N 819

Seat No. [ ][ ][ ][ ][ ][ ][ ]

2025 III 05 1100 -N 819- MATHEMATICS (71) ALGEBRA—PART I (E)

(REVISED COURSE)

Time : 2 Hours (Pages 11) Max. Marks : 40

Note :— ***(i)*** ***All*** **questions are compulsory.**

(ii) **Use of a calculator is not allowed.**

(iii) **The numbers to the right of the questions indicate full marks.**

(iv) **In case of MCQs [Q. No. 1(A)] only the first attempt will be evaluated and will be given credit.**

1. (A) Choose the correct alternative from given : 4

(*i*) $\begin{vmatrix} 1 & 2 \\ 3 & 4 \end{vmatrix}$. Write the degree of the given determinant.

(A) 1

(B) 2

(C) 3

(D) 4

P.T.O.

(*ii*) From the following equations which one is the quadratic equation ?

(A) $\frac{5}{x} - 3 = x^2$

(B) $x(x+5) = 2$

(C) $n - 1 = 2n$

(D) $\frac{1}{x^2}(x+2) = x$

(*iii*) Find the common difference of the following A.P. :

4, 4, 4, ...

(A) 1

(B) 8

(C) 4

(D) 0

(*iv*) Which number cannot represent a probability ?

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

(B) $\frac{15}{10}$

(C) 15%

(D) 0.7

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(B) Solve the following subquestions : 4

(*i*) If $2x + y = 7$ and $x + 2y = 11$, then find the value of $x + y$.

(*ii*) Find the first term of the given sequence :

$$t_n = 3n - 4.$$

(*iii*) How many alpha numerals are there in the format of GSTIN ? ⇒ 15

(*iv*) Two coins are tossed simultaneously. Write the sample space S.

$S = \{HH, HT, TH, TT\}$, $n(S) = 4$

2. (A) Complete and write any *two* activities from the following : 4

(*i*) Complete the following table to draw the graph of $x + 2y = 4$.

Activity :

x	-2	2
y	3	1
(x, y)	$(-2, 3)$	$(2, 1)$

B)

i) $2x + y = 7$ —— (I)

$x + 2y = 11$ —— (II)

Adding eq: (I) & (II),

$2x + y = 7$

$+ \quad x + 2y = 11$

$3x + 3y = 18$

$\therefore \boxed{x + y = 6}$

ii)

$t_n = 3n - 4$

$t_1 = 3(1) - 4$

$= 3 - 4$

$\therefore \boxed{t_1 = -1}$

$x + 2y = 4$

$-2 + 2y = 4$

$2y = 4 + 2$

$2y = 6$

$\boxed{y = 3}$

$x + 2y = 4$

$x + 2(1) = 4$

$x + 2 = 4$

$x = 4 - 2$

$\boxed{x = 2}$

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(ii) Complete the following activity to form a quadratic equation.

Activity :

I am a quadratic equation.

↓

My standard form is [ ].

↓

My roots are 5 and 12.

↓

Sum of my roots [17].

↓

Product of my roots [60].

↓

My quadratic equation is [$x^2 - 17x + 60 = 0$]

(iii) Pushpmala has invested ₹ 24,000 and purchased share of FV ₹ 20 at a premium of ₹ 4. Complete the following activity to find the number of shares she purchased.

Activity :

FV = ₹ 20

Premium = ₹ 4

(B) Sol

(i)

(ii)

(iii)

(iv)

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

$x^2 - 17x + 60 = 0$

MV = FV + Premium

= 20 + 4

= ₹ 24

Number of shares = $\frac{\text{Total investment}}{\text{MV}}$

= $\frac{24,000}{24}$

= 1000 shares.

(B) Solve any *four* subquestions from the following : 8

(*i*) Solve the following simultaneous equations :

$x + y = 3$; $3x - 2y = 4$

(*ii*) Solve the following quadratic equation by factorisation method :

$m^2 + 14m + 13 = 0$

(*iii*) Find the 19th term of the following A.P. :

7, 13, 19, 25, ...

(*iv*) A share is sold for the market value of ₹ 2,000. Brokerage is paid at the rate of 0.5%. What is the amount received after the sale ?

(B)

i) $x + y = 3$ —— (I)

$3x - 2y = 4$ —— (II)

$x = 3 - y$ —— (III)

$3(3-y) - 2y = 4$

$9 - 3y - 2y = 4$

$9 - 5y = 4$

$-5y = 4 - 9$

$-5y = -5$

$y = 1$

$x = 3 - 1$

$x = 2$

$\therefore (x, y) = (2, 1)$

ii)

$m^2 + 14m + 13 = 0$

$m^2 + 13m + m + 13 = 0$

$m(m + 13) + 1(m + 13) = 0$

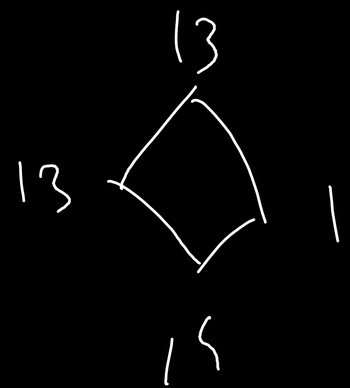
$(m + 13)(m + 1) = 0$

$m + 13 = 0$ or $m + 1 = 0$

$\boxed{m = -13}$ or $\boxed{m = -1}$

$a \times c$

1×13



iii) $t_{19} = ?$

7, 13, 19, 25, ----

$a = 7$

$d = 6$

$t_n = a + (n-1)d$

$t_{19} = 7 + (19-1) \times 6$

$= 7 + 18 \times 6$

$= 7 + 108$

$\therefore \boxed{T_{19} = 115}$

iv) Brokerage = 0.5 %

M.V = ₹ 2000.

$$\text{Brokerage} = 2000 \times \frac{0.5}{100}$$

$$= 20 \times \frac{1}{2}$$

$$= 10$$

$\therefore$ **Brokerage = ₹ 10**

Total Sale = M.V. − Brokerage

= 2000 − 10

$\therefore$ **Sale = ₹ 1990**

(v) The following table shows the number of students and the time they utilized daily for their studies. Find the mean time spent by the students for their studies.

Class Time (In hours)	Class Marks (x_i)	No. of Students (f_i)	$f_i x_i$
0–2	1	8	08
2–4	3	14	42
4–6	5	18	90
6–8	7	10	70
8–10	9	10	90

3. **(A) Complete and write any *one* activity from the following : 3**

(i) Shri Maniklal has purchased 300 shares of F.V. ₹ 100, for M.V. ₹ 120. Company has paid dividend at 7%. Complete the following activity to find the rate of return on his investment.

Activity :

F.V. = ₹ 100

Number of shares = 300

Market value = ₹ 120

Q. 2) B)

1) $\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i}$

$\bar{x} = \frac{300}{60}$

$\therefore \bar{x} = 5$ hours

(*a*) Sum invested = M.V. × No. of shares

$\therefore$ = 120 × 300

= ₹ 36,000

(*b*) Dividend per share = F.V. × rate of dividend

$= 100 \times \frac{7}{100}$

= ₹ 7

$\therefore$ Total dividend received = 300 × 7

= ₹ 2100

(*c*) Rate of return = $\frac{\text{Dividend income}}{\text{Sum invested}} \times 100$

$= \frac{2,100}{36,000} \times 100$

= 5.83 %.

(*ii*) A two digit number is to be formed from the digits 2, 3, 5 without repetition of the digits. Complete the following activity to find the probability that the number so formed is an odd number.

Activity :

Let S be the sample space.

$\therefore$ S = {23, 25, 32, [35], 52, 53}

$\therefore$ $n(S)$ = [6]

Event A : The number so formed is an odd number.

$\therefore$ A = {23, 25, [35], 53}

$\therefore$ $n(A) = 4$

$\therefore$ $P(A) = \frac{[n(A)]}{n(S)}$ ..... (Formula)

$\therefore$ $P(A) = \frac{[4]}{6}$

$\therefore$ $P(A) = \frac{[2]}{3}$.

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(B) Solve any *two* subquestions from the following : 6

(*i*) Solve the following simultaneous equations by Cramer's rule :

$$4x + 3y = 18; \quad 3x - 2y = 5$$

(*ii*) Solve the following quadratic equation by using formula method :

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

(*iii*) A committee of two members is to be formed from three boys and two girls. Find the probability of the following events :

Event A : At least one girl must be a member of the committee.

Event B : Committee must be of one boy and one girl.

(*iv*) In a general store the prices of different articles and its demand is shown in the following frequency distribution table. Find the Median of the prices.

Price in Rupees	No. of Articles
Less than 20	140
20—40	100
40—60	80
60—80	60
80—100	20

Median = ₹ 32

P.T.O.

3) (B)

i) $4x+3y=18$ —— (1)

$3x-2y=5$ —— (2)

$D = -17$

$Dx = -51$

$Dy = -34$

$x = \frac{Dx}{D} = \frac{-51}{-17} = 3$

$y = \frac{Dy}{D} = \frac{-34}{-17} = 2$

$(x, y) = (3, 2)$

ii)

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

$b^2-4ac=16$

$x = \frac{-b \pm \sqrt{\Delta}}{2a}$

$x = 3$ or $x = -1$

iii) $n(S) = 16$

$n(A) = 7$

$n(B) = 6$

$P(A) = \frac{n(A)}{n(S)} = \frac{7}{16}$

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

4. **Solve any *two* subquestions from the following :** 8

(*i*) Find the value of '*m*' if the quadratic equation

$$(m - 12)\,x^2 + 2(m - 12)\,x + 2 = 0$$

has real and equal roots.

$m = 12$ or $m = 14$

(*ii*) A farmer borrows ₹ 1,000 and agrees to repay with a total interest of ₹ 140, in 12 instalments. Each instalment being less than the preceding instalment by ₹ 10. What should be the amount of his first and last instalment ?

$a = 150$, $t_{12} = 40$

(*iii*) The following table shows the marks of 180 students in Mathematics.

Marks	No. of Students
0—10	25
10—20	x
20—30	30
30—40	$2x$
40—50	65

$x = 20$

Find the value of '*x*' and draw histogram.

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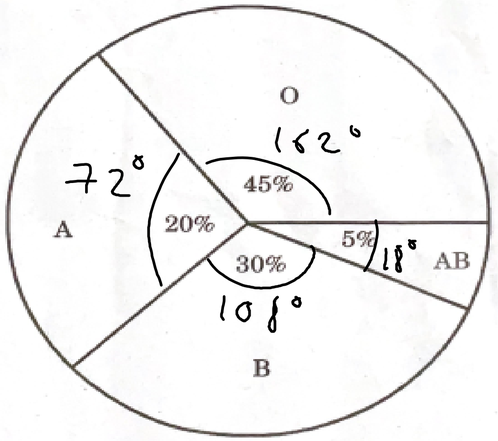
5. **Solve any *one* of the following subquestions :** 3

(*i*) Draw the graphs representing the equation $2x = y + 2$ and $4x + 3y = 24$ on the same graph paper. Find the area of the triangle formed by these lines and the X-axis.

(*ii*) The following pie-diagram shows percentage of persons according to blood group in a blood group checking camp. Answer the following questions :



(*a*) Find the measure of central angle for each blood group.

(*b*) Find the total number of persons, if there are 600 persons of blood group B.

Very good