EDUTECH ACADEMY

Preliminary Examination [MODEL ANSWER]

Std: SSC (E.M) **Subject: Mathematics I** **Time: 2 Hours**

Date : 19/Jan/2026 **Max Marks: 40**

(i) All questions are compulsory.
(ii) Use of calculator is not allowed.
(iii) Total marks are shown on the right side of the question.

Q.1 (A) Choose the correct alternative: **4**

(1) Ans. (a)

Given that one girl alone finishes the work in x days

1 day work of a girl = $\frac{1}{x}$

1 day work of 8 girls = $8\left(\frac{1}{x}\right)$

And one boy alone finishes the work in y days

1 day work of a boy= $\frac{1}{y}$

1 day work of 12 boys = $12\left(\frac{1}{y}\right)$

Therefore, condition 8 girls and 12 boys can finish work in 10 days is expressible as

$$8\left(\frac{1}{x}\right)+12\left(\frac{1}{y}\right)=\frac{1}{10}$$

Similarly, condition 6 girls and 8 boys can finish work in 14 days is expressible as

$$6\left(\frac{1}{x}\right)+8\left(\frac{1}{y}\right)=\frac{1}{14}$$

Thus, the equations are $8\left(\frac{1}{x}\right)+12\left(\frac{1}{y}\right)=\frac{1}{10}$; $6\left(\frac{1}{x}\right)+8\left(\frac{1}{y}\right)=\frac{1}{14}$

(2) Ans. (a)

a = 1 and d = 1

$S_n = n/2[2a + (n - 1)d] = n/2[2 + n - 1] = n(n + 1)/2$

(3) Ans. Cumulative frequencies in a grouped frequency table are useful to find median.

(B) is the correct option.

(4) Ans. (b)

Rate of CGST is percentage of CGST amount by taxable value.
Thus, CGST amount is calculated by multiplying rate of CGST and taxable value, divide by 100.

$$\text{CGST} = \frac{\text{Rate of CGST} \times \text{Taxable Value}}{100}$$

$$= \frac{12 \times 90}{100}$$

$$= 10.8$$

(B) Solve the following: **4**

(1) Ans. $t_1 = 127 \quad t_2 = 132 \quad t_3 = 137$

$t_2 - t_1 = 132 - 127 = 5$

$t_3 - t_2 = 137 - 132 = 5$

In this sequence, difference between two consecutive terms is a constant i.e. 5

∴ Given sequence 127, 132, 137,…… is an A.P with common difference 'd' = 5

(2) Ans.

$$A = \begin{vmatrix} 5 & 3 \\ 7 & 9 \end{vmatrix} = (5 \times 9) - (3 \times 7) = 45 - 21 = 24$$

(3) Ans. (i) MV = 10 + 7 = Rs. 17 (ii) at discount of 25 - 16 = Rs. 9 (iii) FV = Rs. 5.

(4) Ans. $2x^2 - 4x - 3 = 0$

$$\rightarrow \frac{2}{2}x^2 - \frac{4}{2}x - \frac{3}{2} = \frac{0}{2}$$

$$\rightarrow x^2 - 2x - \frac{3}{2} = 0$$

Q.2 (A) Complete the following activities:(Any TWO) **4**

(1) Ans. One die is rolled.

'S' is sample space.

S = { 1, 2, 3, 4, 5, 6 }

∴ n(S) = 6

Event A: Prime number on the upper face.

A = { 2, 3, 5 }

∴ n(A) = 3

∴ $P(A) = \frac{n(A)}{n(S)}$ …….. (formula)

∴ P(A) = 1/2

(2) Ans. $\begin{vmatrix} -1 & 7 \\ 2 & 4 \end{vmatrix}$

$= (-1) \times 4 - \boxed{7 \times 2}$

$= -4 - \boxed{14}$

$= \boxed{-18}$

$\therefore \begin{vmatrix} -1 & 7 \\ 2 & 4 \end{vmatrix} = \boxed{-18}$

(3) Ans. First divide the equation by 2 so that coefficient of y^2 becomes 1.

$$\rightarrow \frac{2}{2}y^2 + \frac{9}{2}y + \boxed{\frac{10}{2}} = \frac{0}{2}$$

$$\rightarrow y^2 + \frac{9}{2}y + 5 = 0$$

To solve the quadratic equation $y^2 + \frac{9}{2}y + 5 = 0$ by method of completing square, add and subtract square of the half of coefficient of 'y'

$$\text{Added/ Subtracted value} = \left(\frac{1}{2} \times \frac{9}{2}\right)^2$$

$$= \boxed{\left(\frac{9}{2}\right)}^2$$

$$\therefore y^2 + \frac{9}{2}y + \left(\frac{9}{4}\right)^2 - \left(\frac{9}{4}\right)^2 + 5 = 0$$

$$\rightarrow y^2 + \boxed{2(y)}\left(\frac{9}{4}\right) + \left(\frac{9}{4}\right)^2 = -\left(\frac{9}{4}\right)^2 - 5$$

$$\rightarrow (y + \frac{9}{4})^2 = \boxed{\frac{81}{16}} - 5$$

$$\rightarrow (y + \frac{9}{4})^2 = \left(\frac{1}{4}\right)^2$$

Taking square roots

$$\rightarrow y + \frac{9}{4} = \frac{1}{4} \text{ or } y + \frac{9}{4} = -\frac{1}{4}$$

$$\rightarrow y = \frac{1}{4} - \frac{9}{4} \text{ or } y = -\frac{1}{4} - \frac{9}{4}$$

$$\rightarrow y = \frac{-8}{4} \quad \text{or } y = \frac{-10}{4}$$

$$\rightarrow y = -2 \quad \text{or } y = \frac{-5}{2}$$

$\therefore$ -2 and $\frac{-5}{2}$ are roots of the quadratic equation

(B) Solve the following: (Any FOUR) **8**

(1) Ans. $x + y = 7$

$2x - 3y = 9$

$\therefore a_1 = 1, b_1 = 1, c_1 = 7$ and $a_2 = 2, b_2 = -3, c_2 = 9$

$$\text{Now, } D = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = \begin{vmatrix} 1 & 1 \\ 2 & -3 \end{vmatrix} = -3 - 2 = -5$$

$$Dx = \begin{vmatrix} c_1 & b_1 \\ c_2 & b_2 \end{vmatrix} = \begin{vmatrix} 7 & 1 \\ 9 & -3 \end{vmatrix} = -21 - 9 = -30$$

$$Dy = \begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix} = \begin{vmatrix} 1 & 7 \\ 2 & 9 \end{vmatrix} = 9 - 14 = -5$$

$$\therefore x = \frac{Dx}{D} = \frac{-30}{-5} = 6 \text{ and } y = \frac{Dy}{D} = \frac{-5}{-5} = 1$$

(2) Ans. A.P is 7, 13, 19, 25

$a = t_1 = 7$

$d = t_2 - t_1$

$= 13 - 7$

$= 6$

$t_n = t_1 + (n - 1)d$ is nth term of A.P.

19^{th} term $= t_{19}$

$= t_1 + (19 - 1)d$

$= 7 + 18(6)$

$= 7 + 108$

$= 115$

$\therefore t_{19} = 115$

(3) Ans.

Let $\alpha = -3$ and $\beta = -7$

$\therefore \alpha + \beta = (-3) + (-7) = -10$ and $\alpha \times \beta = (-3) \times (-7) = 21$

$\therefore$ and quadratic equation is, $x^2 - (\alpha + \beta)x + \alpha\beta = 0$

$\therefore x^2 - (-10)x + 21 = 0$

$\therefore x^2 + 10x + 21 = 0$

(4) Ans. Measure of central angle showing investment in post $= 30°$

Investment in post $= \frac{30°}{360°} \times 12{,}000$

$= \text{Rs } 1000$

(5) Ans. GST paid at the time of purchase (Input tax)

= Rs. 1,00,500

GST paid at the time of sale (Output tax)

= Rs. 1,22,500

GST payable = Output tax – Input tax

= Rs. 1,22,500 – Rs. 1,00,500

= Rs. 22,000

Q.3 (A) Complete the following activity:(Any ONE) **3**

(1) Ans. $3x^2 - 2\sqrt{6}x + 2 = 0$

$\rightarrow 3x^2 - \boxed{\sqrt{6}x} - \sqrt{6}x + \boxed{2} = 0$

$\rightarrow \sqrt{3}x(\sqrt{3}x - \sqrt{2}) - \sqrt{2}(\boxed{\sqrt{3}x} - \sqrt{2}) = 0$

$\rightarrow (\sqrt{3}x - \sqrt{2})(\sqrt{3}x - \sqrt{2}) = 0$

$\rightarrow (\sqrt{3}x - \sqrt{2}) = 0$ or $(\boxed{\sqrt{3}x} - \sqrt{2}) = 0$

$x = \frac{\boxed{\sqrt{2}}}{\sqrt{3}}$ or $x = \frac{\sqrt{2}}{\sqrt{3}}$

$x = \frac{\boxed{\sqrt{6}}}{3}$ or $x = \frac{\sqrt{6}}{3}$

(2) Ans. Experiment is 3 coins are tossed simultaneously

S = {HHH, HHT, HTH, $\boxed{\text{THH}}$, HTT, THT, TTH, TTT}

n(S) = $\boxed{8}$

Condition for event A → To get at least 2 heads

⇒ 2 or more heads

A = {HHT, HTH, $\boxed{\text{THH}}$, HHH}

n(A) = $\boxed{4}$

Condition for event B → To get no heads

B = {$\boxed{\text{TTT}}$}

n(B) = $\boxed{1}$

Conditions for event C → To get head on 2nd coin

C = {HHH, HHT, THH, THT}

n(C) = 4

(B) Solve the following: (Any TWO) **6**

(1) Ans. (1) The class marks are on the X- axis. The point whose x- coordinate is 55 (as the mid-point of the class 50−60 is 55.) y-coordinate is 10. So, the frequency of the class 50−60 is 10.

(2) The frequencies are shown on the Y-axis. The x-coordinate of the point whose y- coordinate is 14, is 25. Note the mark 14 on the Y- axis . The class mark of the class 20−30 is 25. Hence, the frequency of the class 20−30 is 14.

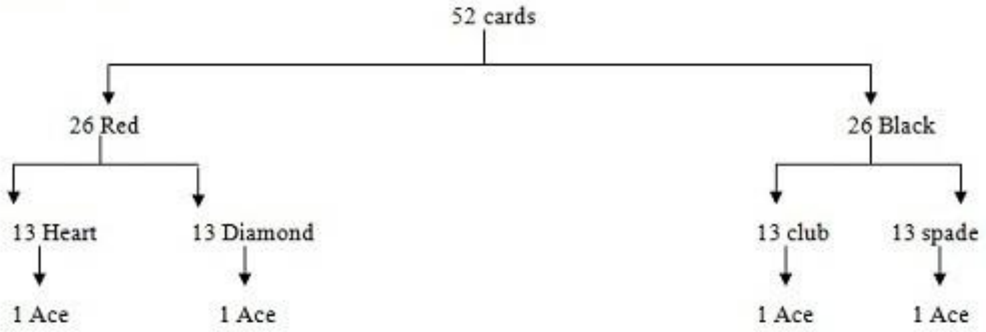
(3) The class mark of the class 50−60 is 55.

(4) The frequency is shown on the Y-axis. On the polygon the maximum value of the y- coordinate is 20. Its corresponding x- coordinate is 35, which is the mark of the class 30−40. Therefore, the maximum frequency is in the class 30−40.

(5) The frequencies of the classes 0−10 and 60−70 are zero.

(2) Ans. Total No. of Cards=52

$\therefore n(S) = 52$



Let Event A: Getting an Ace

$n(A) = 4$

$\therefore P(A) = \frac{n(A)}{n(S)} = \frac{4}{52} = \frac{1}{13}$

Let Event B : Getting a Spade

$n(B) = 13$

$P(B) = \frac{n(B)}{n(S)} = \frac{13}{52} = \frac{1}{4}$

(3) Ans. Here, $\frac{1}{3}x + y = \frac{10}{3}$ ... (I)

$2x + \frac{1}{4}y = \frac{11}{4}$ ... (II)

The coefficients are fractional numbers, to remove the fractional coefficients multiply equation (I) by L.C.M of the denominators i.e. 3 and multiply equation (II) by L.C.M of the denominators i.e. 4 as shown below:

$3 \times (\frac{1}{3}x + y = \frac{10}{3})$ $\quad 4 \times (2x + \frac{1}{4}y = \frac{11}{4})$

Thus, the equations are

$x + 3y = 10$ ... (III)

$8x + y = 11$ ... (IV)

Both the variables are having different coefficients. first make the coefficient same.

Multiply equation (IV) by '3' as

$24x + 3y = 33$ ... (V)

As the sign of '3y' in the equations (III) and (V) is same, proceed as subtracting equation (III) and (V)

$$\begin{array}{rcrcr} x & + & 3y & = & 10 \\ 24x & + & 3y & = & 33 \\ - & & - & = & - \\ \hline -23x & & & = & -23 \\ \hline \end{array}$$

$x = \frac{(-23)}{(-23)}$

$x = 1$

Place $x = 1$ in equation (III) and obtain the value of 'y'

$1 + 3y = 10$

$3y = 10 - 1$

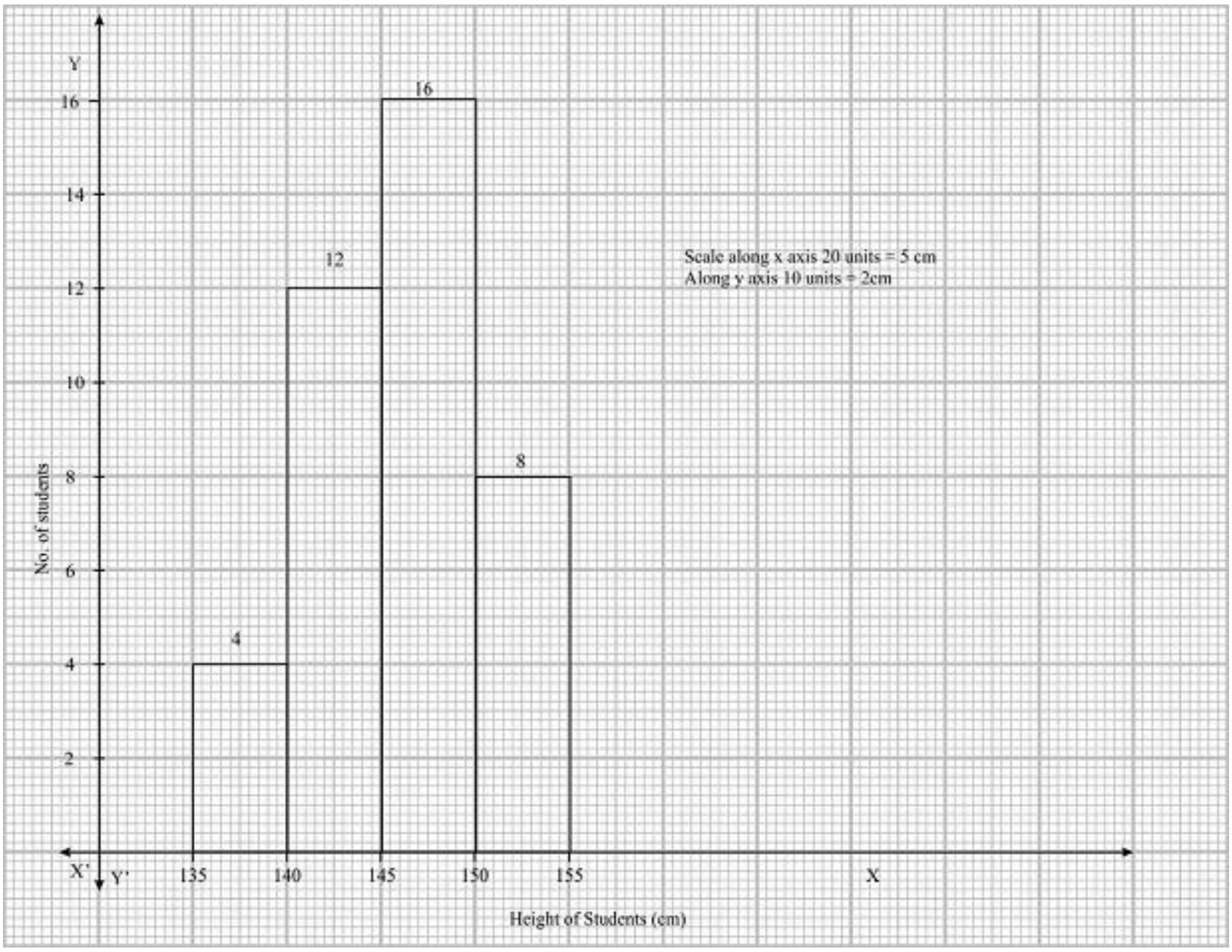
$3y = 9$

$y = \frac{9}{3}$

$y = 3$

$\therefore$ Solution is $(x, y) = (1, 3)$

(4) Ans.



Q.4 Solve the following: (Any TWO) 8

(1) Ans. $9\left(x^2+\frac{1}{x^2}\right)-3\left(x-\frac{1}{x}\right)-20=0$

Now, $\left(x^2+\frac{1}{x^2}\right)=\left(x-\frac{1}{x}\right)^2+2$

$\therefore$ the equation becomes

$$9\left[\left(x-\frac{1}{x}\right)^2+2\right]-3\left(x-\frac{1}{x}\right)-20=0$$

Put $x-\frac{1}{x}=m$ ...(1)

$\therefore$ $9(m^2+2)-3m-20=0$

$\therefore$ $9m^2+18-3m-20=0$

$\therefore$ $9m^2-3m-2=0$

$\therefore$ $9m^2+3m-6m-2=0$

$\therefore$ $3m(3m+1)-2(3m+1)=0$

$\therefore$ $(3m+1)(3m-2)=0$

$\therefore$ $3m+1=0$ or $3m-2=0$

$\therefore$ $m=\frac{-1}{3}$ or $m=\frac{2}{3}$

When $m=\frac{-1}{3}$, from equation (1), we get

$$x-\frac{1}{x}=\frac{-1}{3}$$

$\therefore$ $3x^2-3=-x$

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

$\therefore$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}=\frac{-1\pm\sqrt{1^2-4(3)(-3)}}{2(3)}$

$\therefore$ $\frac{-1\pm\sqrt{1+36}}{6}=\frac{-1\pm\sqrt{37}}{6}$

when $m=\frac{2}{3}$, from equation (1), we get

$$x-\frac{1}{x}=\frac{2}{3}$$

$\therefore$ $3x^2-3=2x$

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

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

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

$$=\frac{2\pm\sqrt{4+36}}{6}=\frac{2\pm\sqrt{40}}{6}$$

$$=\frac{2\pm2\sqrt{10}}{6}=\frac{2(1\pm\sqrt{10})}{6}=\frac{1\pm\sqrt{10}}{3}$$

$\therefore$ The solution set is $\left\{\frac{1\pm\sqrt{10}}{3},\frac{-1\pm\sqrt{37}}{6}\right\}$

(2) Ans. Rate of dividend = 2.5% and market price = Rs. 92

Let number of shares purchased = x

$\therefore$ Selling price of x shares = 92 x

$\therefore$ Income from investing

$$Rs.x = \frac{92x \text{ x } 2.5}{92}$$

$$= \frac{92x \text{ x } 25}{92 \text{ x } 10} = \frac{5}{2}x$$

Again by investing 92x in 5% at Rs. 115

$$\text{the dividend} = \frac{92x \text{ x } 5}{115} = 4x$$

$$\text{Difference} = 4x - \frac{5}{2}x = \frac{3}{2}x$$

$$\therefore \frac{3}{2}x = 90$$

$$\Rightarrow x = \frac{90 \text{ x } 2}{3} = 60$$

(i) $\therefore$ No. of shares = 60

$$\text{(ii) No. of shares sold} = \frac{92x}{115}$$

$$= \frac{92 \text{ x } 60}{115} = 48$$

(iii) New income = 4x = 4 x 60 = Rs. 240

(iv) Rate percent interest on investment

$$= \frac{5 \text{ x } 100}{115} = \frac{100}{23}$$

$$= 4\frac{8}{23}\%$$

(3) Ans. *Here*, $a = 305,\ d = -15,\ S_n = 3250$

Let the time required to clear the loan be 'n' months.

$$S_n = \frac{n}{2}\left[2a + (n-1)d\right]$$

$\therefore$ $3250 = \frac{n}{2}\left[2 \times 305 + (n-1)(-15)\right]$

$\therefore$ $6500 = n(610 - 15n + 15)$

$\therefore$ $6500 = n(625 - 15n)$

$\therefore$ $6500 = 625n - 15n^2$

$\therefore$ $15n^2 - 625n + 6500 = 0$

$\therefore$ $3n^2 - 125n + 1300 = 0$

$\therefore$ $3n^2 - 60n - 65n + 1300 = 0$

$\therefore$ $3n(n-20) - 65(n-20) = 0$

$\therefore$ $n - 20 = 0$ *or* $3n - 65 = 0$

$\therefore$ $n = 20$ *or* $n = \frac{65}{3}$

since n is natural number,

$\therefore$ $n \neq \frac{65}{3}$

$\therefore$ $n = 20$

$\therefore$ *The time required to clear the loan is 20 months.*

Q.5 Solve the following: (Any ONE) **3**

(1) Ans.

Class interval	Frequency f_i	Cumulative frequency	Class Mark (x_i)	f_i x x_i
50-60	4	4	55	220
60-70	8	12	65	520
70-80	14	26	75	1050
80-90	19	45	85	1615
90-100	5	50	95	475
	$N = \sum f_i = 50$			$\sum(f_i \times x_i) = 38$

(i) Mean $= \frac{\sum(f_i \times x_i)}{\sum f_i} =$

$\frac{3880}{50} = 77.6 \approx 78$marks

(ii) $N = \sum f_i = 50$

$\frac{N}{2} = 25$

The cumulative frequency just above $25 = 26$

Hence, the median class is 70-80

So, $1 = 70$, $h = 10$, $f = 14$, $F = 12$ and $\frac{N}{2} = 25$

Median $= 1 + \frac{\frac{N}{2} - F}{f} \text{xh} = 70 + \frac{25-12}{14} \times 10$

$= 70 + 9.29 = 79.29 \approx 79$ Marks

(iii) Since the highest frequency is 19, so the modal class is 80-90

$1 = 80$, $h = 10$, $f = 19$, $f_1 = 14$, $f_2 = 5$

Mode $= 1 + \frac{f - f_1}{2f - f_1 - f_2} \text{xh}$

$= 80 + \frac{19 - 14}{38 - 14 - 5} \times 10$

$= 80 + \frac{5}{19} \text{x}10$

$= 80 + 2.63 = 82.63 \approx 83$ marks

(2) Ans. $y=2(x-1)$

x	1	2	3	4
y	0	2	4	6

$4x+y=4$

$y = 4-4x$

x	1	2	0.5
y	0	-4	2

Coordinates of point where line meets

Line 1: x-axis = (1,0)

y-axis = (0,-2)

Line 2: x-axis = (1,0)

y-axis = (0,4)