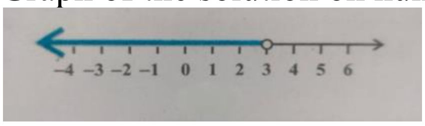
BOARD OF SCHOOL EDUCATION HARYANA
Practice Paper -XI
(2026-27)
Marking Scheme
MATHEMATICS
CODE: 835

⇨ Important Instructions: ● All answers provided in the Marking scheme are SUGGESTIVE
● Examiners are requested to accept all possible alternative correct answer(s).

	SECTION – A (1Mark × 20Q)	
Q. No.	**EXPECTED ANSWERS**	**Marks**
Question 1.	If V = {a, e, i, o, u} and B = {a, i, k, u} then B - V is	
Solution:	(D)	**1**
Question 2	If U = {1,2,3,4,5,6,7,8,9}, X = {1,3,5,7,9}, Y = {2,4,6,8}, then $(X \cap Y)'$ is	
Solution:	(A) {1,2,3,4,5,6,7,8,9}	**1**
Question 3	-47°30' in radian measure is	
Solution:	(B) -19π/72	**1**
Question 4.	a + ib form of i^{-104} is:	
Solution:	(C) 1 + i0	**1**
Question 5.	If $\frac{1}{8!} + \frac{1}{9!} = \frac{X}{10!}$ then value of x is:	
Solution:	(A) 100	**1**
Question 6.	Which term of the G.P. 2, $2\sqrt{2}$, 4,….. is 128 :	
Solution:	(B) 13^{th}	**1**
Question 7.	The value of x for which the numbers -3/11, x, -11/3 are in G.P	
Solution:	(B) ±1	**1**
Question 8.	The derivative of tan(2x+1) is:	
Solution:	(B) $2\sec^2(2x + 1)$	**1**
Question 9.	If the standard deviation of a data is 7, then its variance is:	
Solution:	(A) 49	**1**
Question10.	If two events A and B are not mutually exclusive, then $P(A\cup B) + P(A \cap B) =$	
Solution:	(A) P(A) + P(B)	**1**
Question11.	Find the number of terms in the expansion of $(x + 1)^9 + (x + 1)^9$.	
Solution:	(C) $\frac{9+1}{2} = 5$	**1**
Question12.	Find the coordinates of centre of the circle $2x^2 + 2y^2 - 6x + 12 = 0$.	
Solution:	(C) Centre (3/2, 0)	**1**

Question13.	Write the value of $\lim_{\theta \to 0} \frac{\sin 2\theta}{\theta}$.	
Solution:	$\lim_{\theta \to 0} \frac{\sin 2\theta}{\theta} = \lim_{\theta \to 0} \frac{2.\sin 2\theta}{2\theta} = 2.\lim_{\theta \to 0} \frac{\sin 2\theta}{2\theta} = 2$	**1**
Question14.	If v is the variance and σ is the standard deviation, then what is the relation between v and σ.	
Solution:	$v^2 = \sigma$	**1**
Question15.	Fill in the blank to make the statement true, $U' \cap A =$ …………	
Solution:	$U' \cap A = \emptyset$	**1**
Question16.	Range of $\sin\theta$ is equal to …………….. .	
Solution:	Range of $\sin\theta$ is [-1, 1]	**1**
Question17.	If ${}^5C_r = {}^5C_2$, then either r = 2 or r = 3. (True/ False)	
Solution:	True	**1**
Question18.	Let E and F be two events, then P (E' ∩ F') = 1 – P (E ∪ F). (True/ False)	
Solution:	True	**1**
Question19.	**Assertion (A):** $f(x) = 5x^4 - 9x^2 + 3$ is an even function. **Reason (R):** A function is said to be an even function if f(-x) = - f(x)	
Solution:	(C) Assertion (A) is true and Reason (R) is false.	**1**
Question20.	**Assertion (A):** The point (-5, 0, 9) lies on the XY plane. **Reason (R):** The coordinates of a point P(x, y, z) in XY plane are (0, 0, z).	
Solution:	(D) Assertion (A) is false and Reason (R) is true.	**1**
	<u>SECTION – B (2Marks × 5Q)</u>	
Question21.	If A = {a, e, i, o, u }, B = {a, b, u, i}, C = {b, c, i}; find A ∩ (BUC)	
Solution:	BUC = { a, b, c, u, i } Now, A ∩ (BUC) = {a, i, u }	**1** **1**
Question22.	Find the multiplicative inverse of 2 - 3i.	
Solution:	Multiplicative Inverse of 2 - 3i $= \frac{1}{2+3i}$ ⇨ M.I. $= \frac{1}{2+3i} \times \frac{2-3i}{2-3i}$ ⇨ $= \frac{2-3i}{(2)^2-(3i)^2}$ ⇨ $= \frac{2-3i}{4-9i^2}$ ⇨ $= \frac{2-3i}{4+9} = \frac{2}{13} - \frac{3i}{13}$	**1** **1**
OR Question22.	Express $(1 - i)^4$ in the form of a + ib.	

Solution:	Given $(1-i)^4$ ⇨ $= (1-i)^2.(1-i)^2$ ⇨ $= (1+i^2-2i).(1+i^2-2i)$ ⇨ $= (1-1-2i).(1-1-2i)$ ⇨ $= (-2i).(-2i)$ ⇨ $= 4i^2$ ⇨ $= -4+i0$; where $a = -4$ and $b = 0$	**1** **1**
Question23.	Solve the inequality $7x + 3 < 5x + 9$ and show the graph of the solution on number line.	
Solution:	We have $7x + 3 < 5x + 9$ ⇨ $7x - 5x < 9 - 3$ ⇨ $2x < 6$ ⇨ $x < 3$ ⇨ $x \in (-\propto , 3)$ Graph of the solution on number line: 	 **1** **1**
Question24.	Find the 12[th] term of a G.P.whose 8[th] term is 192 and the common ratio is 2.	
Solution:	Here $r = 2$ and $a_8 = 192$ of a G.P. ⇨ $a.r^7 = 192$ ⇨ $a.(2)^7 = 192$ ⇨ $a = \frac{192}{128} = \frac{3}{2}$ Now, $a_{12} = a.r^{11}$ ⇨ $= (\frac{3}{2}).2^{11}$ ⇨ $= (3).1024 = 3078$	 **1** **1**
Question25.	Find the equation of the parabola with focus (6, 0) and directrix $x = -6$.	
Solution:	Since the focus is at (6, 0) which lies on x-axis. ⇨ x-axis is the axis of the parabola. ⇨ Equation of the parabola is of the form $y^2 = 4ax$ or $y^2 = -4ax$ ⇨ Since the directrix is $x = -6$ and the focus is (6, 0) ⇨ The parabola is to be of the form $y^2 = 4ax$ with $a = 6$ ⇨ $y^2 = 4(6)x$ ⇨ $y^2 = 24x$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
OR Question25.	Find the equation of the ellipse, whose vertices are $(0, \pm 13)$ and foci are $(0, \pm 5)$.	

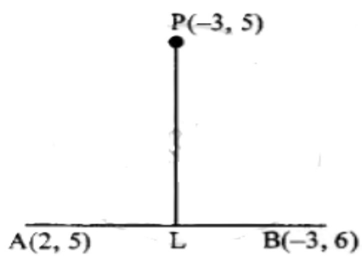
Solution:	Since the vertices are on y-axis, the major axis is along the y-axis. So equation of ellipse is of the form $\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$ Given that a = semi major axis = 13, and c = ± 5 from foci (0, ± 5) And the relation $c^2 = a^2 - b^2$, gives $5^2 = 13^2 - b^2$ i.e. $b^2 = 144$ Therefore, the equation of the ellipse is $\frac{x^2}{25} + \frac{y^2}{144} = 1$	**1** **1**
	SECTION – C (3Marks × 6Q)	
Question26.	If L = {1, 2, 3, 4 }, M = {3, 4, 5, 6 } and N = { 1, 3, 5 }, then verify that L $-(M \cup N) = (L - M) \cap (L - N)$.	
Solution:	Here $M \cup N$ = {1, 3, 4, 5, 6} L $-(M \cup N)$ = {2} $L - M = \{1, 2\}$ $L - N = \{2, 4\}$ $(L - M) \cap (L - N) = \{2\}$ L $-(M \cup N) = (L - M) \cap (L - N)$ Hence verified	**1/2** **1/2** **1/2** **1/2** **1**
Question27.	Find the domain and Range of the function f(x) = $-\ \lvert x \rvert$.	
Solution:	Here f(x) = $-\ \lvert x \rvert$ f(x) will have real values for all real values of x ⇒ x ∈ R ⇒ x ∈ [-∞, ∞] Domain = [-∞, ∞] By definition, the absolute value (modulus) function |x| is always non-negative for any real number x. $\therefore \lvert x \rvert \geq 0$ Multiplying both sides of the inequality by -1 reverses the inequality sign: $-\lvert x \rvert \leq 0$ Since f(x) = -|x|, substituting this into the inequality gives: $f(x) \leq 0$ This indicates that the output values of the function will never be positive. The values will always be less than or equal to zero. Therefore, the range includes all negative real numbers and zero. ∴ Range = $(-\infty, 0]$.	**1** **1** **1**
Question28.	Show that $9^{n+1} - 8n - 9$ is divisible by 64, whenever n is a positive integer.	
Solution:	$9^{n+1} - 8n - 9 = 9.9^n - 8n - 9$ ⇨ $9.(1 + 8)^n - 8n - 9$	**1/2**

	We know $(1+x)^n = 1 + nx + \frac{n(n-1)}{2}x^2 + \frac{n(n-1)(n-2)}{6}x^3 + \ldots\ldots$ ⇨ $9.[1 + 8n + \frac{n(n-1)}{2}8^2 + \frac{n(n-1)(n-2)}{6}8^3 + \ldots\ldots] - 8n - 9$ ⇨ $[9 + 72n + 9.\frac{n(n-1)}{2}8^2 + 9.\frac{n(n-1)(n-2)}{6}8^3 + \ldots\ldots] - 8n - 9$ ⇨ $64n + 9.\frac{n(n-1)}{2}8^2 + 9.\frac{n(n-1)(n-2)}{6}8^3 + \ldots\ldots$ Taking 8^2 common from right side, we have ⇨ $8^2.[8n + 9.\frac{n(n-1)}{2}8 + 9.\frac{n(n-1)(n-2)}{6}8^2 + \ldots\ldots]$ ⇨ $64.[8n + 9.\frac{n(n-1)}{2}8 + 9.\frac{n(n-1)(n-2)}{6}8^2 + \ldots\ldots]$ Which is multiple of 64 and hence divisible by 64.	1 ½ 1
OR Question28.	Compute $(102)^5$.	
Solution:	$(102)^5 = (100+2)^5$ Now $(a+b)^n = {}^nC_0 (a)^n(b)^0 + {}^nC_1 (a)^{n-1}(b)^1 + \ldots\ldots + {}^nC_n (a)^0(b)^n$ ⇨ $(100+2)^5 = {}^5C_0 (100)^5(2)^0 + {}^5C_1 (100)^4(2)^1 + {}^5C_2 (100)^3(2)^2 + {}^5C_3 (100)^2(2)^3 + {}^5C_4 (100)^1(2)^4 + {}^5C_5 (100)^0(2)^5$ ⇨ = 1.(10000000000)(1) + 5.(100000000).2 + 10.(1000000).4 + 10.(10000).8 + 5.(100).16 + 1.(1).32 ⇨ = 10000000000 +1000000000 + 40000000 + 800000 + 8000 +32 ⇨ = 11040808032	$\frac{1}{2}$ $1\frac{1}{2}$ 1
Question29.	Find the sum of the sequence 4, 44, 444, 4444, …….. to n terms.	
Solution:	This is not a GP., however, we can relate it to a GP. by writing the terms as $S_n = 4 + 44 + 444 + 4444 + \ldots$ to n terms $= \frac{4}{9}[9 + 99 + 999 + 9999 + \ldots$ to n term] $= \frac{4}{9}[(10^1 - 1) + (10^2 - 1) + (10^3 - 1) + (10^4 - 1) + \ldots$n terms] $= \frac{4}{9}[(10+10^2+10^3+\ldots$n terms) - (1+1+1+…n terms)] It is a G.P. where a = 10 and r = 10 > 1 $\therefore S_n = \frac{a(r^n-1)}{r-1}$ $= \frac{4}{9}\left[\frac{10(10^n-1)}{10-1} - n\right] = \frac{4}{9}\left[\frac{10(10^n-1)}{9} - n\right]$	1 1 1
OR Question 29	Find the value of n so that $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ may be the geometric mean between a and b.	
Solution:	G.M. between a and b = $\sqrt{a.b}$ => $\frac{a^{n+1}+b^{n+1}}{a^n+b^n} = a^{1/2}.b^{1/2}$ => $a^{n+1} + b^{n+1} = a^{1/2}.b^{1/2}(a^n + b^n)$ => $a^{n+1} + b^{n+1} = a^{n+\frac{1}{2}}.b^{\frac{1}{2}} + a^{\frac{1}{2}}.b^{n+\frac{1}{2}}$	1/2 1

	$\Rightarrow a^{n+1} - a^{n+\frac{1}{2}}.b^{\frac{1}{2}} = a^{\frac{1}{2}}.b^{n+\frac{1}{2}} - b^{n+1}$ $\Rightarrow a^{n+\frac{1}{2}}(a^{\frac{1}{2}} - b^{\frac{1}{2}}) = b^{n+\frac{1}{2}}(a^{\frac{1}{2}} - b^{\frac{1}{2}})$ $\Rightarrow a^{n+\frac{1}{2}} = b^{n+\frac{1}{2}}$ $\Rightarrow \left(\frac{a}{b}\right)^{n+\frac{1}{2}} = 1$ $\Rightarrow \left(\frac{a}{b}\right)^{n+\frac{1}{2}} = \left(\frac{a}{b}\right)^{0}$ $\Rightarrow n + \frac{1}{2} = 0$ $\Rightarrow n = -\frac{1}{2}$	**1** **1/2**
Question30.	Verify that (0, 7, 10), (-1, 6, 6) and (-4, 9, 6) are the vertices of a right angled triangle.	
Solution:	Let the vertices be A(0, 7, 10), B(-1, 6, 6) and C(-4, 9, 6) $\therefore$ AB = $\sqrt{(-1-0)^2 + (6-7)^2 + (6-10)^2}$ ⇨ $AB^2 = (-1)^2 + (-1)^2 + (-4)^2$ ⇨ $AB^2 = 18$ Now BC = $\sqrt{(-4+1)^2 + (9-6)^2 + (6-6)^2}$ ⇨ $BC^2 = (-3)^2 + (3)^2 + (0)^2$ ⇨ $BC^2 = 18$ Now CA = $\sqrt{(0+4)^2 + (7-9)^2 + (10-6)^2}$ ⇨ $CA^2 = (4)^2 + (-2)^2 + (4)^2$ ⇨ $CA^2 = 36$ Since $AB^2 + BC^2 = CA^2$ the triangle satisfies the Pythagorean theorem. Thus, the vertices form a **right-angled triangle**	$1\frac{1}{2}$ $1\frac{1}{2}$
Question31.	The probability that a student will pass the final examination in both English and Hindi is 0.5 and the probability of passing neither is 0.1. If the probability of passing the English examination is 0.75, what is the probability of passing the Hindi examination?	
Solution:	Let **E** be the event that the student passes the English examination and **H** be the event that the student passes the Hindi examination. Probability of passing English, P(E) = 0.75 Probability of passing both English and Hindi, P(E ∩ H) = 0.5 Probability of passing neither exam, P(E' ∩ H') = 0.1 Using De Morgan's Law,	**1**

	the probability of passing neither = P(E' ∩ H') = 1 - P(E ∪ H) 0.1 = 1 - P(E ∪ H) P(E ∪ H) = 1 – 0.1 = 0.9 Now, P(E ∪ H) = P(E) + P(F) - P(E ∩ H) 0.9 = 0.75 + P(F) – 0.5 P(F) = 0.9 – 0.25 P(F) = 0.65	**1** **1**
	SECTION – D (5Marks × 4Q)	
Question32 .(i)	(i) Prove that: $\frac{\sin x - \sin y}{\cos x + \cos y} = \tan\frac{x-y}{2}$	
Solution: (i)	$\frac{\sin x - \sin y}{\cos x + \cos y} = \tan\frac{x-y}{2}$ L.H.S. = $\frac{\sin x - \sin y}{\cos x + \cos y}$ Using $\cos C + \cos D = 2\cos\left(\frac{C+D}{2}\right).\cos\left(\frac{C-D}{2}\right)$ and $\sin C - \sin D = 2\cos\left(\frac{C+D}{2}\right).\sin\left(\frac{C-D}{2}\right)$, we have ⇨ $= \frac{2\cos\left(\frac{x+y}{2}\right).\sin\left(\frac{x-y}{2}\right)}{2\cos\left(\frac{x+y}{2}\right).\cos\left(\frac{x-y}{2}\right)}$ ⇨ $= \frac{\sin\left(\frac{x-y}{2}\right)}{\cos\left(\frac{x-y}{2}\right)}$ ⇨ $= \tan\frac{x-y}{2}$ ⇨ L.H.S. = R. H.S.	 **1/2** **1/2** **1** $\frac{1}{2}$
Solution:32(ii)	(ii) Prove that: $2\cos\frac{\pi}{13}.\cos\frac{9\pi}{13} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13} = 0$	
Solution: (ii)	$2\cos\frac{\pi}{13}.\cos\frac{9\pi}{13} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13} = 0$ L.H.S. = $2\cos\frac{\pi}{13}.\cos\frac{9\pi}{13} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$ We know, $2\cos A.\cos B = \cos(A+B) + \cos(A-B)$ ⇨ $= \cos\left(\frac{\pi}{13} + \frac{9\pi}{13}\right) + \cos\left(\frac{\pi}{13} - \frac{9\pi}{13}\right) + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$ ⇨ $= \cos\left(\frac{10\pi}{13}\right) + \cos\left(-\frac{8\pi}{13}\right) + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$ ⇨ $= \cos\left(\pi - \frac{3\pi}{13}\right) + \cos\left(\pi - \frac{5\pi}{13}\right) + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$ ⇨ $= -\cos\left(\frac{3\pi}{13}\right) - \cos\left(\frac{5\pi}{13}\right) + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$	 **1/2** **1/2** **1**

<table>
<tr><td></td><td>⇨ = 0
⇨ L.H.S. = R. H.S.</td><td>1/2</td></tr>
<tr><td>OR Q32</td><td>Prove that: $\cos^2 x + \cos^2 (x + \frac{\pi}{3}) + \cos^2 (x - \frac{\pi}{3}) = \frac{3}{2}$</td><td></td></tr>
<tr><td>Solution:</td><td>$\cos^2 x + \cos^2 (x + \frac{\pi}{3}) + \cos^2 (x - \frac{\pi}{3}) = \frac{3}{2}$
L.H.S. = $\cos^2 x + \cos^2 (x + \frac{\pi}{3}) + \cos^2 (x - \frac{\pi}{3})$
Multiply and divide by 2, we have
⇨ $= \frac{1}{2} [2\cos^2 x + 2\cos^2 (x + \frac{\pi}{3}) + 2\cos^2 (x - \frac{\pi}{3})]$
Using $2.\cos^2 A = 1 + \cos 2A$, we have
⇨ $= \frac{1}{2} [1 + \cos 2x + 1 + \cos (2x + \frac{2\pi}{3}) + 1 + \cos (2x - \frac{2\pi}{3})]$
⇨ $= \frac{1}{2} [3 + \cos 2x + \cos (2x + \frac{2\pi}{3}) + \cos (2x - \frac{2\pi}{3})]$
Using $\cos (A + B) + \cos (A - B) = 2.\cos A . \cos B$, we have
⇨ $= \frac{1}{2} [3 + \cos 2x + 2.\cos (2x).\cos (\frac{2\pi}{3})]$
⇨ $= \frac{1}{2} [3 + \cos 2x + 2.\cos (2x).\cos (\pi - \frac{\pi}{3})]$
⇨ $= \frac{1}{2} [3 + \cos 2x + 2.\cos (2x).-\cos (\frac{\pi}{3})]$
⇨ $= \frac{1}{2} [3 + \cos 2x + 2.\cos (2x).(-\frac{1}{2})]$
⇨ $= \frac{1}{2} [3 + \cos 2x - \cos (2x)]$
⇨ $= \frac{3}{2}$</td><td>½
½
$1\frac{1}{2}$
½
1
1</td></tr>
<tr><td>Question33.</td><td>Find the coordinates of the foot of perpendicular from the point (-1, 3) to the line 3x – 4y – 16 = 0.</td><td></td></tr>
<tr><td>Solution:</td><td>Given equation of line 3x – 4y – 16 =0 …(1)
Let the foot of perpendicular be (x, y) from (-1, 3).
Since line joining (x, y) and (-1, 3) and the given line 3x – 4y – 16 =0 are perpendicular with each other
∴ Equation of any line perpendicular to 3x – 4y – 16 = 0 is
4x + 3y + k = 0 …(2)
Now line (2) is passing through (-1, 3)
⇨ 4(-1) + 3(3) + k = 0
⇨ k = -5
∴ Equation of line passing through (-1, 3) and ⊥ar to 3x – 4y – 16 = 0 is
4x + 3y – 5 = 0 sss …(3)
Now solving equations (1) and (3)(any method), we obtain
3x – 4y = 16 …(4)
4x + 3y = 5 …(5)</td><td>1
$1\frac{1}{2}$</td></tr>
</table>

	Multiply (4) by 3, (5) by 4 and then adding , we have 25x = 68 => x = $\frac{68}{25}$ using this value in (5), we have $4(\frac{68}{25}) + 3y = 5$ => $3y = 5 - \frac{272}{25}$ $3y = \frac{125-272}{25}$ => $3y = \frac{-147}{25}$ $y = \frac{-49}{25}$ So foot of perpendicular is ($\frac{68}{25}$, $\frac{-49}{25}$)	$2\frac{1}{2}$
OR Question33.	Find the equation of the line passing through (-3, 5) and perpendicular to the line through the points (2, 5) and (-3, 6).	
Solution:	Slope of the line passing through the points A(2. 5) and B(-3, 6) $m_1 = \frac{y_2 - y_1}{x_2 - x_1}$ $m_1 = \frac{6-5}{-3-2} = \frac{1}{-5}$ $m_1 = -\frac{1}{5}$  P(-3,5) A(2, 5) B(-3,6) If PL is perpendicular to AB from the point P(-3, 5), then consider its slope as m_2 . Lines PL and AB are mutually perpendicular if, Slope of PL x Slope of AB = -1 => $m_1 \times m_2 = -1$ In other words, $m_2 \times (-\frac{1}{5}) = -1$ ∴ $m_2 = 5$ The slope of PL is 5 and it passes through P(-3, 5), then the equation of PL is, $(y - y_1) = m_2 (x - x_1)$ or $(y - 5) = 5 (x + 3)$ $y - 5 = 5x + 15$ $5x - y + 20 = 0$	**$\frac{1}{2}$** **1** **1** **1** **$1\frac{1}{2}$**
Question34.	Find the derivative of sin 2x from first principle.	
Solution:	Let f(x) = sin 2x , the $\frac{d(f(x))}{dx} = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \to 0} \frac{\sin(2x+2h) - \sin(2x)}{h}$ $= \lim_{h \to 0} \left[\frac{2\cos(\frac{2x+2h+2x}{2}) \sin(\frac{2x+2h-2x}{2})}{h}\right]$ [using $\sin C - \sin D = 2\cos(\frac{C+D}{2}).\sin(\frac{C-D}{2})$]	**1/2** **1**

	$= \lim_{h \to 0} \left[\frac{2\sin(2x+h)\sin(h)}{h}\right]$ $= \lim_{h \to 0}[2\sin(2x+h)] . \lim_{h \to 0}\left[\frac{\sin h}{h}\right]$ $= 2\sin 2x . (1)$ $= 2.\sin 2x$	$1\frac{1}{2}$ 1 1
OR Q34(i).	Find $\lim_{x\to1} f(x)$, if $f(x) = \begin{cases} x^2 - 1, & x \le 1 \\ -x^2 - 1, & x > 1 \end{cases}$	
Solution:	Here, limit exist at $x \to 1$ i.e., LHL = RHL LHL at $x \to 1$ $= \lim_{x\to1-} f(x)$ $= \lim_{h\to0} f(1-h)$ $= \lim_{h\to0}[(1-h)^2 - 1]$ $= 1 - 1 = 0$ RHL at $x \to 1$ $= \lim_{x\to1+} f(x)$ $= \lim_{h\to0} f(1+h)$ $= \lim_{h\to0}[-(1-h)^2 - 1]$ $= -1 - 1 = -2$ LHL $\neq$ RHL $\therefore$ Limit does not exist at $x = 1$	$1\frac{1}{2}$ $1\frac{1}{2}$
OR Q34(ii).	Evaluate: $\lim_{x \to 0} \frac{\sin ax + bx}{ax + \sin bx}$ a, b, a+b $\neq 0$	
Solution:	$\lim_{x \to 0} \frac{\sin ax + bx}{ax + \sin bx}$ a, b, a+b $\neq 0$ Dividing Num. and Deno. By x, we have $\Rightarrow \lim_{x \to 0} \frac{\frac{\sin ax}{x} + b}{a + \frac{\sin ax}{x}}$ $\Rightarrow \frac{\lim_{x \to 0}(\frac{\sin ax}{x} + b)}{\lim_{x \to 0}(a + \frac{\sin bx}{x})}$ $\Rightarrow \frac{\lim_{x \to 0}(\frac{a.\sin ax}{ax} + b)}{\lim_{x \to 0}(a + \frac{b.\sin bx}{bx})}$ $\Rightarrow \frac{a.1+b}{a+b.1} = \frac{a+b}{a+b} = 1$	1/2 1/2 1/2 1/2

Question: 35

Calculate the mean deviation about median for the following data.

वर्ग	0-10	10-20	20-30	30-40	40-50	50-60
बारंबारता	6	7	15	16	4	2

Solution:

From the given data, we construct the following table.

Class	**Frequency f_i**	**Cumulative Frequency c.f.**	**Midpoint x_i**	**$\lvert x_i - Med.\rvert$**	**$f_i . \lvert x_i - Med.\rvert$**
0 – 10	6	6	5	23	138
10 – 20	7	13	15	13	91
20 – 30	15	28	25	3	45
30 – 40	16	44	35	7	112
40 – 50	4	48	45	17	68
50 – 60	2	50	55	27	54
	50				508

$3\frac{1}{2}$

The class interval containing $\frac{N^{th}}{2}$ or 25^{th} item is 20 – 30. Therefore, 20 – 30 is the median class.

We know that Median $= l + \frac{\frac{N}{2} - C}{f} \times h$ 1/2

Here $l = 20$, C = 13, f = 15, h = 10 and N = 50

Therefore, Median $= 20 + \frac{25-13}{15} \times 10 = 20 + 8 = 28$ 1/2

Thus, mean Deviation about median is given by

M.D.(M) $= \frac{1}{N}\sum_{i=1}^{6} f_i . |x_i - Med.| = \frac{1}{50} \times 508 = 10.16$ 1/2

OR Q35.

Calculate mean, variance and standard deviation for the following distribution.

Classes	0- 10	10-20	20-30	30-40	40-50
Frequency	5	8	15	16	6

Solution:

From the given data, we construct the following table.

Class	**Frequency f_i**	**Midpoint x_i**	**$f_i x_i$**	**$(x_i - \bar{x})^2$**	**$f_i(x_i - \bar{x})^2$**
30 – 40	3	35	105	729	2187
40 – 50	7	45	315	289	2023
50 – 60	12	55	660	49	588
60 – 70	15	65	975	9	135
70 – 80	8	75	600	169	1352
80 – 90	3	85	255	529	1587

	90 – 100	2	95	190	1089	2178
		50		3100		10050

$3\frac{1}{2}$

Thus Mean $\bar{x} = \frac{1}{N}\sum_{i=1}^{i=7} f_i x_i$

$= \frac{3100}{50} = 62$ **1/2**

Variance (σ^2) $= \frac{1}{N}\sum_{i=1}^{i=7} f_i\,(x_i - \bar{x})^2$

$= \frac{10050}{50} = 201$ **1/2**

and Standard deviation(σ) = $\sqrt{201}$ = 14.18 **1/2**

SECTION – E (4Marks × 3Q)

Question36. Sudhir who is a student of class XI got a Maths assignment from his class teacher. He did all the questions except a few. If the value of sin x = $\frac{3}{5}$, cos y = $\frac{12}{13}$, where x and y both lie in the second quadrant, then help Sudhir in solving these questions.

(A) What will be the value of cos x ?
(a) 4/5 (b) - 3/5 (c) - 4/5 (d) 3/5

(B) What will be the value of sin y?

(a) 5/12 (b) - 12/13 (c) - 5/13 (d) 5/13

(C) Which of the following options is correct?

(a) sin(x - y) = sin x.cos y + cos x.sin y
(b) sin(x + y) = cos x.sin y - sin x.cos y
(c) sin(x + y) = sin x.cos y + cos x.sin y
(d) sin(x - y) = sin x.sin y - cos x.cos y

(D) The value of sin(x + y) is:

(a) - 56/65 (b) 56/65 (c) 55/67 (d) - 55/67

Solution:

(i) (a) 4/5	**1**
(ii) (d) 5/13	**1**
(iii) (c) sin(x + y) = sin x.cos y + cos x.sin y	**1**
(iv) (b) 56/65	**1**

Question37. The A locker in a bank has a 3 digit lock. The digit at each place may vary from 0 to 9. Ravish has a locker in the bank where he has put all his

	property papers and important documents. Once he needs one of the document but he forgot his password and tried various combinations of numbers to open the locker. *Based on the given information answer the following questions:* (i) How many permutations of 3 different digits are there, chosen from 0 to 9, both inclusive? (iii) In how many ways the lock will not open if digit can repeat ?	
Solution: (i)	**Total available digits** from 0 to 9 = **10** digits. **First position** can be filled in **10** possible ways. **Second position** can be filled in **9** remaining ways (since digits cannot be repeated). **Third position** can be filled in **8** remaining ways. By the **Fundamental Principle of Counting**, the total number of permutations (combinations) is: $10 \times 9 \times 8 = 720$	**1/2** **1** **1/2**
(ii)	If digits can repeat **First position** can be filled in **10** possible ways. **Second position** can be filled in **10** remaining ways (since digits can be repeated). **Third position** can be filled in **10** remaining ways. Therefore, Total no. of ways = $10 \times 10 \times 10 = 1000$ **No. of correct way to open:** 1 way **Ways the lock will NOT open: 1000 −1 = 999 ways**	1 1
Question 38.	The ceiling of a hall in a famous science museum is designed in a semi-elliptical shape. It is known as a 'Whispering Gallery'. An ellipse possesses a unique property: if a sound wave originates from one focus, it reflects off the ceiling and travels directly to the other focus. Consequently, if a person standing at one focus speaks in a very low voice (a whisper), a person standing at the other focus can hear it clearly. The total length of the hall (major axis) is 100 meters, and the maximum height of the ceiling from the center (semi-minor axis) is 40 meters. Answer the questions below based on the given information: (i) Find the equation of this elliptical hall, assuming its center is at the origin (0,0) and the major axis lies along the x-axis. (ii) Find the eccentricity of the semi-elliptical shape. OR At what distance from the center (i.e., the distance of the two foci) should the two individuals stand to hear the whisper clearly?	

Solution(i):	Total length of the major axis = 2a = 100 => a = 50meters. Length of the semi-minor axis (height) = b = 40meters. Since the major axis lies along the \(x\)-axis, the standard equation of the ellipse is: $$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$$ Substituting the values: $$\frac{x^2}{(50)^2}+\frac{y^2}{(40)^2}=1$$ => $$\frac{x^2}{2500}+\frac{y^2}{1600}=1$$	
Solution(ii):	For eccentricity $c^2 = a^2 - b^2$ ⇨ $c^2 = (50)^2 - (40)^2$ ⇨ $c^2 = 2500 - 1600$ ⇨ $c^2 = 900$ ⇨ $c = \sqrt{900} = 30$ Now Eccentricity $e = \frac{c}{a} = \frac{30}{50} = 0.6$	**1/2** **1** **1/2**
OR (ii)	The distance from the center to the focus is c, given by the formula: $c^2 = a^2 - b^2$ ⇨ $c^2 = (50)^2 - (40)^2$ ⇨ $c^2 = 2500 - 1600$ ⇨ $c^2 = 900$ ⇨ $c = \sqrt{900} = 30$ Therefore, both individuals must stand at a distance of **30meters** from the center (one to the left and the other to the right) to hear the whisper clearly.	**1** **1**