SISHYA SCHOOL, HOSUR

ANNUAL EXAMINATIONS (2024-25)

XI (JEE)

CLASS:	**XI (SCIENCE)**	**TIME:**	**3 HOURS**
SUBJECT:	**MATHEMATICS (041)**	**MAXIMUM MARKS:**	**80**

General Instructions:

1. This Question paper contains - **five sections** A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. **Section A** has **18 MCQs and 02 Assertion-Reason based** questions of 1 mark each.
3. **Section B** has **5 Very Short Answer (VSA)-type** questions of 2 marks each.
4. **Section C** has **6 Short Answer (SA)-type** questions of 3 marks each.
5. **Section D** has **4 Long Answer (LA)-type** questions of 5 marks each.
6. **Section E** has **3 case-based** questions of 4 marks each, with sub parts.

Q. No.	Question	M	S	T
	SECTION A MULTIPLE CHOICE QUESTIONS ***Each question carries 1 mark***			
1.	The solution to the inequality $2x + 8 < 13, x \in N$ is -----. (a) $[3, \infty)$ (b) $[1, 2]$ (c) $\{1, 2\}$ (d) $\{\dots, -1, 0, 1, 2\}$	1	U	2
	Answer: (c)			
2.	The number of six digit numbers, the digits of which are all odd is -----. (a) 6^5 (b) 5^6 © $5 \cdot 5!$ (d) Not possible	1	U	2
	Answer: (b)			
3.	If$x, 2y, 3z$ are in AP, where the distinct numbers x, y, z are in GP , then the common ratio of the GP is (a) 3 (b) $\frac{1}{3}$ (c) 2 (d) $\frac{1}{2}$	1	An	3
	Answer: (b)			

4.	If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$, then the value of $A + B$ =-----. (a) 45° (b) 60° © 30° (d) 0°	1	U	2
	Answer: (a)			
5.	The degree measure of $\frac{7\pi}{18} =$ (a) 60° (b) 70° © 100° (d) 80°	1	U	3
	Answer: (b)			
6.	The fourth term from the end of the G.P. $3, 6, 12, 24, \ldots, 3072$ is (a) 348 (b) 1536 © 438 (d) 384	1	U	3
	Answer: (d)			
7.	A die is rolled. Let E be the event "die shows 4" and F be the event "die shows even number", Then, E and F are (a) mutually exclusive (b) mutually exclusive and exhaustive © exhaustive (d) neither mutually exclusive nor exhaustive	1	U	3
	Answer: (d)			
8.	The XOZ-Plane divides the join of $(2, 3, 1)$ and $(6, 7, 1)$ in the ratio (a) $3: 7$ (b) $2: 7$ © $-3: 7$ (d) $-2: 7$	1	U	2
	Answer: ©			
9.	If $A = \{1, 2, 3\}$ and $B = \{4, 5\}$ then the number of relations from A to B is: -----. (a) 6 (b) 8 (c) 9 (d) 64	1	U	2
	Answer: (d)			
10.	The domain of the real valued function $f(x) = \frac{1}{3x-2}$ is -----. (a) $Q - \left\{\frac{2}{3}\right\}$ (b) $R - \left\{\frac{2}{3}\right\}$ (c) $R - \{2\}$ (d) N	1	An	3
	Answer: (b)			
11.	$sin(-330^0)$ is equal to -----.	1	U	3

	(a) $\frac{\sqrt{3}}{2}$ (b) $\frac{1}{2}$ (c) $-\frac{1}{2}$ (d) $-\frac{\sqrt{3}}{2}$			
	Answer: (b)			
12.	The value of $\frac{1-tan^2 15^0}{1+tan^2 15^0}$ is -----. (a) $\frac{\sqrt{3}}{2}$ (b) $\frac{2}{\sqrt{3}}$ (c) $\frac{\sqrt{2}}{3}$ (d) $\frac{1}{\sqrt{2}}$	1	App	2
	Answer: (a)			
13.	x, y, z are in GP,where x, y and z are non- zero numbers if and only if (a) x^2=yz (b) $y^2 = xz$ (c) $z^2 = xy$ (d) $xyz = 1$	1	An	3
	Answer: (b)			
14.	If $tanA = \frac{1}{2}$ and $tanB = \frac{1}{3}$, then $tan(2A + B)$ is equal to -----. (a) 1 (b) 2 (c) 3 (d) 4	1	U	3
	Answer: (c)			
15.	The equation of the straight line passing through the point $(3, 2)$ and perpendicular to the line $y = x$ is -----. (a) $x - y = 5$ (b) $x + y = 5$ (c) $x + y = 1$ (d) $x - y = 1$	1	App	3
	Answer: (c)			
16.	The number of terms in the expansion of $(x + y)^6 + (x - y)^6$ is -----. (a) 4 (b) 3 (c) 7 (d) 6	1	App	3
	Answer: (a)			
17.	The conjugate of $i^{-35} =$ (a) 1 (b) -1 (c) i (d) $-i$	1	U	3
	Answer: (d)			
18.	The common ratio of the G.P. of which the ratio of the 7th and the third term is 16 is (a) 2 (b) ± 2 (c) 4 (d) ± 4	1	An	3
	Answer: (b)			

	ASSERTION-REASON BASED QUESTIONS In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices. (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.			
19.	**Assertion (A):** $nC_7 = nC_5\ , n = 12$ **Reason (R):** $nC_p = nC_q, p = q \text{ or } p + q = n$ Answer: (a)	1	AN	3
20.	**Assertion (A):** The equation of a straight line parallel to x-axis and passing through the point $(-2, -2)$ is $y = -2$ **Reason (R):** A line passing through the origin and having a slope of 45° will always be of the form $y = x$ Answer: (b)	1	AN	3
	SECTION B ***This section comprises of very short answer type questions (VSA) of 2 marks each***			
21.	Let A = {1, 2}, B = {4, 5, 6}, C = {5, 6}. Verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$. Solution: B ∩ C = {5, 6} ∴ A × (B ∩ C) = {(1, 5), (1, 6), (2, 5), (2, 6), (3, 5), (3, 6), (4, 5), (4, 6)} A × B = {(1, 4), (1, 5), (1, 6), (2, 4), (2, 5), (2, 6), (3, 4), (3, 5), (3, 6), (4, 4), (4, 5), (4, 6)} A × C = {(1, 5), (1, 6), (2, 5), (2, 6), (3, 5), (3, 6), (4, 5), (4, 6)} ∴ (A × B) ∩ (A × C) = {(1, 5), (1, 6), (2, 5), (2, 6), (3, 5), (3, 6), (4, 5), (4, 6)} ∴ A × (B ∩ C) = (A × B) ∩ (A × C) **OR** If $f(x) = \|x\| + 1$ and $g(x) = [x] - 10x$ where $[\cdot]$ represents the greatest integer function, verify if $f(2x) + 2g(x) = 2f(x) + g(2x)$ when $x = -3.5$ Solution: $LHS = 8 + 2[(-4 + 35) = 70$ $RHS = 9 + (-7 + 70) = 72$. They are not equal.	2	AN	4

22.	A fair coin with 1 marked on one face and 6 on the other and a fair die are both tossed. Find the probability that the sum of numbers that turn up is (i) 3 (ii) 12 Solution: One die has 1 and 6 marked on it and the other has 1, 2, 3, 4, 5, 6 $\therefore$ Sample space = {(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)} **(i)** The sum of the given numbers is obtained by the event (1, 2). Number of favourable outcomes = 1 $\therefore$ Probability when the sum of the numbers obtained is 3 = $\frac{1}{12}$ **(ii)** The sum of the given numbers is obtained by the event (6, 6). Here, number of favourable outcomes = 1 $\therefore$ Probability when the sum of the numbers obtained is 12 = $\frac{1}{12}$	1 1	AP	4
23.	Prove that $\sin\frac{8\pi}{3}\cos\frac{23\pi}{6}+\cos\frac{13\pi}{3}\sin\frac{35\pi}{6}=\frac{1}{2}$ Solution: LHS = $\sin\frac{8\pi}{3}\cos\frac{23\pi}{6}+\cos\frac{13\pi}{3}\sin\frac{35\pi}{6}$ $=\sin\left(\frac{8}{3}\times 180^\circ\right)\cos\left(\frac{23}{6}\times 180^\circ\right)+\cos\left(\frac{13}{3}\times 180^\circ\right)\sin\left(\frac{35}{6}\times 180^\circ\right)$ $=\sin(480^\circ)\cos(690^\circ)+\cos(780^\circ)\sin(1050^\circ)$ $=\sin(90^\circ\times 5+30^\circ)\cos(90^\circ\times 7+60^\circ)+\cos(90^\circ\times 8+60^\circ)\sin(90^\circ\times 11+60^\circ)$ $=\cos(30^\circ)\sin(60^\circ)+\cos(60^\circ)[-\cos(60^\circ)]$ $=\frac{\sqrt{3}}{2}\times\frac{\sqrt{3}}{2}+\frac{1}{2}\times\left(-\frac{1}{2}\right)$ $=\frac{3}{4}-\frac{1}{4}$ $=\frac{2}{4}$ $=\frac{1}{2}$ = RHS Hence proved .	1 1	App	4
24.	Find the number of sides of a polygon having 27 diagonals Solution:	2	App	4

	We know that to calculate number of diagonals in a polygon we use the formula Number of diagonals $= n \times (n-3)/2$ Using the given value we get: $27 = n \times (n-3)/2$ $n(n-3) = 54$ $n^2 - 3n = 54$ $n^2 - 3n - 54 = 0$ $(n+6)(n-9) = 0$ $n = -6$ or $n = 9$ Since we are calculating the number of sides it should be positive, therefore the number of sides of a polygon having 27 diagonals is 9	of these are images pl. check source	of 9	S
25.	Find a G.P. for which the sum of the first two terms is -4 and the fifth term is 4 times the third term. Solution: $a + ar = -4$ $ar^4 = 4ar^2 \Rightarrow r = \pm 2$ $a = -\frac{4}{3}$ or $a = 4.$ The G.P.s are $-\frac{4}{3}, -\frac{8}{3}, -\frac{16}{3} \ldots$ or $4, -8, 16, \ldots$	1 1	U	4
	SECTION C ***This section comprises of short answer type questions (SA) of 3 marks each***			
26.	Find $(a+b)^4 - (a-b)^4$ and hence evaluate $\left(\sqrt{3}+\sqrt{2}\right)^4 - \left(\sqrt{3}-\sqrt{2}\right)^4$ Solution: Using Binomial Theorem, the expressions, $(a+b)^4$ and $(a-b)^4$, can be expanded as $(a+b)^4 = {}^4C_0\, a^4 + {}^4C_1\, a^3 b + {}^4C_2\, a^2b^2 + {}^4C_3\, ab^3 + {}^4C_4\, b^4$ $(a-b)^4 = {}^4C_0\, a^4 - {}^4C_1\, a^3b + {}^4C_2\, a^2b^2 - {}^4C_3\, ab^3 + {}^4C_4 b^4$ $\therefore (a+b)^4 - (a-b)^4 = {}^4C_0\, a^4 + {}^4C_1\, a^3 b + {}^4C_2\, a^2b^2 + {}^4C_3\, ab^3 + {}^4C_4\, b^4$ $[{}^4C_0\, a^4 - {}^4C_1\, a^3b + {}^4C_2\, a^2b^2 - {}^4C_3\, ab^3 + {}^4C_4\, b^4]$	1	AP	7

	$2\left({}^4C_1a^3b + {}^4C_3ab^3\right) = 2(4a^3b + 4ab^3)$ $= 8ab\,(a^2 + b^2)$ In this, by substituting $a = \sqrt{3}, b = \sqrt{2}$ $\left(\sqrt{3} + \sqrt{2}\right)^4 - \left(\sqrt{3} - \sqrt{2}\right)^4$ $= 8\sqrt{3}.\sqrt{2}\left[\left(\sqrt{3}\right)^2 + \left(\sqrt{2}\right)^2\right]$ $= 8\sqrt{6}(3+2) \;= 40\sqrt{6}$	1 1		
27.	Find the equations of the lines that pass through $(3, 4)$, and whose sum of the intercepts on the axes is 14. Solution: Equation of the line in intercept form: $$\frac{x}{a} + \frac{y}{b} = 1, \quad \text{where } a + b = 14 \implies b = 14 - a.$$ Substitute point $(3, 4)$: $$\frac{3}{a} + \frac{4}{14-a} = 1.$$ Simplify and eliminate fractions: $$3(14-a) + 4a = a(14-a).$$ $$a^2 - 13a + 42 = 0.$$ Solve the quadratic equation: $$(a-6)(a-7) = 0 \implies a = 6 \text{ or } a = 7.$$ Equations of the line: • For $a = 6, b = 8$: $4x + 3y = 24$. • For $a = 7, b = 7$: $x + y = 7$. **OR** Find the equations of the medians of the triangle, the sides of which are given by the lines $x + y - 6 = 0,\; x - 3y - 2 = 0$ and $5x - 3y + 2 = 0$ Solution:	1 1 1	U	7

	Find the vertices of the triangle: Solve the equations pairwise: • Intersection of $x+y-6=0$ and $x-3y-2=0$: $A(5,1)$. • Intersection of $x-3y-2=0$ and $5x-3y+2=0$: $B(-1,-1)$. • Intersection of $5x-3y+2=0$ and $x+y-6=0$: $C(2,4)$. **Find the midpoints of the sides:** • Midpoint of BC: $M_1=\left(\frac{-1+2}{2},\frac{-1+4}{2}\right)=\left(\frac{1}{2},\frac{3}{2}\right)$. • Midpoint of CA: $M_2=\left(\frac{2+5}{2},\frac{4+1}{2}\right)=\left(\frac{7}{2},\frac{5}{2}\right)$. • Midpoint of AB: $M_3=\left(\frac{5-1}{2},\frac{1-1}{2}\right)=(2,0)$. **Final Equations of the Medians:** 1. $x+9y=14$, 2. $7x-9y=2$, 3. $x=2$.	1 1 1		
28.	Show that $9^{n+1}-8n-9$ is divisible by 64, whenever 'n' is a positive integer. Solution: Consider, $9^{n+1}=(1+8)^{n+1}={}^{n+1}C_0+{}^{n+1}C_1(8)+{}^{n+1}C_2(8)^2+\ldots\ldots+{}^{n+1}C_{n+1}(8)^{n+1}$ $=1+(n+1)(8)+8^2[{}^{n+1}C_2+{}^{n+1}C_3x8+\ldots\ldots+{}^{n+1}C_{n+1}(8)^{n-1}]$ $=9+8n+64[{}^{n+1}C_2+{}^{n+1}C_3x8+\ldots\ldots+{}^{n+1}C_{n+1}(8)^{n-1}]$ $\Rightarrow 9^{n+1}-8n-9=64k$, Where $k={}^{n+1}C_2+{}^{n+1}C_3x8+\ldots\ldots+{}^{n+1}C_{n+1}(8)^{n-1}$ which is a natural number Thus, $9^{n+1}-8n-9$ is divisible by 64, whenever n is a positive integer.	1 1 1	U	7
29.	Find the equations of the line which pass through the points (4,5) and make equal angles with the lines $5x-12y+6=0$ and $3x=4y+7$. Solution:		AP	7

	Let the Slope of line be m Now, slope of other lines are $\frac{3}{4}, \frac{12}{5}$ The Slope is Equally inclined so it must lie between these slopes such that $\frac{3}{4} < m < \frac{12}{5}$ As it is equally inclined so angle between the line and the two given line must be same $\Rightarrow \theta_1 = \theta_2 \Rightarrow \tan\theta_1 = \tan\theta_2$ $\Rightarrow \frac{\frac{12}{5} - m}{1 + \frac{12}{5}m} = \frac{m - \frac{3}{4}}{1 + \frac{3}{4}m} \Rightarrow 63m^2 - 32m - 63 = 0$ $\Rightarrow m = \frac{32 \pm \sqrt{32^2 + 4 * 63 * 63}}{2 * 63} \Rightarrow m = \frac{-7}{9}, \frac{9}{7}$ Now, Equation of line as it passes through (4, 5) will be Putting the obtained values of m in above Equation we get $9x - 7y = 1$ $7x + 9y = 73$	1 1 1		
30.	If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$ and $B = \{2, 3, 5, 7\}$, prove that $(A - B) \cup (B - A) = (A \cup B) - (A \cap B)$ Solution:	1 1	U	7

	Define Set Operations: • $A - B = \{x \in A \mid x \notin B\} = \{4, 6, 8\}$. • $B - A = \{x \in B \mid x \notin A\} = \{3, 5, 7\}$. • $(A - B) \cup (B - A) = \{4, 6, 8\} \cup \{3, 5, 7\} = \{3, 4, 5, 6, 7, 8\}$. Find $A \cup B$ and $A \cap B$: • $A \cup B = \{2, 3, 4, 5, 6, 7, 8\}$. • $A \cap B = \{2\}$. Calculate $(A \cup B) - (A \cap B)$: • Remove elements of $A \cap B = \{2\}$ from $A \cup B = \{2, 3, 4, 5, 6, 7, 8\}$: $$(A \cup B) - (A \cap B) = \{3, 4, 5, 6, 7, 8\}.$$ $$(A - B) \cup (B - A) = (A \cup B) - (A \cap B).$$	1		
31.	A fruit juice distributor has 500-litre solution of 10% fruit concentrate. He wants to dilute it more by adding a 3% fruit concentrate solution. The customers will accept it only if the final mixture has a concentration between 5% and 8%. The distributor finds that he has four barrels of the 3% concentrate: a 200 litre barrel, a 1000 litre barrel, a 1,500 litre barrel and a 2,000 litre barrel. If he must open only one, which one should he choose so that there is adequate but no excess concentrate? Substantiate your answer through necessary calculations. Solution: 500 litres of 10% solution of fruit concentrate: $\frac{10}{100} \times 500$ x litres of 3% solution of fruit concentrate: $x \times \frac{3}{100}$ litres Total mixture $= \frac{10}{100} \times 500 + \frac{3}{100} \times x$ $\frac{5}{100}(500 + x) < \frac{10}{100} \times 500 + \frac{3}{100} \times x < \frac{8}{100}(500 + x)$ Solving, we get $200 < x < 1250$ He must choose the 1,000 litre barrel.	1 1 1	EV	7
	SECTION D ***This section comprises of long answer-type questions (LA) of 5 marks each***			
32.	Prove that $\cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$ Solution:		U	10

$$\text{L.H.S.} = \frac{1+\cos 2x}{2} + \frac{1+\cos\left(2x+\frac{2\pi}{3}\right)}{2} + \frac{1+\cos\left(2x-\frac{2\pi}{3}\right)}{2}$$

$$= \frac{1}{2}\left[3+\cos 2x+\cos\left(2x+\frac{2\pi}{3}\right)+\cos\left(2x-\frac{2\pi}{3}\right)\right]$$ 2

$$= \frac{1}{2}\left[3+\cos 2x+2\cos 2x \cos\frac{2\pi}{3}\right]$$ 1

$$= \frac{1}{2}\left[3+\cos 2x+2\cos 2x \cos\left(\pi-\frac{\pi}{3}\right)\right]$$

$$= \frac{1}{2}\left[3+\cos 2x-2\cos 2x \cos\frac{\pi}{3}\right]$$ 1

$$= \frac{1}{2}\left[3+\cos 2x-\cos 2x\right] = \frac{3}{2} = \text{R.H.S.}$$ 1

OR

Prove that $\frac{\sin 3A+\sin 5A+\sin 7A+\sin 9A}{\cos 3A+\cos 5A+\cos 7A+\cos 9A} = \tan 6A$

Solution:

$$\frac{\sin 3A + \sin 5A + \sin 7A + \sin 9A}{\cos 3A + \cos 5A + \cos 7A + \cos 9A}$$

When we rearrange we get,

$$= \frac{(\sin 9A + \sin 3A) + (\sin 7A + \sin 5A)}{(\cos 9A + \cos 3A) + (\cos 7A + \cos 5A)}$$

$$= \frac{\left(2\sin\frac{9A+3A}{2}\cos\frac{9A-3A}{2}\right) + \left(2\sin\frac{7A+5A}{2}\cos\frac{7A-5A}{2}\right)}{\left(2\cos\frac{9A+3A}{2}\cos\frac{9A-3A}{2}\right) + \left(2\cos\frac{7A+5A}{2}\cos\frac{7A-5A}{2}\right)}$$

$$= \frac{\left(2\sin\frac{12A}{2}\cos\frac{6A}{2}\right) + \left(2\sin\frac{12A}{2}\cos\frac{2A}{2}\right)}{\left(2\cos\frac{12A}{2}\cos\frac{6A}{2}\right) + \left(2\cos\frac{12A}{2}\cos\frac{2A}{2}\right)}$$ 2

$$= \frac{(2\sin 6A\cos 3A) + (2\sin 6A\cos A)}{(2\cos 6A\cos 3A) + (2\cos 6A\cos A)}$$ 1

$$= \frac{2\sin 6A(\cos 3A + \cos A)}{2\cos 6A(\cos 3A + \cos A)}$$

$$= \frac{\sin 6A}{\cos 6A}$$

$$= \tan 6A$$ 1

= RHS

<table>
<tr><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td>33.</td><td>Find the domain and range of the following functions:
i) $\sqrt{x^2-8}$ ii) $\frac{2x-1}{x+2}$
Solution:
i) Since is a square root function,
$$|x| \geq 2\sqrt{2}$$
This means x must be outside the interval $(-2\sqrt{2}, 2\sqrt{2})$, so:
$$x \leq -2\sqrt{2} \quad \text{or} \quad x \geq 2\sqrt{2}$$
Thus, the domain is:
$$(-\infty, -2\sqrt{2}] \cup [2\sqrt{2}, \infty)$$
Range:
$y = \sqrt{x^2-8} \therefore y \geq 0$
$x = \sqrt{y^2+8}$. Therefore, $y \geq 0$
ii) Domain: $x \in R - \{-2\}$
Range:
$y = \frac{2x-1}{x+2} \Rightarrow x = \frac{2y+1}{2-y}$
$\therefore y \neq 2$. Therefore the range is $R - \{2\}$</td><td>1
1
1
2</td><td>AP</td><td>10</td></tr>
<tr><td>34.</td><td>A group of four friends □ Aryan, Bella, Chris, and Dylan □ were playing a game of quadrilaterals. From a well shuffled set of coordinates printed on cards, a set of four cards are chosen at random and are found to be $A(1,3,0), B(-5,5,2), C(-9,-1,2)$, and $D(-3,-3,0)$. Now, each one picks up a card with a quadrilateral printed on it from another set of cards placed face down. Aryan gets a card with a trapezium, Bella gets a parallelogram (with unequal diagonals), Chris gets a rectangle and Dylan gets a rhombus. The one that matches with the shape formed by the coordinates wins the round. Who would win the round in this case? Justify your answer with appropriate calculations.
Solution:</td><td></td><td>AN</td><td>12</td></tr>
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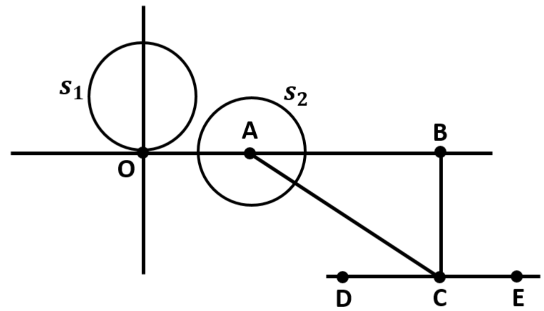
	Length of AB $$AB = \sqrt{(-5-1)^2 + (5-3)^2 + (2-0)^2}$$ $$= \sqrt{(-6)^2 + 2^2 + 2^2} = \sqrt{36+4+4} = \sqrt{44}$$ Length of CD $$CD = \sqrt{(-9+3)^2 + (-1+3)^2 + (2-0)^2}$$ $$= \sqrt{(-6)^2 + 2^2 + 2^2} = \sqrt{36+4+4} = \sqrt{44}$$ ✅ Since $AB = CD$, one pair of opposite sides is equal. Length of BC $$BC = \sqrt{(-9+5)^2 + (-1-5)^2 + (2-2)^2}$$ $$= \sqrt{(-4)^2 + (-6)^2 + 0^2} = \sqrt{16+36} = \sqrt{52}$$ Length of DA $$DA = \sqrt{(-3-1)^2 + (-3-3)^2 + (0-0)^2}$$ $$= \sqrt{(-4)^2 + (-6)^2 + 0^2} = \sqrt{16+36} = \sqrt{52}$$ Length of AC $$AC = \sqrt{(-9-1)^2 + (-1-3)^2 + (2-0)^2}$$ $$= \sqrt{(-10)^2 + (-4)^2 + 2^2} = \sqrt{100+16+4} = \sqrt{120}$$ Length of BD $$BD = \sqrt{(-3+5)^2 + (-3-5)^2 + (0-2)^2}$$ $$= \sqrt{(2)^2 + (-8)^2 + (-2)^2} = \sqrt{4+64+4} = \sqrt{72}$$ $AC \neq BD$. Therefore the quadrilateral is not a rectangle. Therefore, it is a parallelogram and Bella wins the round.	3 2		
35.	Find x and y, for which the complex numbers $-3 + ix^2y$ and $x^2 + y + 4i$ are conjugate for each other , Given $x, y \in R$.		U	10
	SECTION E ***This section comprises of 3 case study/passage-based questions of 4 marks each.***			

36.	**Case Study 1:** Two circular shaped celestial bodies s_1 and s_2, with same radius of 2 units, were spotted by an astronomer. s_1 had its center on y-axis, touching the x-axis at the origin, while s_2 was located with its centre on x-axis at point A, which is 4 units away from the origin. She observed that both were moving at the same uniform speed. While s_1 took 1 hour to move horizontally form O to A, it took twice the time to move from A to B. s_2 moved from A to C in 5 hours. AB is parallel to DE and perpendicular to BC. Answer the following questions, based on the given information.  			
	(i) Find the equation of the circle s_2 when its centre is C.	2	AN	3
	Answer: From the given information, AB $= 8$ and AC $= 10$. Therefore, BC $= 6$. The point C is $(12, -6)$. The required equation is $(x-12)^2 + (y+6)^2 = 4$			
	(ii) If s_1 moved from B vertically to C with DE as its tangent at C, find its equation at its new position.	2	AN	3
	Answer: At its new position, From the given information, The point C is $(12, 6)$. The y-coordinate of the centre is $-(6-2) = -4$. $\therefore$ Its centre is at the point $(12, -4)$. The required equation is $(x-12)^2 + (y+4)^2 = 4$.			
37.	**Case-Study 2:** The probability that a girl, preparing for competitive examination will get a State Government service is 0.12; the probability that she will get a Central Government job is 0.25 and the probability that she will get both is 0.07. Based on the information, answer the following questions:			
	(i) What is the probability that she won't get the central government job? Answer: Let S be the event of getting State Government service and C be the event of getting Central Government job. $P(S') = 1 - 0.25 = 0.75$	1	AP	3
	(ii) Find the probability that she will get at least one of the two jobs. Answer: P (at least one of the two jobs) $= P(S \text{ or } C) = P(S \cup C)$	1	AP	3

	$= P(S) + P(C) - P(S \cup C)$ $= 0.12 + 0.25 - 0.07 = 0.30$			
	(iii) Find the probability that she will get only one of the two jobs. Solution: P (Only one of the two jobs) $= P(\text{only } S \text{ } or \text{ only } C)$ $= P(S \cap \bar{C}) + P(\bar{S} \cap C)$ $= \{P(S) - P(S \cap C)\} + \{P(C) - P(S \cap C)\}$ $= \{0.12 - 0.07\} + \{0.25 - 0.07\}$ $= 0.23.$	2	AN	4
38.	**Case Study 3:** Riya and her five friends went on a tour to Simla. They stayed in a hotel. There were 4 vacant rooms – A, B, C and D. Out of these, A and B were double rooms which could accommodate two persons each, while C and D could accommodate only one person each. Based on the information, answer the following questions:			
	(i) Find the number of ways in which room A can be filled. Solution: Since A is a double room, the number of ways $= {}^6C_2 = 15.$	1	AP	3
	(ii) If both the rooms A and B are filled, in how many ways can room C be filled? Solution: Since C is a single room and there are two people remaining, the number of ways $= {}^2C_1 = 2.$	1	AP	3
	(iii) If Riya wanted to stay with a particular friend, find the total number of ways of accommodating the 6 of them. Solution: The remaining four can be accommodated in the following ways: ${}^4C_2 \times 2!$ But Riya and her friend can be accommodated in A or B. $\therefore$ the total number of ways $= 2 \times {}^4C_2 \times 2! = 24$	2	AP	4

Declaration: Certified that the question paper does not have questions which have been given in unit tests or other assessments.

Prepared by: A.Pradhap

Reliability by : Guru IIT

Grammar Checked by : Ms. Latha

grammar oversight

Signature of the Principal: