

# केन्द्रीय विद्यालय संगठन, राँची संभाग

KENDRIYA VIDYALAYA SANGATHAN, RANCHI REGION

प्री-बोर्ड परीक्षा / Pre-Board Examination

सत्र / SESSION 2024-25

कक्षा / CLASS X

गणित / MATHEMATICS STANDARD (041)

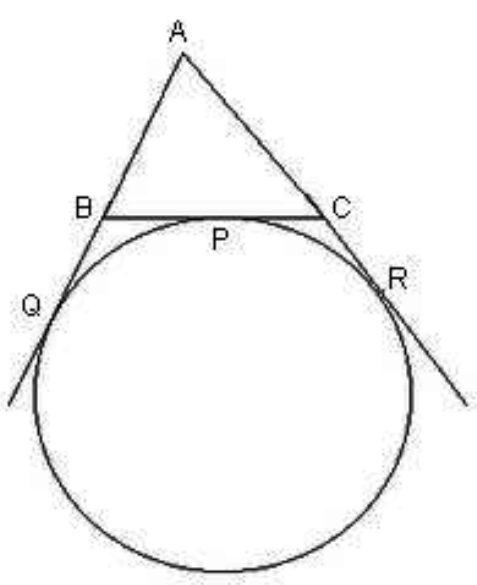
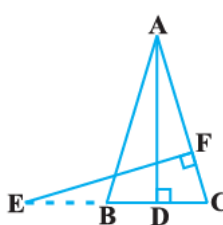
**Time Allowed: 3 Hours**

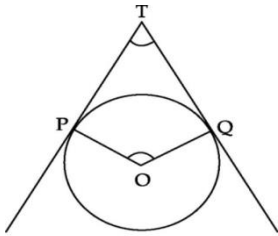
**Maximum Marks: 80**

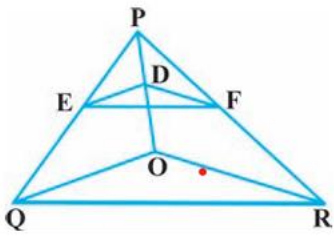
1. This question paper contains **38** questions. All questions are compulsory.
2. Question paper is divided into FIVE sections-**SECTION A, B, C, D** and **E**.
3. In **Section A**, question number **1** to **18** are multiple choice questions (MCQs) and question number **19** and **20** are Assertion -Reason based questions of **1** marks each.
4. In **Section B**, questions number **21** to **25** are very short answer (VSA) type questions of **2** marks each.
5. In **Section C**, questions number **26** to **31** are short answer (SA) type questions carrying **3** marks each.
6. In **Section D**, questions number **32** to **35** are long answer (LA) type questions carrying **5** marks each.
7. In **Section E**, question number **36** to **38** are case based integrated units of assessment questions carrying **4** marks each. Internal choice is provided in 2 marks question in each case study. in case study.
8. There is no overall choice. However, and internal choice has been provided in 2 questions in section B, 2 questions in Section C, 2 questions in Section D and 3 questions in Section E.
9. Draw neat figures wherever required. Take  $\pi=22/7$  wherever required in stated.
10. Use of calculators is NOT allowed


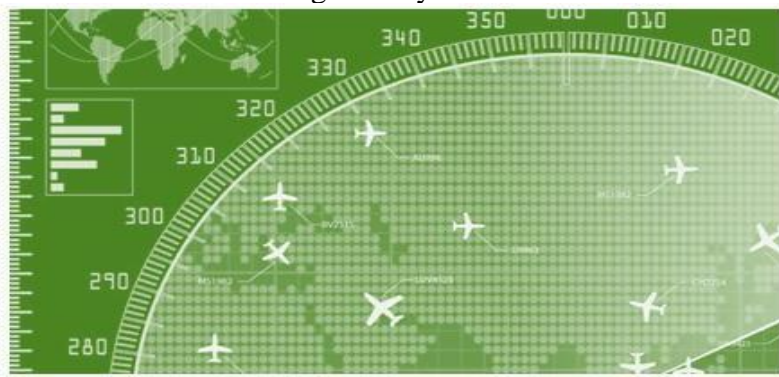
Q.No.	SECTION A	
1	The area of a sector of a circle with radius 6 cm if the angle of the sector is $60^\circ$ . (a) $142/7 \text{ cm}^2$ (b) $152/7 \text{ cm}^2$ (c) $132/7 \text{ cm}^2$ (d) $122/7 \text{ cm}^2$	1
2	If $\alpha$ and $\beta$ are the zeros of a polynomial $f(x) = px^2 - 2x + 3p$ and $\alpha + \beta = \alpha\beta$ , then p is (a) $-2/3$ (b) $2/3$ (c) $1/3$ (d) $-1/3$	1
3	The pair of equations $3x - 5y = 7$ and $-6x + 10y = 7$ have (a) a unique solution (b) infinitely many solutions (c) no solution (d) two solutions	1
4	If two positive integers $a$ and $b$ are written as $a = x^3y^2$ and $b = xy^3$ ; $x, y$ are prime numbers, then HCF ( $a, b$ ) is (a) $xy$ (b) $xy^2$ (c) $x^3y^3$ (d) $x^2y^2$	1
5	$\sqrt{3} \cos^2 A + \sqrt{3} \sin^2 A$ is equal to (a) 1 (b) $1/\sqrt{3}$ (c) $\sqrt{3}$ (d) 0	1
6	If the quadratic equation $x^2 + 4x + k = 0$ has real and equal roots, then (a) $k < 4$ (b) $k > 4$ (c) $k = 4$ (d) $k \geq 4$	1
7	If the arithmetic mean of $x, x + 3, x + 6, x + 9$ and $x + 12$ is 10, then $x = ?$	

	(a) 1                      (b) 2                      (c) 6                      (d) 4	1												
8	The total surface area of a solid sphere of diameter 14 cm is : (a) $112\pi \text{ cm}^2$ (b) $56\pi \text{ cm}^2$ (c) $196\pi \text{ cm}^2$ (d) $147\pi \text{ cm}^2$	1												
9	If two tangents inclined at an angle $60^\circ$ are drawn to a circle of radius 3 cm, then length of each tangent is equal to (a) $2\sqrt{3} \text{ cm}$ (b) $6\sqrt{3} \text{ cm}$ (c) $3\sqrt{3} \text{ cm}$ (d) 3 cm	1												
10	A flag pole 18 m high casts a shadow 9.6 m long. Find the height of the tower which cast a shadow of length 48 m long. (a) 90 m                      (b) 45 m                      (c) 36 m                      (d) 54 m	1												
11	In a triangle ABC, $DE \parallel BC$ . If $AD = x$ , $DB = x - 2$ , $AE = x + 2$ and $EC = x - 1$ , the value of x is: (a) 2                      (b) 4                      (c) 3                      (d) 1	1												
12	In $\Delta ABC$ , right-angled at B, $AB = 24 \text{ cm}$ , $BC = 7 \text{ cm}$ . The value of $\tan A$ is: (a) $12/7$ (b) $24/7$ (c) $20/7$ (d) $7/24$	1												
13	If $x \tan 60^\circ \cos 30^\circ = \sin 60^\circ \cot 30^\circ$ , then the value of x is equal to (a) $\cos 30^\circ$ (b) $\tan 30^\circ$ (c) $\tan 45^\circ$ (d) $\cot 30^\circ$	1												
14	On a morning walk, three persons step off together and their steps measure 40 cm, 42 cm and 45 cm, respectively. What is the minimum distance each should walk so that each can cover the same distance in complete steps? (a) 2520cm                      (b) 2525cm                      (c) 2555cm                      (d) 2528cm	1												
15	The area of a quadrant of a circle of radius 14 cm is (a) $154 \text{ cm}^2$ (b) $308 \text{ cm}^2$ (c) $154/3 \text{ cm}^2$ (d) $77 \text{ cm}^2$	1												
16	If the points A(6, 1), B(8, 2), C(9, 4) and D(p, 3) are the vertices of a parallelogram, taken in order, then the value of p is (a) 4                      (b) -6                      (c) 7                      (d) -2	1												
17	A card is selected at random from a well shuffled deck of 52 cards. The probability of its being a red king is (a) $3/13$ (b) $6/52$ (c) $2/13$ (d) $1/26$	1												
18	For the following distribution : <table border="1" style="margin-left: auto; margin-right: auto;"><tbody> <tr> <td>Class</td> <td>0 - 5</td> <td>5 - 10</td> <td>10 - 15</td> <td>15 - 20</td> <td>20 - 25</td> </tr> <tr> <td>Frequency</td> <td>10</td> <td>15</td> <td>12</td> <td>20</td> <td>9</td> </tr> </tbody></table> The sum of lower limits and upper limits of modal class is: (a) 15                      (b) 25                      (c) 35                      (d) 30	Class	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	Frequency	10	15	12	20	9	1
Class	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25									
Frequency	10	15	12	20	9									
	<b>DIRECTIONS for (Q.19-Q.20):</b> In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A) B) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A) C) Assertion (A) is true but reason (R) is false. D) Assertion (A) is false but reason (R) is true.													

19	<p><b>Assertion (A):</b> The ratio in which the line segment joining (2, -3) and (5, 6) internally divided by x axis is 1:2.</p> <p><b>Reason (R):</b> as formula for the internal division is <math>((mx_2 + nx_1)/(m + n), (my_2 + ny_1)/(m + n))</math></p>	1
20.	<p><b>Assertion (A):</b> If HCF of 404 and 96 is 8, then the LCM of 404 &amp; 96 is 9696</p> <p><b>Reason (R):</b> as <math>HCF(a, b) \times LCM(a, b) = a \times b</math></p>	1
<b>SECTION B</b>		
21	For what value of $k$ , will the system $x + 2y + 7 = 0$ , $2x + ky + 14 = 0$ represent coincident lines.	2
22	<p>If <math>a \sin \theta = x</math>, <math>b \tan \theta = y</math>, then show that <math>\frac{a^2}{x^2} - \frac{b^2}{y^2} = 1</math>.</p> <p style="text-align: center;">(OR)</p> <p>If <math>\sin(A+B) = 1</math> and <math>\cos(A-B) = \sqrt{3}/2</math>, <math>0^\circ &lt; A+B \leq 90^\circ</math> and <math>A &gt; B</math>, then find the measures of angles A and B.</p>	2
23	<p>A circle is touching the side BC of <math>\Delta ABC</math> at P and touching AB and AC produced at Q and R respectively. Prove that <math>AQ = \frac{1}{2}</math> (perimeter of triangle ABC)</p> <div style="text-align: center;">  </div>	2
24	<p>In fig., E is a point on side CB produced of an isosceles <math>\Delta ABC</math> with <math>AB = AC</math>.</p> <p>If <math>AD \perp BC</math> and <math>EF \perp AC</math>, prove that <math>\Delta ABD \sim \Delta ECF</math>.</p> <div style="text-align: center;">  </div>	2

25.	<p>The perimeter of a sector of a circle of radius 5.7 m is 27.2 m. Find the area of the sector.</p> <p style="text-align: center;"><b>(OR)</b></p> <p>The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes.</p>	2
<b>SECTION-C</b>		
26.	<p>Two dice are thrown at the same time. What is the probability that the sum of the two numbers appearing on the top of the dice is</p> <p>(i) 8?  (ii) 13?  (iii) less than or equal to 12?</p>	3
27	<p>If <math>\alpha</math> and <math>\beta</math> are the zeroes of a polynomial <math>x^2 - 4\sqrt{3}x + 3</math>, then find the value of</p> $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$	3
28	<p>Prove that <math>3+2\sqrt{5}</math> is an irrational number, where <math>\sqrt{5}</math> is an irrational number.</p>	3
29	<p>Prove that the lengths of tangents from an external point to a circle are equal. Also find <math>\angle TOP</math> if tangents TP and TQ from a point T to a circle with centre O are inclined to each other at an angle of <math>80^\circ</math>. (see fig.)</p>	3
		
30	<p>The taxi charges in a city consist of a fixed charge together with the charge for the distance covered. For a distance of 10km, the charge paid is Rs105, and for a journey of 15km, the charge paid is Rs 155.</p> <p>a) What are the fixed charges and charges per kilometer?  b) How much does a person have to pay for travelling a distance of 25Km ?</p> <p style="text-align: center;"><b>(OR)</b></p> <p>A fraction becomes <math>\frac{4}{5}</math> if 1 is added to both the numerator and denominator. If 5 is subtracted from both the numerator and denominator, the fraction becomes <math>\frac{1}{2}</math>. Find the fraction.</p>	3
31.	<p>Prove that <math>(\sin \theta + \operatorname{cosec} \theta)^2 + (\cos \theta + \sec \theta)^2 = 7 + \tan^2 \theta + \cot^2 \theta</math></p> <p style="text-align: center;"><b>(OR)</b></p> <p>Prove that <math>(1 + \cot \theta - \operatorname{cosec} \theta)(1 + \tan \theta + \sec \theta) = 2</math></p>	3
<b>SECTION D(LONG ANSWER TYPE)</b>		
32	<p>A passenger train takes one hour less for a journey of 150km if its speed is increased by 5km/hr from its usual speed. Find the usual speed of the train.</p>	5

	<b>(OR)</b>																							
	The difference of two numbers is 5 and the difference of their reciprocal is $\frac{1}{10}$ . Find the numbers.																							
33	<p>Prove that If a line is drawn parallel to one side of a triangle to intersect other two sides in distinct points, the other two sides are divided in the same ratio.</p> <p>In Fig., <math>DE \parallel OQ</math> and <math>DF \parallel OR</math>. Show that <math>EF \parallel QR</math>.</p> 	5																						
34	<p>The following table shows the data of the amount donated by 100 people in a blind school.</p> <table border="1"> <thead> <tr> <th>(Amount Donated in Rs.)</th> <th>Number of persons</th> </tr> </thead> <tbody> <tr> <td>0 - 100</td> <td>2</td> </tr> <tr> <td>100 - 200</td> <td>5</td> </tr> <tr> <td>200 - 300</td> <td><math>x</math></td> </tr> <tr> <td>300 - 400</td> <td>12</td> </tr> <tr> <td>400 - 500</td> <td>17</td> </tr> <tr> <td>500 - 600</td> <td>20</td> </tr> <tr> <td>600 - 700</td> <td><math>y</math></td> </tr> <tr> <td>700 - 800</td> <td>9</td> </tr> <tr> <td>800 - 900</td> <td>7</td> </tr> <tr> <td>900 - 1000</td> <td>4</td> </tr> </tbody> </table> <p>If the median of the above data is 525, find the value of <math>x</math> and <math>y</math>.</p>	(Amount Donated in Rs.)	Number of persons	0 - 100	2	100 - 200	5	200 - 300	$x$	300 - 400	12	400 - 500	17	500 - 600	20	600 - 700	$y$	700 - 800	9	800 - 900	7	900 - 1000	4	5
(Amount Donated in Rs.)	Number of persons																							
0 - 100	2																							
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35	<p>A vessel is in the form of an inverted cone. Its height is 8 cm and the radius of its top, which is open, is 5 cm. It is filled with water up to the brim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the vessel, one-fourth of the water flows out. Find the number of lead shots dropped in the vessel.</p> <p style="text-align: center;"><b>(OR)</b></p> <p>From a solid cylinder whose height is 8 cm and radius is 6 cm, a conical cavity of height 8 cm and the base radius 6 cm is hollowed out. Find the volume of the remaining solid correct to two places of decimal. Also, find the total</p>	5																						

	surface area of the remaining solid. (Take $\pi = 3.14$ )	
	<b>SECTION E(CASE BASED QUESTIONS)</b>	
36	<p>Push-ups are a fast and effective exercise for building strength. These are helpful in almost all sports including athletics. While the push-up primarily targets the muscles of the chest, arms, and shoulders, support required from other muscles helps in toning up the whole body.</p>  <p>Nitesh wants to participate in the push-up challenge. He can currently make 3000 push-ups in one hour. But he wants to achieve a target of 3900 push-ups in 1 hour for which he practices regularly. With each day of practice, he is able to make 5 more push-ups in one hour as compared to the previous day. If on first day of practice he makes 3000 push-ups and continues to practice regularly till his target is achieved. Keeping the above situation in mind answer the following questions:</p> <p>(i) Form an A.P representing the number of push-ups per day .</p> <p>(ii) Find the minimum number of days he needs to practice before the day his goal is accomplished?</p> <p>(iii) Find the total number of push-ups performed by Nitesh up to the day his goal is achieved</p> <p style="text-align: center;"><b>(OR)</b></p> <p>An another boy Ramesh make pushups in following manner: 50 pushups on day1,70 on day 2, 90 on day 3 and continues for 40 days.Find total no.of pushups done in 40 days.</p>	<p>1</p> <p>1</p> <p>2</p>
37.	<p>We all have seen the airplanes flying in the sky but might have not thought of how they actually reach the correct destination. Air Traffic Control (ATC) is a service provided by ground-based air traffic controllers who direct aircraft on the ground and through a given section of controlled airspace, and can provide advisory services to aircraft in non-controlled airspace. Actually, all this air traffic is managed and regulated by using various concepts based on coordinate geometry and trigonometry.</p>  <p>At a given instance, ATC finds that the angle of elevation of a jet plane from a point A on the ground is <math>60^\circ</math>. After a flight of 30 seconds, the angle of elevation hangs to <math>30^\circ</math>. If the plane is flying at a constant height of <math>3000\sqrt{3}</math> m, find the speed of the jet plane. Use the above information to answer the questions that follow-</p> <p>(i) Draw a neat labelled figure to show the above situation diagrammatically.</p>	<p>1</p> <p>2</p>

(ii) What is the distance travelled by the plane in 30 seconds?

OR

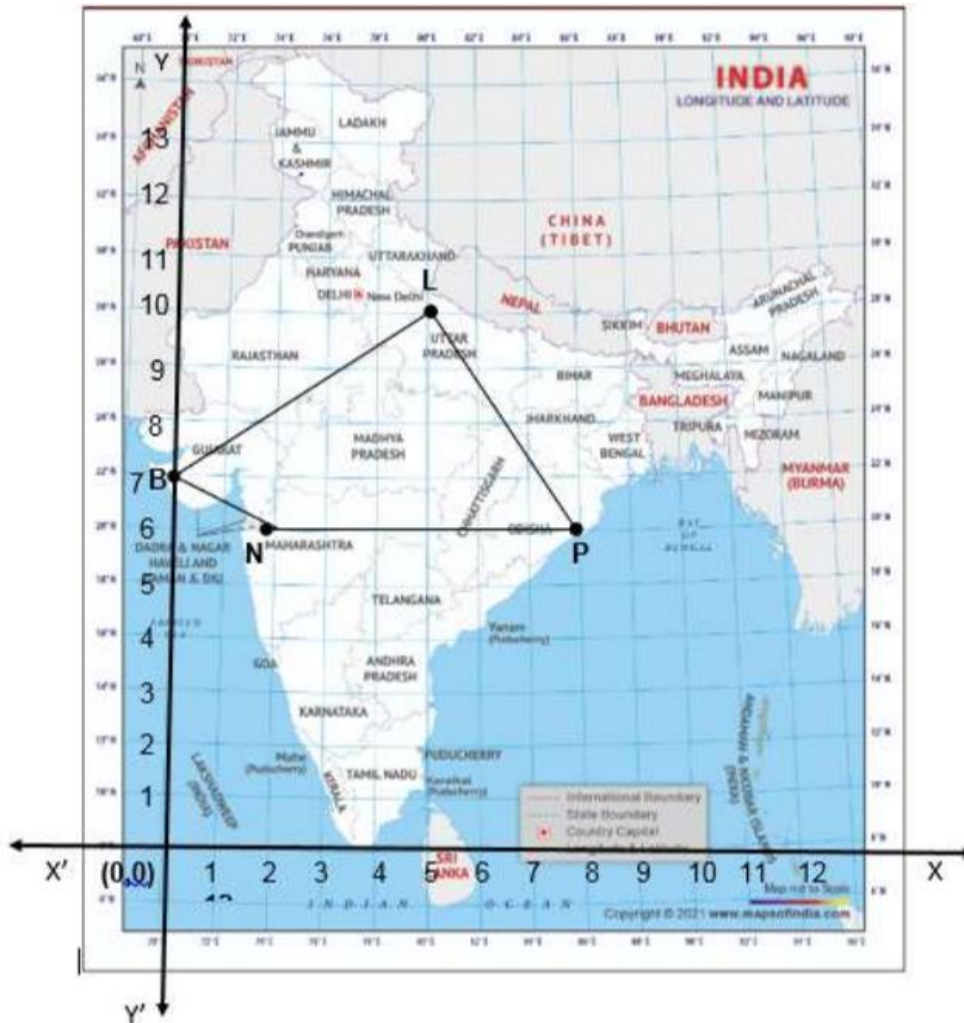
Keeping the height constant, during the above flight, it was observed that after  $15(\sqrt{3} - 1)$  seconds, the angle of elevation changed to  $45^\circ$ . How much is the distance travelled in that duration.

(iii) What is the speed of the plane in km/hr.

1

38

In a GPS, The lines that run east-west are known as lines of latitude, and the lines running north-south are known as lines of longitude. The latitude and the longitude of a place are its coordinates and the distance formula is used to find the distance between two places. The distance between two parallel lines is approximately 150 km. A family from Uttar Pradesh planned a round trip from Lucknow (L) to Puri (P) via Bhuj (B) and Nashik (N) as shown in the given figure below.



Based on the above information answer the following questions using the coordinate geometry.

(i) Find the distance between Lucknow (L) to Bhuj (B).

(ii) If Kota (K), internally divide the line segment joining Lucknow (L) to Bhuj (B) into 3 : 2 then find the coordinate of Kota (K).

(iii) Name the type of triangle formed by the places Lucknow

1

1

2

	(L), Nashik (N) and Puri (P)  <b>(OR)</b> Find a place (point) on the longitude (y-axis) which is equidistant from the points Lucknow (L) and Puri (P).	
	END OF QUESTIONS	