ST. MARY'S SCHOOL, SAFDARJUNG ENCLAVE
CLASS X: MATHEMATICS (041)
FIRST TERM EXAMINATION 2024-25

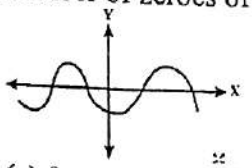
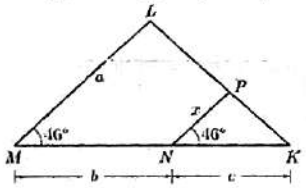
Time Allowed: 3 hours | Maximum Marks: 80

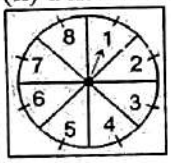
General Instructions:

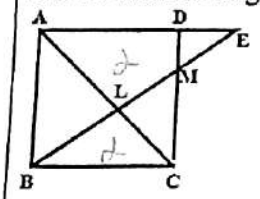
1. *This Question Paper has 5 Sections A, B, C, D and E.*
2. *Section A has 20 MCQs carrying 1 mark each*
3. *Section B has 5 questions carrying 02 marks each.*
4. *Section C has 6 questions carrying 03 marks each.*
5. *Section D has 4 questions carrying 05 marks each.*
6. *Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.*
7. *All Questions are compulsory. However, some internal choices have been provided.*
8. *Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.*

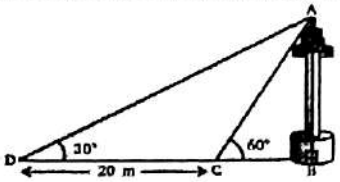
SECTION A

Q1.	Prime factorisation of 8232 is: (a) $2^3 \times 3 \times 7^3$ (b) $7^2 \times 3 \times 2^3$ (c) $2 \times 3 \times 7^4$ (d) $2^2 \times 3^2 \times 7^2$	1
Q2	If the distance between the points (2,-2) and (-1, x) is 5, one of the values of x is: (a) -2 (b) -1 (c) 1 (d) 2	1
Q3.	The pair of equations $x + 2y + 5 = 0$ and $-3x - 6y + 9 = 0$ have: (a) one solution (b) two solutions (c) infinitely many solutions (d) no solution	1
Q4.	If α and β are the zeroes of the quadratic polynomial x^2+4x+4, then: (a) $\alpha = \beta$, $\alpha + \beta = -4$ (b) $\alpha = -\beta$, $\alpha + \beta = 4$ (c) $\alpha = \beta$, $\alpha + \beta = 4$ (d) $\alpha = -\beta$, $\alpha + \beta = -4$	1
Q5.	If $\Delta ABC \sim \Delta EDF$ and ΔABC is not similar to ΔDEF, then which of the following is not true? (a) $BC \cdot EF = AC \cdot FD$ (b) $AB \cdot EF = AC \cdot DE$ (c) $BC \cdot DE = AB \cdot EF$ (d) $BC \cdot DE = AB \cdot FD$	1
Q6.	If $\tan A = \frac{4}{3}$ what is the value of sinA + cosA? (a) $\frac{2}{5}$ (b) $\frac{3}{5}$ (c) $\frac{4}{11}$ (d) $\frac{7}{5}$	1
Q7.	The ratio in which P(4, m) divides the line segment joining A(2,3) and B(6,-3) is: (a) 1:2 (b) 2:1 (c) 1:3 (d) 1:1	1
Q8.	Which of the following can be the probability of an event? (a) -0.4 (b) 1.004 (c) $\frac{18}{23}$ (d) $\frac{46}{25}$	1
Q9.	The HCF of two numbers is 16 and their product is 3072. Their LCM is (a) 182 (b) 192 (c) 200 (d) 210	1
Q10.	The distance between the points A (0, 6) and B (0, –2) is: (a) 6 (b) 8 (c) 4 (d) 2	1

Q11.	The graph of $y = p(x)$ where $p(x)$ is a polynomial in variable x is as follows. The number of zeroes of $p(x)$ is:  (a) 0 (b) 2 (c) 3 (d) 4	1
Q12.	The value of $\frac{\tan 30°}{\cot 60°} - \frac{\sin 45°}{\cos 45°}$ is (a) 0 (b) 1 (c) 2 (d) 5	1
Q13.	The probability that a non-leap year selected at random contains 53 Tuesdays is: (a) $\frac{2}{7}$ (b) 1 (c) $\frac{1}{7}$ (d) $\frac{4}{7}$	1
Q14.	What is the value of $5\tan^2\theta - 5\sec^2\theta$? (a) 1 (b) 0 (c) -1 (d) -5	1
Q15.	For what value of k, do the equations $2x - 3y + 10 = 0$ and $3x + ky + 15 = 0$ represent coincident lines? (a) $\frac{-9}{2}$ (b) -11 (c) $\frac{9}{2}$ (d) -7	1
Q16.	In the given figure, PN ‖ LM. Then the value of x is:  (a) $\frac{ab}{a+b}$ (b) $\frac{ac}{b+c}$ (c) $\frac{bc}{b+c}$ (d) $\frac{ac}{a+c}$	1
Q17.	If P(A) denotes the probability of an event A, then (a) $P(A) < 0$ (b) $P(A) > 1$ (c) $0 \leq P(A) \leq 1$ (d) $-1 \leq P(A) \leq 1$	1
Q18.	The distance of the point (0, -5) from the x-axis is: (a) 0 (b) 2 (c) 3 (d) 5	1
Q19.	DIRECTION: In question number 19 and 20, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option. **Assertion(A)**: For any two positive integers p and q, HCF (p, q) × LCM (p, q) = p × q **Reason(R)**: If the HCF of two numbers is 5 and their product is 150, then their LCM is 40.	1

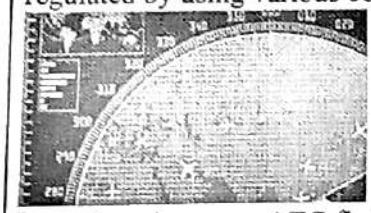
	(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A) (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A) (c) Assertion (A) is true but reason (R) is false. (d) Assertion (A) is false but reason (R) is true.	1
Q20.	**Assertion:** The graphical representation of the equations $x+2y=3$ and $2x+4y+7=0$ gives a pair of intersecting lines. **Reason:** The graph of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ gives a pair of intersecting lines if $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ (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.	1
	Section B (Section B consists of 5 questions of 2 marks each.)	
Q21.	Given that $\sqrt{2}$ is an irrational number, prove that $3+\sqrt{2}$ is an irrational number.	2
Q22.	Find the value of θ in the following equation: $\sqrt{3}\tan 2\theta - 3 = 0$ **OR** Prove that $\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A + \tan A$	2
Q23.	Find a quadratic polynomial whose zeroes are $(5-3\sqrt{2})$ and $(5+3\sqrt{2})$.	2
Q24.	Cards numbered 1 to 30 are put in a bag. A card is drawn at random from this bag. Find the probability that the number on this drawn card is: (i) not divisible by 3 (ii) a prime number greater than 7 **OR** A game of chance consists of spinning an arrow which comes to rest, pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8, and these are equally likely outcomes. What is the probability that it will point at (i) an odd number? (ii) a number which is even as well as prime? 	2
Q25.	If $\triangle ABC \sim \triangle DEF$, AB = 4 cm, DE = 6 cm, EF = 9 cm and FD = 12 cm, then find the perimeter of $\triangle ABC$.	2

	Section C (Section C consists of 6 questions of 3 marks each)	
Q26.	Find the zeroes of the quadratic polynomial $x^2 + \frac{1}{6}x - 2$, and verify the relationship between the zeroes and the coefficients.	3
Q27.	The angle of elevation of the top of a hill at the foot of a tower is 60° and the angle of elevation of the top of the tower from the foot of the hill is 30°. If the tower is 50 m high, what is the height of the hill? Also, find the distance between the foots of the hill and the tower. (Take $\sqrt{3} = 1.73$) **OR** There is a small island in the middle of a 100 m wide river and a tall tree stands on the island. P and Q are points directly opposite to each other on two banks and in line with the tree. If the angles of elevation of the top of the tree from P and Q are respectively 30° and 45°, find the height of the tree.	3
Q28.	Name the type of quadrilateral formed, if any, by the following points, and give reasons for your answer: (1, 7), (4, 2), (–1, –1) and (– 4, 4)	3
Q29.	Through the midpoint M on the side CD of a parallelogram ABCD, the line BM is drawn intersecting AC in L and AD produced in E. Prove that EL = 2 BL.  	3
Q30.	Prove that: $\frac{\tan^2 A}{\tan^2 A - 1} + \frac{\operatorname{cosec}^2 A}{\sec^2 A - \operatorname{cosec}^2 A} = \frac{1}{1 - 2\cos^2 A}$	3
Q31.	The sum of a two-digit number and the number obtained by reversing the order of its digits is 165. If the digits differ by 3, find the number. **OR** If we add 1 to the numerator and subtract 1 from the denominator, a fraction reduces to 1. It becomes $\frac{1}{2}$ if we only add 1 to the denominator. What is the fraction?	3
	Section D (Section D consists of 4 questions of 5 marks each)	
Q32.	The vertices of a triangle are A(4, 6), B(1, 5) and C(7, 2). A line is drawn to intersect sides AB and AC at P and Q respectively, such that $\frac{AP}{AB} = \frac{AQ}{AC} = \frac{1}{4}$. Find the length of the line segment PQ. **OR** If the coordinates of the mid-points of the sides of a triangle are (1, 2), (0, -1) and (2, -1). Find the coordinates of its vertices.	5
Q33.	(a) State and prove the Basic Proportionality theorem. (b) In triangles PQR and MST, $\angle P = 55^\circ$, $\angle Q = 25^\circ$, $\angle M = 100^\circ$ and $\angle S = 25^\circ$. Is $\triangle QPR \sim \triangle TSM$? Why?	5

Q34.	Find the solution of the pair of equations graphically: $x - 2y = 0$ $3x + 4y = 20$ Determine the coordinates of the vertices of the triangle formed by these lines and the y-axis. Calculate the area of the triangle so formed.	5
Q35.	A TV tower stands vertically on a bank of a canal. From a point on the other bank directly opposite the tower, the angle of elevation of the top of the tower is 60°. From another point 20 m away from this point on the line joining this point to the foot of the tower, the angle of elevation of the top of the tower is 30°. Find the height of the tower and the width of the CD and 20 m from pole AB.  **OR** A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of 30°, which is approaching the foot of the tower with a uniform speed. Six seconds later, the angle of depression of the car is found to be 60°. Find the time taken by the car to reach the foot of the tower from this point.	5
	SECTION E (Case-Based Questions)	
Q36.	It is common that Governments revise travel fares from time to time based on various factors such as inflation (a general increase in prices and fall in the purchasing value of money) on different types of vehicles like auto, Rickshaws, taxis, Radio cab etc. The auto charges in a city comprise of a fixed charge together with the charge for the distance covered. Study the following situations   Situation 1: In city A, for a journey of 10 km, the charge paid is Rs 75 and for a journey of 15 km, the charge paid is Rs 110. Situation 2: In a city B, for a journey of 8km, the charge paid is Rs91 and for a journey of 14km, the charge paid is Rs 145. Answer the following questions.	

Name of the city	Distance travelled (Km)	Amount paid (Rs.)
City A	10	75
	15	110
City B	8	91
	14	145

	(i) Referring to situation 1, if the fixed charges of an auto rickshaw are Rs x and the running charges are Rs y per km, write the pair of linear equations representing the situation.	1
	(ii) Referring to situation 2, if the fixed charges of an auto rickshaw are Rs x and the running charges are Rs y per km, write the pair of linear equations representing the situation.	1
	(iii) A person travels a distance of 50km. What is the amount he has to pay in situation 1? **OR** What will a person have to pay for traveling a distance of 30km in situation 2?	2

Q37.	In a club, men are playing a card game. A man named Sanjeev draws a card randomly from a deck of 52 playing cards. Based on the above information, answer the following questions. 	
	(i) What is the probability that Sanjeev draws a king of black colour?	1
	(ii) Find the probability that Sanjeev draws a face card?	1
	(iii) A person wins the game if he draws either a jack of clubs or any spade. What is the probability of not winning the game? **OR** While playing the game, tea is spilled on all the face cards and hence, they are removed from the deck. A card is drawn at random from the remaining cards. What is the probability of drawing either a red card or black ace card from the remaining cards?	2
Q38.	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.  At a given instance, ATC finds that the angle of elevation of an airplane from a point on the ground is 60°. After a flight of 30 seconds, it is observed that the angle of elevation changes to 30°. The height of the plane remains constantly as $3000\sqrt{3}$ m. Use the above information to answer the questions that follow-	
	(i) Draw a neat labelled figure to show the above situation.	1
	(ii) What is the distance travelled by the plane in 30 seconds? **OR** (ii) 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°. How much is the distance travelled in that duration. (Use $\sqrt{3} = 1.73$)	2
	(iii) What is the speed of the plane in km/hr.	1