Explanation: $|x + 2| \leq 5$

$\Rightarrow -5 \leq x + 2 \leq 5$

$\Rightarrow -7 \leq x \leq 3$

$\Rightarrow x \in [-7, -3]$

13.

(d) 17 km/hr

Explanation: 12 km upstream in 48 min $\Rightarrow$ it will cover 15 km in 1 hr

Speed of stream = 2 km/hr

$\therefore$ Speed of boat in still water = 15 + 2 = 17 km/hr

14. **(a)** none of these

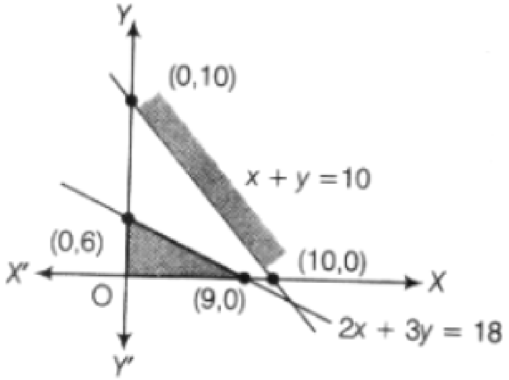
Explanation: Z = 4x + 2y

Subject to constraints

$2x + 3y \leq 18$,

$x + y \geq$ and

$x, y \geq 0$



There is no common area in the first quadrant. Hence, the objective function Z cannot be maximized.

15.

(d) I quadrant

Explanation: I quadrant

16.

(d) accepted

Explanation: accepted

17.

(b) -xe^{-x} + C

Explanation: I = $\int$(x - 1)e^{-x}

= $\int$xe^{-x} dx - $\int$e^{-x} dx

= -xe^{-x} - $\int$1.(-)e^{-x} dx - $\int$e^{-x} dx + c

= -xe^{-x} + $\int$e^{-x} dx - $\int$e^{x} dx + c

= -xe^{-x} + C

18.

(c) y_c = a + bx

Explanation: y_c = a + bx

19.

(d) A is false but R is true.

Explanation: Assertion: A = $\begin{bmatrix} 3 & -1 & 0 \\ \frac{3}{2} & 3\sqrt{2} & 1 \\ 4 & 3 & -1 \end{bmatrix}$ is a square matrix of order 3.

Reason: In general, A = $[a_{ij}]_{m\times 1}$ is a column matrix.

20.

(d) Assertion (A) is false and Reason (R) is true.

Explanation: Assertion (A) is false and Reason (R) is true.

Section B

21. The Compound Annual Growth Rate (CAGR) can be calculated using the following formula:

CAGR = $\left(\frac{EV}{BV}\right)^{\frac{1}{n}}$ - 1

Now, plug these values into the formula:

CAGR = $\left(\frac{200{,}000}{100{,}000}\right)^{\frac{1}{3}}$ - 1

CAGR = $(2)^{\frac{1}{3}}$ - 1

1.26 = $(2)^{\frac{1}{3}}$ - 1

Now, let's solve for $2^{\frac{1}{3}}$:

$2^{\frac{1}{3}}$ = 1.26 + 1

$2^{\frac{1}{3}}$ = 2.26

Now, raise both sides to the power of 3 to isolate 2:

2 = $(2.26)^3$

Now, calculate 2.26^3

2 $\approx$ 12.1657

So, the approximate CAGR over the 3-year period spanning the end of 2015 to the end of 2018 is 12.1657%.

22. P = ₹ 10,000, r = 7% p.a., n = 3 years

S.I. = $\frac{10000\times7\times3}{100}$ = ₹ 2100 ...(i)

C.I. = P $\left[\left(1+\frac{7}{100}\right)^3 - 1\right]$

= 10000[$(1.07)^3$ - 1]

= 10000(1.225 - 1)

= 10000 $\times$ 0.225 = ₹ 2250 ...(ii)

Difference = ₹ (2250 - 2100) [from (i), (ii)]

= ₹ 150

OR

Let the rate of interest allowed by the banker be r. It is given that $r_e = \frac{9.43}{100} = 0.0943$

$\therefore r = 2.3025 \log(1 + r_e)$

$\Rightarrow r = 2.3025 \log(1.0943) = 2.3025 \times 0.0391 = 0.0900$

Thus, the rate of interest allowed by the banker is 9% compounded continuously

If the interest is compounded quarterly, then

r = 0.09, m = 4

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

$\Rightarrow r_e = (1 + \frac{0.09}{4})^4 - 1 = (1.0225)^4 - 1 = 1.0930 - 1 = 0.0930$

Thus, the effective rate of interest is 9.3%.

23. $\int_0^1 x(1-x)^n dx = \int_0^1 (1-x)(1-(1-x))^n dx$

$= \int_0^1 (1-x)x^n dx = \int_0^1 \left(x^n - x^{n+1}\right) dx$

$= \left[\frac{x^{n+1}}{n+1}\right]_0^1 - \left[\frac{x^{n+2}}{n+2}\right]_0^1 = \frac{1}{n+1}(1-0) - \frac{1}{n+2}(1-0)$

$= \frac{1}{n+1} - \frac{1}{n+2} = \frac{(n+2)-(n+1)}{(n+1)(n+2)} = \frac{1}{n^2+3n+2}$

24. We know that the corresponding elements of two equal matrices are equal.

$\therefore \begin{bmatrix} x-y & 2z+w \\ 2x-y & 2x+w \end{bmatrix} = \begin{bmatrix} 5 & 3 \\ 12 & 15 \end{bmatrix}$

$\Rightarrow$ x - y = 5, 2z + w = 3, 2x - y = 12 and 2x + w = 15

Solving x - y = 5 and 2x - y = 12 as simultaneous linear equations, we get x = 7, y = 2

Putting x = 7 in equation 2x + w = 15, we get w = 1

Putting w = 1 in 2z + w = 3, we get z = 1

Hence, x = 7, y = 2, z = 1 and w = 1

OR

By using the definition, of expansion along first column, we obtain,

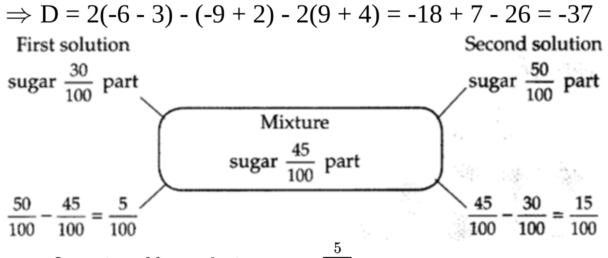
$D = \begin{vmatrix} 2 & 3 & -2 \\ 1 & 2 & 3 \\ -2 & 1 & -3 \end{vmatrix}$

$\Rightarrow D = (-1)^{1+1}(2)\begin{vmatrix} 2 & 3 \\ 1 & -3 \end{vmatrix} + (-1)^{2+1}(1)\begin{vmatrix} 3 & -2 \\ 1 & -3 \end{vmatrix} + (-1)^{3+1}(-2)\begin{vmatrix} 3 & -2 \\ 2 & 3 \end{vmatrix}$

$\Rightarrow D = 2\begin{vmatrix} 2 & 3 \\ 1 & -3 \end{vmatrix} - \begin{vmatrix} 3 & -2 \\ 1 & -3 \end{vmatrix} - 2\begin{vmatrix} 3 & -2 \\ 2 & 3 \end{vmatrix}$

$\Rightarrow D = 2(-6-3) - (-9+2) - 2(9+4) = -18 + 7 - 26 = -37$

25.



$\therefore \frac{\text{Quantity of first solution}}{\text{Quantity of second solution}} = \frac{\frac{5}{100}}{\frac{15}{100}} = \frac{1}{3}$ i.e. 1 : 3

Section C

26. The given differential equation is,

$e^{\frac{dy}{dx}} = x + 1$

Taking log on both sides, we get,

$\frac{dy}{dx} \log e = \log(x+1)$

$\Rightarrow \frac{dy}{dx} = \log(x+1)$

$\Rightarrow dy = \{\log(x+1)\} dx$

Integrating both sides, we get

$\int dy = \int \{\log(x+1)\} dx$

$\Rightarrow y = \int \underset{II}{1} \times \log(\underset{I}{x} + 1) dx$

$\Rightarrow$ y = log (x + 1) $\int$ 1 dx - $\int[\frac{d}{dx}$(log x + 1) $\int$ 1dx] dx

$\Rightarrow$ y = x log (x + 1) - $\int \frac{x}{x+1}dx$

$\Rightarrow$ y = x log (x + 1) - $\int \left(1 - \frac{1}{x+1}\right) dx$

$\Rightarrow$ y = x log (x + 1) - x + log (x + 1) + C ...(i)

It is given that y(0) = 3

$\therefore$ 3 = 0 $\times$ log (0 + 1) - 0 + log (0 + 1) + C

$\Rightarrow$ C = 3

Substituting the value of C in (i), we get

y = x log (x + 1) + log (x + 1) - x + 3

$\Rightarrow$ y = (x + 1) log (x + 1) - x + 3

Hence, y = (x + 1) log (x + 1) - x + 3 is the solution to the given differential equation.

OR

The given differential equation can be written as

$625\left(\frac{d^2y}{dx^2}\right)^4 = 1 + \left(\frac{dy}{dx}\right)^2$

It is of order 2 and degree 4.

27. Given beginning value of investment = ₹ 20,000

Final value of the investment = ₹ 32,000 No. of years = 5

So, CAGR = $\left(\frac{\text{End Value}}{\text{Beginning Value}}\right)^{\frac{1}{n}} - 1$

=$\left(\frac{32000}{20000}\right)^{\frac{1}{5}} - 1$

= $(1.6)^{\frac{1}{5}} - 1$

x = $(1.6)^{\frac{1}{5}}$

Let,

Taking log both sides, we get

log x = $\frac{1}{5}$log(1.6)

$\Rightarrow$ log x = $\frac{1}{5}$ $\times$0.2041

$\Rightarrow$ log x = 0.04082

$\Rightarrow$ x = antilog (0.04802)

= 1.098

CAGR = 1.098 - 1 = 0.098

= 9.8%

28. i. Let R be the total revenue. Then,

R = px

$\Rightarrow$ R = (45 - x^2)x

$\Rightarrow$ R = 45x - x^3 and $\frac{dR}{dx}$ = 45 - 3x^2

$\Rightarrow$ R = 45x - x^2, and MR = 45 - 3x^2

ii. Let P be the profit function. Then,

$\frac{dP}{dx}$ = MR - MC

$\Rightarrow$ $\frac{dP}{dx}$ = 45 - 3x^2) - $\left(6 + \frac{1}{4}x^2\right)$

$\Rightarrow$ $\frac{dP}{dx}$ = 39 - $\frac{13}{4}x^2$ and $\frac{d^2P}{dx^2}$ = $-\frac{13}{2}x$

For maximum profit, we must have

$\frac{dP}{dx}$ = 0 $\Rightarrow$ 39 - $\frac{13}{4}x^2$ = 0 $\Rightarrow$ x^2 = 12 $\Rightarrow$ x = $2\sqrt{3}$ = 3.46 $\simeq$ 3.5

Clearly, $\left(\frac{d^2P}{dx^2}\right)_{x=35}$ = $-\frac{13}{2} \times 3.5$ < 0

Hence, P is maximum when x = 3.5. Putting x = $2\sqrt{3}$ in p = 45 - x^2, we obtain p = 45 - 12 = 33. Thus, we obtain p_0 = 33 and x_0 = $2\sqrt{3}$.

iii. The consumer's surplus at x_0 = $2\sqrt{3}$ is given by

CS = $\int_0^{x_0} pdx - p_0x_0$

$\Rightarrow$ CS = $\int_0^{2\sqrt{3}} (45 - x^2)\,dx - 33 \times 2\sqrt{3}$

$\Rightarrow$ CS = $\left[45x - \frac{x^3}{3}\right]_0^{2\sqrt{3}} - 66\sqrt{3}$ = $(90\sqrt{3} - 8\sqrt{3} - 66\sqrt{3})$ = $16\sqrt{3}$

Hence, the consumer's surplus at x_0 = $2\sqrt{3}$ is ₹ $16\sqrt{3} \approx$ ₹ 28

29. Given P(X = 0) = P(X = 1) = p and P(X = 2) = P(X = 3) = k(say)

The probability distribution of the random variable X is

X	0	1	2	3
P(X)	p	p	k	k

We know that $\sum p_i = 1$

$\Rightarrow$ p + p + k + k = 1 $\Rightarrow$ 2p + 2k = 1

$\Rightarrow$ p + k = $\frac{1}{2}$ $\Rightarrow$ k = $\frac{1}{2}$ - p

We construct the following table:

x_i	p_i	$p_i x_i$	$p_i x_i^2$
0	p	0	0
1	p	p	p
2	$\frac{1}{2}$ - p	1 - 2p	2 - 4p
3	$\frac{1}{2}$ - p	$\frac{3}{2}$ - 3p	$\frac{9}{2}$ - 9p
Total		$\frac{5}{2}$ - 4p	$\frac{13}{2}$ - 12p

Given $\Sigma p_i x_i^2 = 2\Sigma p_i x_i$

$\Rightarrow$ $\frac{13}{2}$ - 12p = 2 ($\frac{5}{2}$ - 4p) $\Rightarrow$ $\frac{13}{2}$ - 12p = 5 - 8p $\Rightarrow$ -4p = 5 - $\frac{13}{2}$

$\Rightarrow$ -4p = -$\frac{3}{2}$ $\Rightarrow$ p = $\frac{3}{8}$

Hence, the value of p is $\frac{3}{8}$.

OR

According to given, we have

np + npq = 1.8 $\Rightarrow$ np(1 + q) = $\frac{9}{5}$ ...(i)

and np $\cdot$ npq = 0.8 $\Rightarrow$ n^2p^2q = $\frac{4}{5}$ ...(ii)

Dividing the square of (i) by (ii), we get

$\frac{n^2p^2(1+q)^2}{n^2p^2q} = \left(\frac{9}{5}\right)^2 \times \frac{5}{4} \Rightarrow \frac{(1+q)^2}{q} = \frac{81}{20}$

$\Rightarrow$ 20(1 + 2q + q^2) = 81q $\Rightarrow$ $20q^2$ - 41q + 20 = 0

$\Rightarrow$ (5q - 4) (4q - 5) = 0 $\Rightarrow$ q = $\frac{4}{5}$, $\frac{5}{4}$ but 0 < q < 1

$\Rightarrow$ q = $\frac{4}{5}$

$\therefore$ p = 1 - q = 1 - $\frac{4}{5}$ = $\frac{1}{5}$

From (i), n $\cdot$ $\frac{1}{5}$ (1 + $\frac{4}{5}$) = $\frac{9}{5}$ $\Rightarrow$ n = 5

Hence, the binomial distribution is $(q + p)^n$ i.e., $\left(\frac{4}{5} + \frac{1}{5}\right)^5$

Probability of atleast one success = 1 - P(0) = 1 - q^5

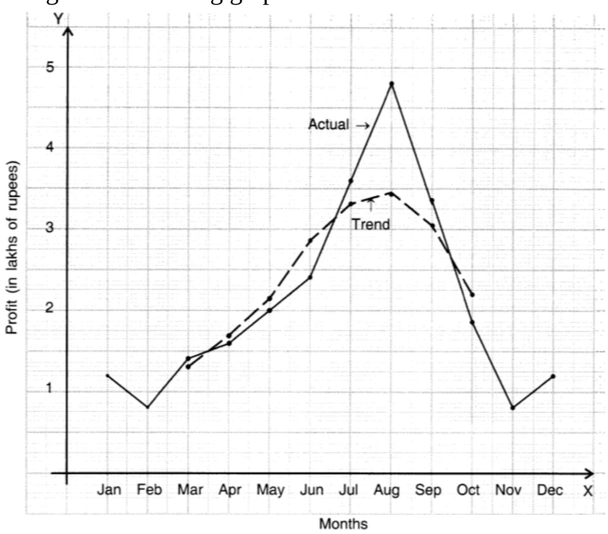
= 1 - $(\frac{4}{5})^2$ = 1 - $\frac{1024}{3125} = \frac{2101}{3125}$

30. Since we are to calculate four monthly moving averages, so the period is even, therefore, we have to calculate centred moving averages.

Calculation of 4-monthly centred moving averages:

Months	Profit (in lakh of rupees)	four monthly moving total	four monthly moving average	four monthly centre moving average
Jan	1.2			
Feb	0.8			
		5.0	1.25	
Mar	1.4			1.35
		5.8	1.45	
Apr	1.6			1.65
		7.4	1.85	
May	2.0			2.125
		9.6	2.4	
Jun	2.4			2.8
		12.8	3.2	
Jul	3.6			3.375
		14.2	3.55	
Aug	4.8			3.475
		13.6	3.4	
Sept	3.4			3.05
		10.8	2.7	
Oct	1.8			2.25
		7.2	1.8	
Nov	0.8			
Dec	1.2			

We get the following graph from the above data:



The dotted curve shows four monthly moving averages.

31. A group of 5 patients treated with medicine A weigh 10, 8, 12, 6, 4 kg. A second group of 7 patients treated with medicine B weigh 14, 12, 8, 10, 6, 2, 11 kg. Comment on the rejection of hypothesis with 5% level of significance.
[Given: $t_{(10,0.05)} = 1.812$]

Consider,

$H_0 : \mu_1 = \mu_2$ and

$H_1 : \mu_1 > \mu_2$

Where μ_1 and μ_2 denotes population means for the given two groups.

for Medicine A

$\bar{x} = \frac{\sum x}{n} = \frac{40}{5} = 8$

x	10	8	12	6	4	$\sum x$ = 40
$x - \bar{x}$	2	0	4	-2	-4	0
$(x - \bar{x})^2$	4	0	16	4	16	$\sum (x - \bar{x})^2$ = 40

For Medicin B

$\bar{y} = \frac{\sum y}{n} = \frac{63}{7} = 9$

y	14	12	8	10	6	2	11	$\sum y$ = 63
$y - \bar{y}$	5	3	-1	1	-3	-7	2	0
$(y - \bar{y})^2$	25	9	1	1	9	49	4	$\sum (y - \bar{y})^2$ = 98

Now, $S^2 = \frac{1}{n_1+n_2-2}[\sum(x-\bar{x})^2 + \sum(y-\bar{y})^2]$

$S^2 = \frac{1}{5+7-2}[40+98]$

$S^2 = \frac{1}{10} \times 138 = 13.8$

$S = \sqrt{13.8} = 3.71$

$t = \frac{\bar{x}-\bar{y}}{s\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}$

$t = \frac{8-9}{3.71\sqrt{\frac{1}{5}+\frac{1}{7}}}$

$t = \frac{-1}{3.71\sqrt{\frac{7+5}{35}}}$

$t = \frac{-1}{3.71\sqrt{\frac{12}{35}}}$

$t = \frac{-1}{3.71\times 0.58}$

t = -0.46

Given: $t_{(10,0.05)} = 1.812$

Since, $t_{cal.}$ value < t_{tab} value

Hence null hypothesis H_0 may be accepted with 5% significance.

Section D

32. Given constraints are

$2x + 3y \leq 6$

$3x - 2y \leq 6$

$y \leq 1$

$x, y \geq 0$

For graph of 2x + 3y $\leq$ 6

We draw the graph of 2x + 3y = 6

x	0	3
y	2	0

$2 \times 0 + 3 \times 0 < 6 \Rightarrow (0, 0)$ satisfy the constraints.

Hence, feasible region lie towards origin side of line.

For graph of 3x - 2y $\leq$ 6

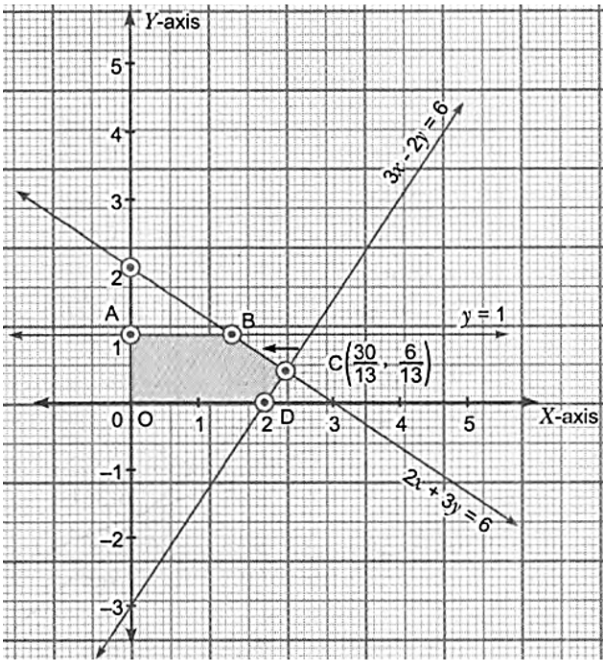
We draw the graph of 3x - 2y = 6

x	0	2
y	-3	0

$3 \times 0 - 2 \times 0 \leq 6$

$\Rightarrow$ Origin (0, 0) satisfy 3x - 2y = 6

Hence, feasible region lie towards origin side of line.



For graph of y < 1

We draw the graph of line y = 1, which is parallel to x-axis and meet y-axis at 1.

$0 \leq 1 \Rightarrow$ feasible region lie towards origin side of y = l.

Also, $x \geq 0, y \geq 0$ say feasible region is in 1st quadrant.

Therefore, OABCDO is the required feasible region, having corner point 0(0, 0), A(0, 1) B$\left(\frac{3}{2}, 1\right)$, C$\left(\frac{30}{13}, \frac{6}{13}\right)$O(2, 0).

Here, feasible region is bounded. Now the value of objective function Z = 8x + 9y is obtained as.

Comer Points	**Z = 8x + 9y**
O(0, 0)	0
A (0, 1)	9
B$\left(\frac{3}{2}, 1\right)$	21
C$\left(\frac{30}{13}, \frac{6}{13}\right)$	22.6 ← Maximum
D(2, 0)	16

Z is maximum when $x = \frac{30}{13}$ and $y = \frac{6}{13}$

OR

Let x large boxes and y small boxes be manufactured.

The number of boxes cannot be negative. Therefore, $x \geq 0, y \geq 0$

The large boxes require 4 sq. metre per box while the small boxes require 3 sq. metre per box and if 60 sq. metre of cardboard is stock.

$4x + 3y \leq 60$

The manufacturer is required to make at least three large boxes and at least twice as many small boxes as large boxes.

$x \geq 3$

$y \geq 2x$

If the profits on the large and small boxes are ₹3 and ₹2 per box. Therefore, profit gained by him on x large boxes and y small boxes is ₹3x and ₹2y respectively.

Total profit = Z = 3x + 2y

The mathematical formulation of the given problem is

Max Z = 3x + 2y

subject to

$4x + 3y \leq 60$

$x \geq 3$

$y \geq 2x$

$x \geq 0, y \geq 0$

First we will convert inequations into equations as follows:

4x + 3y = 60, x = 3, y = 2x, x = 0 and y = 0

The region represented by 4x + 3y $\leq$ 60:

The line 4x + 3y = 60 meets the coordinate axes at A(15, 0) and B(0, 20) respectively. By joining these points we obtain the line 4x + 3y = 60. Clearly (0, 0) satisfies the 4x + 3y = 60. So, the region which contains the origin represents the solution set of the inequation 4x + 3y $\leq$ 60.

Region represented by x $\geq$ 3:

The line x = 3 is the line passes through (3, 0) and is parallel to Y-axis. The region to the right of the line x = 3 will satisfy the inequation

x $\geq$ 3

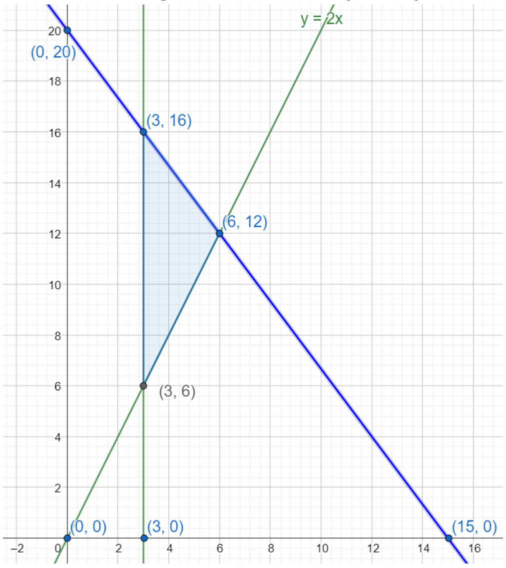
Region represented by y $\geq$ 2x:

The line y = 2x is the line that passes through (0, 0). The region above the line y = 2x will satisfy the inequation y $\geq$ 2x. Like if we take an example taking a point (5, 1) below the line y = 2x. Here, 1 < 10 which does not satisfies the inequation y $\geq$ 2x. Hence, the region above the line y = 2x will satisfy the inequality y $\geq$ 2x.

Region represented by x $\geq$ 0 and y $\geq$ 0 :

Since, every point in the first quadrant satisfies these inequations. So, the first quadrant is the region represented by the inequations x $\geq$ 0, and y $\geq$ 0.

The feasible region determined by the system of constraints 4x + 3y $\leq$ 60, x $\geq$ 3, y $\geq$ 2x, x $\geq$ 0 and y $\geq$ 0 are as follows



The corner points are E (3, 16), D(6, 12) and C(3, 6). The values of Z at the corner points are

Corner points	Z = 3x + 2y
E	41
D	42
C	21

The maximum value of Z is 42 which is at D(6, 12).

Thus, for a maximum profit is ₹42, 6units of large boxes and 12 units of smaller boxes should be manufactured.

33. We have been a week's data

Cost of cassette, C = 300 + $\frac{3}{2}x$

Revenue, R = 2x

Where x = number of cassettes produced and sold in a week.

We know that profit is given by, Profit = Revenue - Cost ...(i)

Revenue is the income that a business has from its normal business activities, usually from the sale of goods and services to customers.

A cost is the value of money that has been used up to produce something or deliver a service and hence is not available for use anymore.

And Profit is the gain in the business.

So, it is justified that profit in any business would be measured by the difference in the capital generated by the business and the capital used up in the business.

Profit generated by the company manufacturing cassettes is given by,

Profit = R - C (from (i))
Where, R = Revenue
C = Cost of cassette
Here,
If R < C, then
Profit < 0
$\Rightarrow$ There is a loss.
If R = C, then
Profit = 0
$\Rightarrow$ There is no profit no loss.
If R > C, then
Profit > 0
$\Rightarrow$ There is a profit.
We need to find the number of cassettes sold to make a profit. That is, we need to find x.
So, R > C (to realize a profit)
Substituting values of R and C. We get
$2x > 300 + \frac{3}{2}x$
$\Rightarrow 2x - \frac{3}{2}x > 300$
$\Rightarrow \frac{4x-3x}{2} > 300$
$\Rightarrow \frac{x}{2} > 300$
$\Rightarrow x > 300 \times 2$
$\Rightarrow x > 600$
This means that x must be greater than 600.
Thus, the company must sell more than 600 cassettes to realize a profit.

34. Let X be a random variable denoting the number of successes in two tosses of a die. Then, X can take values 0, 1, 2.
Let S_i and F_i denote the success and failure respectively in i^{th} toss. Then,we have,
$P(S_i)$ = Probability of getting an odd number in i^{th} toss = $\frac{3}{6} = \frac{1}{2}$
and $P(F_i)$ = Probability of not getting an odd number in i^{th} toss = $\left(1 - \frac{1}{2}\right) = \frac{1}{2}$
Now, P (X = 0) = Probability of getting no success in two tosses of a die
$\Rightarrow P(X = 0) = P(F_1 \cap F_2)$
$\Rightarrow P(X = 0) = P(F_1) P(F_2)$ [by Multiplication Theorem]
$\Rightarrow P(X = 0) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ [$\because P(F_1) = P(F_2) = \frac{1}{2}$]
P(X = 1) = Probability of getting one success in two tosses of a die
$\Rightarrow P(X = 1) = P((S_1 \cap F_2) \cup (F_1 \cap S_2))$
$\Rightarrow P(X = 1) = P(S_1 \cap F_2) + P(F_1 \cap S_2) = P(S_1) P(F_2) + P(F_1) P(S_2) = \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} = \frac{1}{2}$
and, P (X = 2) = Probability of getting two successes in two tosses of a die
$\Rightarrow P(X = 2) = P(S_1 \cap S_2) = P(S_1) P(S_2) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
Therefore, the probability distribution of X i.e. the number of successes in two tosses of a die is as follows:

X	0	1	2
P(X)	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$

Computation of variance:

x_i	$p_i = P(X = x_i)$	$p_i x_i$	$p_i x_i^2$
0	$\frac{1}{4}$	0	0
1	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
2	$\frac{1}{4}$	$\frac{1}{2}$	1
		$\Sigma p_i x_i = 1$	$\Sigma p_i x_i^2 = \frac{3}{2}$

Therefore, we have $\Sigma p_i x_i = 1$ and $\Sigma p_i x_i^2 = \frac{3}{2}$

$\therefore$ Var(X) = $\Sigma p_i x_i^2 - (\Sigma p_i x_i)^2 = \frac{3}{2} - 1 = \frac{1}{2}$

OR

i. When no head and 4 tails appear. Let A be the event money lost = ₹ (4 × 1.50) = ₹ 6.00.

There is only one way of getting no head and 4 tails i.e., (TTTT) ⇒ n(A) = 1

n(S) = 16, since there are 16 possible outcomes

$\therefore$ P(A) = $\frac{n(A)}{n(S)} = \frac{1}{16}$

ii. Let B be the event when 1 head and 3 tails appear.

$\therefore$ B = {HTTT, THTT, TTHT, TTTH}

⇒ n(B) = 4

Money lost = ₹ (3 × 1.50 - 1 × 1) = ₹ 3.50

$\therefore$ P(B) = $\frac{n(B)}{n(S)} = \frac{4}{16} = \frac{1}{4}$

iii. Let C be the event that 2 head and 2 tail appear.

$\therefore$ Money lost = ₹ (2 × 1.50 - 2 × 1)

= ₹ 1

C = {HHTT, HTHT, HTTH, THHT, THTH, TTHH}

⇒ n(C) = 6

$\therefore$ P(C) = $\frac{n(C)}{n(S)} = \frac{6}{16} = \frac{3}{8}$

iv. Let D be the event that 3 head and 1 tail appear.

$\therefore$ D = {HHHT, HHHT, THHH, HHTH}

⇒ n(D) = 4

Money gained = ₹ (3 × 1 - 1 × 1.5) = ₹ 1.50

P(E) = $\frac{n(D)}{n(S)} = \frac{4}{16} = \frac{1}{4}$

v. Let E be the event that all heads appear.

$\therefore$ E = {HHHH} ⇒ n(E) = 1

Money gained = ₹ (4 × 1) = ₹ 4

Also, P(E) = $\frac{n(E)}{n(S)} = \frac{1}{16}$.

35. a. We know the formula, We know the formula, $\frac{dP}{dt} = \frac{Pr}{100}$.

$\Rightarrow \int \frac{dP}{P} = \int \frac{r}{100} dt$

$\Rightarrow$ log P = $\frac{rt}{100} + c$

Let, t = 0, P = P_0

$\Rightarrow$ log P_0 = 0 + c ⇒ c = log P_0

Therefore the equation becomes: log P = $\frac{rt}{100}$ + log P_0

$\Rightarrow$ log P - log P_0 = $\frac{rt}{100}$

$\Rightarrow \log \frac{P}{P_0} = \frac{rt}{100}$

According to given, P_0 = 100, P = $2P_0$ = 200 & r = 5

$\Rightarrow \log \frac{200}{100} = \frac{5t}{100}$

⇒ 20 × log 2 = t

Now, log 2 = 0.6931

t = 20 × 0.6931 = 13.8 years.

b. Let principal = p

Given p increases at the rate r% per year

$\therefore \frac{dp}{de}$ = r% × p ⇒ $\frac{dp}{p} = \frac{r}{100}$dt

integrating both side

$\int \frac{dp}{p} = \frac{r}{100} \int dt \Rightarrow \log p = \frac{rt}{100} + \log c$

⇒ log p - log c = $\frac{rt}{100}$

$\Rightarrow \log \frac{p}{c} = \frac{rt}{100} \Rightarrow \frac{p}{c} = e^{\frac{rt}{100}}$ ...(i)

put t = 0, p = 100 in (i)

$\frac{100}{c} = e^{\frac{r \times o}{c}}$

$\therefore$ c = 100

Now keep value of c in eq (i)

$\frac{p}{100} = e^{\frac{rt}{100}}$

Now put t = 10, p = 200 in eq(given ₹ 100 double in)

$\frac{200}{100} = e^{\frac{10r}{100}}$

$z = e^{\frac{r}{10}}$

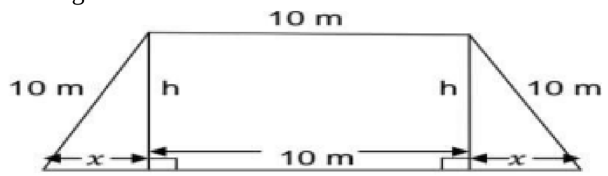
$\log 2 = \frac{r}{10} \Rightarrow 0.6931 = \frac{r}{10}$

$\therefore$ Rate of interest r = 6.931%

Section E

36. **Read the text carefully and answer the questions:**

The front gate of a building is in the shape of a trapezium as shown below. Its three sides other than base are 10m each. The height of the gate is h meter. On the basis of this information and figure given below answer the following questions:



(i) $(10 + x)\sqrt{100 - x^2}$

(ii) $\frac{-2x^2-10x+100}{\sqrt{100-x^2}}$

(iii)5

OR

$75\sqrt{3}$ sq.m

37. **Read the text carefully and answer the questions:**

Loans are an integral part of our lives today. We take loans for a specific purpose - for buying a home, or a car, or sending kids abroad for education - loans help us achieve some significant life goals. That said, when we talk about loans, the word "EMI", eventually crops up because the amount we borrow has to be returned to the lender with interest.

Suppose a person borrows ₹1 lakh for one year at the fixed rate of 9.5 percent per annum with a monthly rest. In this case, the EMI for the borrower for 12 months works out to approximately ₹8,768.

Example:

In year 2000, Mr. Tanwar took a home loan of ₹3000000 from State Bank of India at 7.5% p.a. compounded monthly for 20 years.

(i) ₹ 24167.82

(ii) ₹ 10458.69

(iii)₹ 13709.13

OR

₹ 410293.41

38. The sales for the month of January can be represented by the matrix:

	Luxury	**Premium**	**Standard**
Dealer A	5	3	4
Dealer A	7	2	3

The sales for the 2-month period of Q can be represented by the matrix:

	Luxury	**Premium**	**Standard**
Dealer A	8	7	6
Dealer B	10	5	7

The sales for the month of February is equal to the sales for the 2-month period of January-February minus the sales for the month of January. Thus, the sales in February is given by:

$Q - P = \begin{vmatrix} 8 & 7 & 6 \\ 10 & 5 & 7 \end{vmatrix} - \begin{vmatrix} 5 & 3 & 4 \\ 7 & 2 & 3 \end{vmatrix}$

	Luxury	**Premium**	**Standard**
Dealer A	3	4	2

Dealer B	3	3	4

OR

Let ₹ x, ₹ y and ₹ z be invested in saving accounts at the rate of 5%, 8% and $8\frac{1}{2}$%, respectively.

Then, according to given condition, we have the following system of equations

x + y + z = 7000 ...(i)

and $\frac{5x}{100}+\frac{8y}{100}+\frac{17z}{200}$ = 550

⇒ 10x + 16x + 17z = 110000 ...(ii)

Also, x - y = 0 ...(iii)

This system of equations can be written in matrix from as AX = B

where, A = $\begin{bmatrix}1&1&1\\10&16&17\\1&-1&0\end{bmatrix}$, X = $\begin{bmatrix}x\\y\\z\end{bmatrix}$ and B = $\begin{bmatrix}7000\\110000\\0\end{bmatrix}$

Here, |A| = $\begin{vmatrix}1&1&1\\10&16&17\\1&-1&0\end{vmatrix}$

⇒ |A| = 1(0 + 17) - 1(0 - 17) + 1(-10 - 16)

= 17 +17 - 26 = 8 $\neq$ 0

So, A is non- singular matrix and its inverse exists.

Now, cofactors of elements of |A| are,

$A_{11} = (-1)^2 \begin{vmatrix}16&17\\-1&0\end{vmatrix}$ = 1(0 + 17) = 17

$A_{12} = (-1)^3 \begin{vmatrix}10&17\\1&0\end{vmatrix}$ = -1(0 - 17) = 17

$A_{13} = (-1)^4 \begin{vmatrix}10&16\\1&-1\end{vmatrix}$ = 1(-10 - 16) = -26

$A_{21} = (-1)^3 \begin{vmatrix}1&1\\-1&0\end{vmatrix}$ = -1(0 + 1) = -1

$A_{22} = (-1)^4 \begin{vmatrix}1&1\\1&0\end{vmatrix}$ = 1(0 - 1) = -1

$A_{23} = (-1)^5 \begin{vmatrix}1&1\\1&-1\end{vmatrix}$ = -1(-1 - 1) = 2

$A_{31} = (-1)^4 \begin{vmatrix}1&1\\16&17\end{vmatrix}$ = 1(17 - 16) = 1

$A_{32} = (-1)^5 \begin{vmatrix}1&1\\10&17\end{vmatrix}$ = -1(17 - 10) = -7

$A_{33} = (-1)^6 \begin{vmatrix}1&1\\10&16\end{vmatrix}$ = 1(16 - 10) = 6

∴ adj (A) = $\begin{bmatrix}A_{11}&A_{12}&A_{13}\\A_{21}&A_{22}&A_{23}\\A_{31}&A_{32}&A_{33}\end{bmatrix}^T$

$=\begin{bmatrix}17&17&-26\\-1&-1&2\\1&-7&6\end{bmatrix}^T=\begin{bmatrix}17&-1&1\\17&-1&-7\\-26&2&6\end{bmatrix}$

Now, $A^{-1} = \frac{\text{adj}(A)}{|A|}=\frac{1}{8}\begin{bmatrix}17&-1&1\\17&-1&-7\\-26&2&6\end{bmatrix}$

and the solution of given system is given by

$X = A^{-1}$ B.

$\Rightarrow \begin{bmatrix}x\\y\\z\end{bmatrix}=\frac{1}{8}\begin{bmatrix}17&-1&1\\17&-1&-7\\-26&2&6\end{bmatrix}\begin{bmatrix}7000\\110000\\0\end{bmatrix}$

$=\frac{1}{8}\begin{bmatrix}119000-110000+0\\119000-110000+0\\-182000+220000+0\end{bmatrix}$

$$= \frac{1}{8}\begin{bmatrix} 9000 \\ 9000 \\ 38000 \end{bmatrix} = \begin{bmatrix} 1125 \\ 1125 \\ 4750 \end{bmatrix}$$

On comparing the corresponding elements, we get x = 1125, y = 1125, z = 4750.

Hence, the amount deposited in each type of account is ₹1125, ₹1125 and ₹4750, respectively.