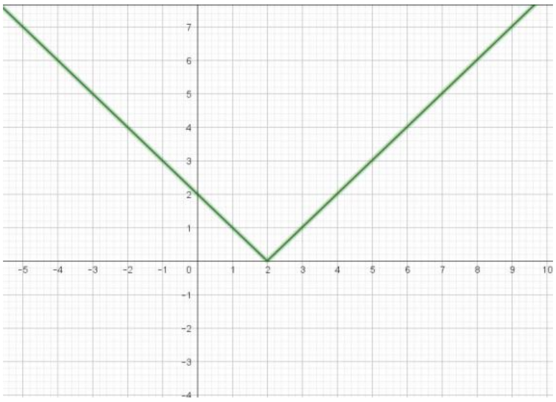
MARKING SCHEME

CLASS-XI (2025-26)

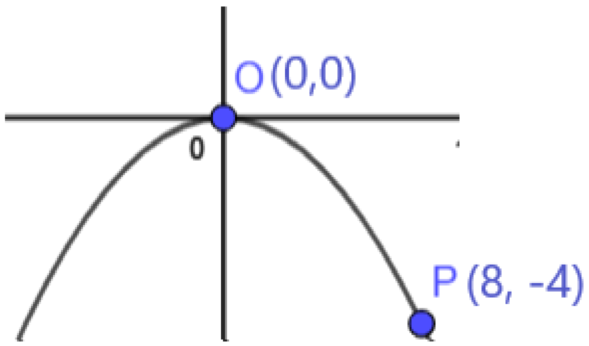
SUBJECT-MATHEMATICS **MAXIMUM MARKS: 80**

NOTE: Any other relevant answer, not given herein but given by the candidate, be suitably awarded.

Q.No.	Answer/Solutions/Value points	Step Marks	Total Marks
SECTION - A			
1.	(D)7	1	1
2.	(A) $\sqrt{3}$	1	1
3.	(C) (4,4)	1	1
4.	(D)$\frac{-i}{4}$	1	1
5.	(D)90	1	1
6.	(A)$\frac{25}{21}$	1	1
7.	(D) $\emptyset$	1	1
8.	(D) $n+1$	1	1
9.	(C)24	1	1
10.	(B) $45°$	1	1
11.	(B)$\frac{1}{5}$	1	1
12.	(C) $\frac{2}{7}$	1	1
13.	(A)$(-\infty, 3) \cup (5, \infty)$	1	1
14.	(C) 4	1	1
15.	(A)(1,2,3)	1	1
16.	(B) $\{(1, d), (2, c), (3, b), (4, b)\}$	1	1
17.	(B)Centre ($\frac{1}{4}$, 0) , Radius = $\frac{1}{4}$	1	1
18.	(C)252500	1	1
19.	(C) (A) is true but (R) is false.	1	1
20.	(D) (A) is false but (R) is true.	1	1
SECTION – B			

21.	$f(x) = \begin{cases} x-2 & if\ x \geq 2 \\ -x+2 & if\ x < 2 \end{cases}$  OR R= {(a, b) : $b = a^2 + a, a \in A, b \in B\}$ Range = {2, 6, 12, 20}	1 1 1 1	2 2
22.	$-4 \leq 3 - x \leq 4$ $-7 \leq -x \leq 1$ $\Rightarrow x \in [-1, 7]$	1 $\frac{1}{2}$ $\frac{1}{2}$	2
23.	Given that, $f(x) = \dfrac{x^2}{x\cos x - \sin x}$ $\Rightarrow f'(x) = \dfrac{(x\cos x - \sin x)2x - x^2(\cos x - x\sin x - \cos x)}{(x\cos x - \sin x)^2}$ $\Rightarrow f'(x) = \dfrac{2x^2\cos x - 2x\sin x + x^3\sin x}{(x\cos x - \sin x)^2}$	$1\frac{1}{2}$ $\frac{1}{2}$	2
24.	Let the required point be $(0, y, 0)$. $\Rightarrow \sqrt{9 + (y+2)^2 + 25} = 5\sqrt{2}$ Squaring both sides, we get $y^2 + 4y - 12 = 0$ $\Rightarrow (y+6)(y-2) = 0$ $\Rightarrow y = -6\ or\ y = 2$ ∴Required points are (0, 2, 0) and (0, -6, 0).	1 $\frac{1}{2}$ $\frac{1}{2}$	2
25.	$P(A^C \cap B^C) = P(A \cup B)^C = 1 - P(A \cup B)$ $= 1 - [P(A) + P(B) - P(A \cap B)]$ $= 1 - [0.37 + 0.45 - 0]$ $= 1 - 0.82$ $= 0.18$	1 1	2

	OR $P(R) = P(Riya\ qualifies) = 0.17$ $P(D) = P(Diya\ qualifies) = 0.12$ $P(R \cap D) = 0.09$ Required Probability $= P(R^C \cup D^C)$ $= P(R \cap D)^C$ $= 1 - P(R \cap D)$ $= 1 - 0.09$ $= 0.91$	1 1	2
	SECTION – C		
26.	Given, $f(x) = \sqrt{x^2 - 1}$ f(x) is defined $when\ x^2 - 1 \geq 0$ $\Rightarrow x \leq -1\ or\ x \geq 1$ $\Rightarrow$Domain = $(-\infty, -1] \cup [1, \infty)$ Since, y is defined as positive square root of $x^2 - 1$ therefore $y \in [0, \infty)$ $\Rightarrow$ Range = $[0, \infty)$ OR (i) Since $(1,2) \in T$ but $(2,1) \notin T$ $\therefore$ $(a, b) \in T$ implies $(b, a) \in T$ is false (ii) Since $(10,5) \in R$ and $(5,2) \in R$ But $(10,2) \notin R$ $\therefore (a, b) \in T, (b, c) \in T$ implies $(a, c) \in T$ is false.	$\frac{1}{2}$ 1 1 $\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$	3 3
27.	(a) Let $x = \frac{\pi}{8}$,then $2x = \frac{\pi}{4}$ $\Rightarrow \tan 2x = \dfrac{2\tan x}{1 - tan^2 x}$ $\Rightarrow tan^2 x + 2\tan x - 1 = 0$ $\Rightarrow \tan x = -1 \pm \sqrt{2}$ $\Rightarrow \tan\frac{\pi}{8} = \sqrt{2} - 1$ {Since , $\frac{\pi}{8} \in 1st\ quadrant$} OR	1 1 1	3

	LHS : $(\sin 3x - \sin x) + \sin 2x$ $= 2\cos 2x\ \sin x + 2\sin x\ \cos x$ $= 2\sin x\ (\cos 2x + \cos x)$ $= 4\sin x \cos\frac{x}{2}\cos\frac{3x}{2}$ = RHS	$1\frac{1}{2}$ $1\frac{1}{2}$	3
28. (i) (ii)	 Let the equation of the parabalic curve be $x^2 = -4ay$ $\because$ $(8, -4)$ lies on the parabola $\therefore$ $64 = -4a(-4)$ $\Rightarrow a = 4$ $\Rightarrow$Requred equation is $x^2 = -16y$ Focus is at $(0, -4)$	1 mark for correct figure $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	3
29.	$(a+b)^n = {}^nC_0\, a^n + {}^nC_1 a^{n-1}b + {}^nC_2\, a^{n-2}\, b^2 + \ldots$ $(a+b)^{n+3} = {}^{n+3}C_0\, a^{n+3} + {}^{n+3}C_1\, a^{n+2}\, b + {}^{n+3}C_2\, a^{n+1}\, b^2 + {}^{n+3}C_3\, a^n\, b^3 + \ldots$ ATQ ${}^nC_1 a^{n-1}b : {}^nC_2\, a^{n-2}\, b^2 = {}^{n+3}C_2\, a^{n+1}\, b^2 : {}^{n+3}C_3\, a^n\, b^3$ $\frac{2}{(n-1)}\frac{a}{b} = \frac{3}{n+1}\frac{a}{b}$ $\Rightarrow 2n + 2 = 3n - 3$ $\Rightarrow n = 5$	$\frac{1}{2}$ $\frac{1}{2}$ 1 1	3
30.	$Z = \frac{1 - i\sin\theta}{1 + i\sin\theta} \times \frac{1 - i\sin\theta}{1 - i\sin\theta}$ $= \frac{(1 - i\sin\theta)^2}{1 + \sin^2\theta}$	$\frac{1}{2}$	

	$= \frac{1 - sin^2\theta}{1 + sin^2\theta} - \frac{2i \sin\theta}{1 + sin^2\theta}$ As Z is purely imaginary $\Rightarrow$Re(Z)=0 $\Rightarrow 1 - sin^2\theta = 0$ $\Rightarrow \sin\theta = \pm 1$ $\Rightarrow \theta = \frac{\pi}{2}$ or $\frac{3\pi}{2}$ OR Given $\frac{(1+i)^2}{2-i} = x + iy$ $\Rightarrow \frac{(2i)}{2-i} = x + iy$ $\Rightarrow \frac{2i(2+i)}{5} = x + iy$ $\Rightarrow \frac{4i}{5} - \frac{2}{5} = x + iy$ $\Rightarrow x = \frac{-2}{5}$ and $y = \frac{4}{5}$ $2x + y = 0$	1 $\frac{1}{2}$ 1 $\frac{1}{2}$ 1 1 $\frac{1}{2}$	3 3
31.	(i) Required Probability $= P$(all are white) $+ P$(all are black) $= \frac{4c_3}{9c_3} + \frac{3c_3}{9c_3}$ $= \frac{4 \times 3 \times 2}{9 \times 8 \times 7} + \frac{3 \times 2 \times 1}{9 \times 8 \times 7}$ $= \frac{1}{21} + \frac{1}{84} = \frac{5}{84}$ (ii) Required Probability $= P(w\&R\&G)$ $= \frac{{}^4c_1 \times {}^3c_1 \times {}^2c_1}{{}^9c_3}$ $= \frac{4 \times 3 \times 2}{9 \times 8 \times 7} \times 3 \times 2 \times 1$ $= \frac{2}{7}$	1 $\frac{1}{2}$ 1 $\frac{1}{2}$	3
SECTION – D			
32.	*Since*, $\sin x = -\frac{2\sqrt{2}}{3}$, $x \in \text{III}^{\text{rd}}$ Quadrant $\Rightarrow \cos x = -\frac{1}{3}$ Since, $x \in \text{III}^{\text{rd}}$ Quadrant	1	

	$\therefore \frac{x}{2} \in \text{II}^{\text{nd}}$ Quadrant $\sin\frac{x}{2} = \sqrt{\frac{1-\cos x}{2}} = \sqrt{\frac{1+\frac{1}{3}}{2}} = \sqrt{\frac{2}{3}}$ $\cos\frac{x}{2} = -\sqrt{\frac{1+\cos x}{2}} = -\sqrt{\frac{1-\frac{1}{3}}{2}} = -\frac{1}{\sqrt{3}}$ $\tan\frac{x}{2} = \frac{\sin\frac{x}{2}}{\cos\frac{x}{2}} = -\sqrt{2}$	1 1 1 1	5
33.	Given, $f(x) = \sqrt{\tan(3x-5)}$ According to first principle of derivatives, $f'(x) = \lim_{h\to 0}\frac{\sqrt{\tan(3x+3h-5)} - \sqrt{\tan(3x-5)}}{h}$ $= \lim_{h\to 0}\frac{\tan(3x+3h-5)-\tan(3x-5)}{h[\sqrt{\tan(3x+3h-5)}+\sqrt{\tan(3x-5)}]}$ $= \lim_{h\to 0}\frac{\tan(3x+3h-5-3x+5)\cdot\{1+\tan(3x+3h-5)\tan(3x-5)\}}{h\left[\sqrt{\tan(3x+3h-5)}+\sqrt{\tan(3x-5)}\right]}$ $= \lim_{h\to 0}\frac{\tan 3h\cdot\{1+\tan(3x+3h-5)\tan(3x-5)]}{h[\sqrt{\tan(3x+3h-5)}+\sqrt{\tan(3x-5)}]}$ $= \frac{3\cdot\{1+tan^2(3x-5)\}}{2\sqrt{\tan(3x-5)}}$ $= \frac{3\sec^2(3x-5)}{2\sqrt{\tan(3x-5)}}$ OR $f(0) = c$ $L.H.L. = \lim_{x\to 0^-}\frac{Sin\,(a+1)x + \sin x}{x}$ $= \lim_{x\to 0^-}\frac{Sin\,(a+1)x}{x} + \frac{Sin\,x}{x}$ Put $x = 0 - h$ where $h > 0$ and $h \to 0$ $= (a+1)\lim_{h\to 0}\frac{Sin\,(a+1)h}{(a+1)h} + \lim_{h\to 0}\frac{Sin\,h}{h}$ $= a+2$ $R.H.L. = \lim_{x\to 0^+}\frac{\sqrt{x+bx^2}-\sqrt{x}}{bx^{3/2}}$	1 1 1 1 1 $\frac{1}{2}$ $1\frac{1}{2}$	5

<table>
<tr>
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<td>$= \lim_{x\to 0^+} \frac{\sqrt{x}\{\sqrt{1+bx}-1\}}{bx\sqrt{x}} \times \frac{\sqrt{1+bx}+1}{\sqrt{1+bx}+1}$

$= \lim_{x\to 0^+} \frac{1}{\sqrt{1+bx}+1}$
Put $x = 0 + h$ where $h > 0$ and $h \to 0$

$= \lim_{h\to 0} \frac{1}{\sqrt{1+bh}+1}$

$=\frac{1}{2}$
According to the question,
$\lim_{x\to 0^-} f(x) = \lim_{x\to 0^+} f(x) = f(0)$

$\Rightarrow a + 2 = \frac{1}{2} = c$
$\Rightarrow a = -\frac{3}{2}, c = \frac{1}{2}, b \in R - \{0\}$</td>
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<td>34.</td>
<td>$x, 2y, 3z$ are in A.P. $\Rightarrow 4y = x + 3z$-------(1)
x, y, z are in G.P.
$\therefore \frac{y}{x} = \frac{z}{y} = r$ (let)
$y = xr$
$z = yr = xr^2$
Putting the values of y and z in equation (1)
$4xr = x + 3xr^2$
$\Rightarrow 4r = 1 + 3r^2$
$\Rightarrow 3r^2 - 4r + 1 = 0$
$\Rightarrow 3r^2 - 3r - r + 1 = 0$
$\Rightarrow 3r(r-1) - 1(r-1) = 0$
$\Rightarrow (3r-1)(r-1) = 0$
$\Rightarrow r = \frac{1}{3}, 1$
Common ratios are $\frac{1}{3}, 1$</td>
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<td>35.</td>
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<table>
<tr><th>C. I</th><th>f</th><th>cf</th><th>x</th><th>$D = |x - 140|$</th><th>fD</th></tr>
<tr><td>$0 - 60$</td><td>4</td><td>4</td><td>30</td><td>110</td><td>440</td></tr>
<tr><td>$60 - 120$</td><td>5</td><td>9</td><td>90</td><td>50</td><td>250</td></tr>
<tr><td>$120 - 180$</td><td>3</td><td>12</td><td>150</td><td>10</td><td>30</td></tr>
<tr><td>$180 - 240$</td><td>6</td><td>18</td><td>210</td><td>70</td><td>420</td></tr>
<tr><td>$240 - 300$</td><td>2</td><td>20</td><td>270</td><td>130</td><td>260</td></tr>
<tr><td></td><td>20</td><td></td><td></td><td></td><td>1400</td></tr>
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$\frac{N}{2} = 10$ therefore, median class is $(120 - 180)$.

$Median = 120 + \frac{10-9}{3} \times 60$</td>
<td>2 marks for correct table

$\frac{1}{2}$

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	$= 140$ Mean Deviation about Median $= \frac{\sum fD}{\sum f} = \frac{1400}{20} = 70$ OR (b)	$\frac{1}{2}$ 1	

C.I	f	x	$d = \frac{x-55}{10}$	fd	fd^2
$30 - 40$	3	35	-2	-6	12
$40 - 50$	7	45	-1	-7	7
$50 - 60$	12	55	0	0	0
$60 - 70$	15	65	1	15	15
$70 - 80$	8	75	2	16	32
$80 - 90$	5	85	3	15	45
	50			33	111

2 marks for correct table

$$\text{Mean } = 55 + 10 \times \frac{33}{50}$$
$$= 55 + 6.6 = 61.6$$ 1

$$\text{Variance } = h^2\left[\frac{\sum fd^2}{\sum f} - \left(\frac{\sum fd}{\sum f}\right)^2\right]$$
$$= 100\left[\frac{111}{50} - \left(\frac{33}{50}\right)^2\right]$$ 1
$$= 100\left[\frac{5550 - 1089}{2500}\right] = \frac{4461}{25} = 178.44$$ $\frac{1}{2}$

Standard deviation $= \sqrt{\text{variance}} = \sqrt{178.44} = 13.35$ (approx.) $\frac{1}{2}$

SECTION – E

36.	(i) Slope of OF $= \frac{-3-0}{6-0} = \frac{-1}{2}$	1	
	(ii) Equation of OP : $y - 0 = \frac{\sqrt{3}-0}{3-0}(x-0)$ $\Rightarrow y = \frac{1}{\sqrt{3}}x$ or $x = \sqrt{3}y$	1	
	(iii) a) $\theta = 90° - \alpha$,where α is the inclination of line OP $tan\alpha = \frac{\sqrt{3}-0}{3-0}$	1	
	$\Rightarrow tan\alpha = \frac{1}{\sqrt{3}} \Rightarrow \alpha = 30°$ $\theta = 90° - 30° = 60°$	1	4
	OR Since, EF || y – axis with F at (6, -3) therefore, equation of EF is $x = 6$.	1	

	Let d be the distance of point F from OP Then, d= $\frac{\lvert 6-\sqrt{3}(-3)\rvert}{\sqrt{1^2+(-\sqrt{3})^2}}$ d= $\frac{6+3\sqrt{3}}{2}$ or $\frac{3(2+\sqrt{3})}{2}$	1	
37.	$(i) E = \{ s_1, w_1, h, l, p, t_1, c_1\}$ $A = \{w_1, g, w_2, h, b_1, r, b_2, c_2, s_2\}$ $M = \{w_2, b_1, g, t_2, j, w_1, f, e\}$ (ii)$M - A = \{t_2, j, f, e\}$ (iii)$E \cup A \cup M = \{s_1, w_1, h, l, p, t_1, c_1, g, w_2, b_1, r, b_2, c_2, s_2, j, f, e\}$ $E \cap A = \{w_1, h\}$ $(E \cap A)' = \{s1, l, p, t1, c1, g, w2, b1, r, b2, c2, s2, t2, j, f, e\}$ OR (b)$A \cup M = \{w_1, g, w2, h, b1, r, b2, c2, s2, t2, j, f, e\}$ $E \cap A \cap M = \{w_1\}$ $(A \cup M) - (E \cap A \cap M) = \{g, w2, h, b1, r, b2, c2, s2, t2, j, f, e\}$	1 1 1 1 1 1	4
38.	(i)Total arrangements = 7! Arrangements with Corn as first topping=6! Required arrangements = 7! – 6! = 6! (7-1) = 4320 (ii) Since Corn must be included so 3 toppings out of 6 can be selected in $^6C_3$ ways Also, two dressings out of four can be selected in $^4C_2$ ways Possible combinations = 1($^6C_3$) ($^4C_2$)=20(6)=120	1 1 1 1	4