CODE:2801- AG-B-TS-23-24 पजियन क्रमांक **REG.NO:-TMC -D/79/89/36**

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 MCQ's 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 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, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8.Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

EXAMINATION 2023 -24

Time : 3 Hours | Maximum Marks : 80

CLASS – X | **MATHEMATICS**

Sr. No.	**SECTION – A** This section comprises of very short answer type-questions (VSA) of 1 marks each	Marks
Q.1	If two positive integers a and b are written as $a=x^3y^2$ and $b=xy^3$, where x,y are prime numbers, then the result obtained by dividing the product of the positive integers by the LCM (a,b) is (a) xy (b)xy^2 (c) x^3y^3 (d)x^2y^2	1
Q.2	If y = 1 is a common root of the equations $ay^2 + ay + 3 = 0$ and $y^2 + y + b = 0$, then ab equals a) 3 b) -3 c) 6 d) -7/2	1
Q.3	5 years hence, the age of a man shall be 3 times the age of his son while 5 years earlier the age of the man was 7 times the age of his son. The present age of the	1

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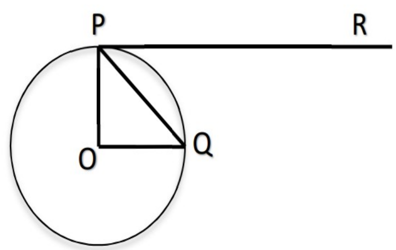
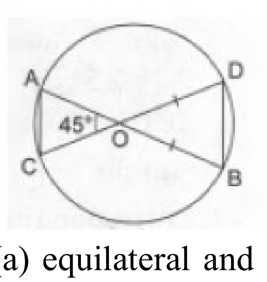
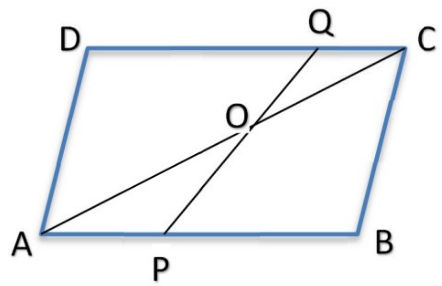
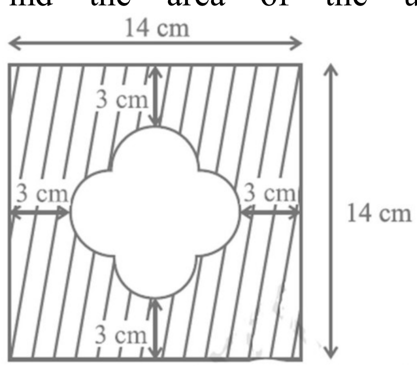
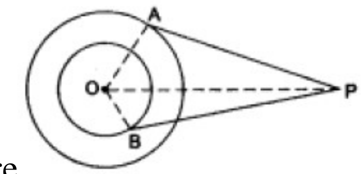
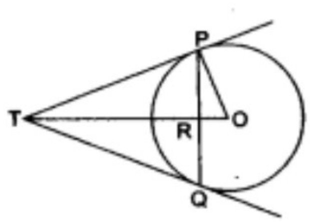
	man is a) 50 years b) 45 years c) 47 years d) 40 years (d) 40 years	
Q.4	Let b = a + c. Then the equation $ax^2 + bx + c = 0$ has equal roots if a) a = - c b) a = c c) a = -2c d) a = 2c	1
Q.5	Two Aps have the same common difference. The first term of one of these is -1 and that of the other is -8. The difference between their 4^{th} terms is (a) 1 (b) -7 (c) 7 (d)9	1
Q.6	AOBC is a rectangle whose three vertices are A(0, 3), O(0, 0) and B(5, 0). The length of its diagonal is a) 5 b) 3 c) $\sqrt{34}$ d) 4	1
Q.7	The base PQ of two equilateral triangles PQR and PQR' with side 2a lies along y-axis such that the mid-point of PQ is at the origin. The coordinates of the vertices R and R' of the triangles (a) $(a\sqrt{3},0)$ (b) $(-a\sqrt{3},0)$ (c) a and b both (d) none of these	1
Q.8	XY is drawn parallel to the base BC of a ΔABC cutting AB at X and AC at Y. If AB = 4 BX and YC = 2cm, then AY = a) 8 cm b) 4 cm c) 6 cm d) 2 cm	1
Q.9	If O is center of a circle and chord PQ makes an angle 50^0 with the tangent PR at the point of contact P, then the angle substended by the chord at the centre is  (a) 130^0 (b) 100^0 (c) 50^0 (d)30^0	1
Q.10	In the given figure,O is the point of intersection of two chords AB and CD such that OB=OD and $\angle AOC = 45^0. \; then, \Delta OAC \; and \; \Delta ODB \; are$  (a) equilateral and similar (b) equilateral but not similar (c) isosceles but not similar (d) isosceles and similar	1
Q.11	If a sphere is inscribed in a cube, then the ratio of the volume of the cube to the volume of the sphere is	1

	(a) 6: π (b) π : 6 (c) π : 4 (d) 4 : π	
Q.12	If a cot θ+ b cosecθ = p and b cot θ+ a cosecθ = q, then $p^2 - q^2$ = a) $a^2 + b^2$ b) $a^2 - b^2$ c) $b^2 - a^2$ d) b – a	1
Q.13	If a pole 6 m high casts a shadow $2\sqrt{3}m$ long on the ground, then the sun's elevation is (a) 60^0 (b) 45^0 (c) 30^0 (d)90^0	1
Q.14	In a circle of radius 14 cm, an arc subtends an angle of 1200 at the centre. If $\sqrt{3}$ = 1.73 then the area of the segment of the circle is a) 124.63 cm^2 b) 130.57 cm^2 c) 120.56 cm^2 d) 118.24 cm^2	1
Q.15	If the perimeter of a sector of a circle of radius 6.5 cm is 29 cm, then its area is a) 56 cm^2 b) 58 cm^2 c) 52 cm^2 d) 25 cm^2	1
Q.16	The probability that a two digit number selected at random will be a multiple of 3 and not a multiple of 5 is (a) 2 / 15 (b) 4 / 15 (c) 1 / 15 (d) 4 / 90	1
Q.17	2 cards of hearts and 4 cards of spades are missing from a pack of 52 cards. A card is drawn at random from the remaining pack. What is the probability of getting a black card? (a) 22/52 (b) 22/46 (c) 24/52 (d) 24/46	1
Q.18	The mean of 2, 7, 6 and x is 5 and the mean of 18, 1, 6, x and y is 10. What is the value of y? a) 30 b) 10 c) 5 d) 20	1
	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.	
Q.19	Assertion (A): If A(2a, 4a) and B(2a, 6a) are two vertices of an equilateral triangle ABC then the vertex C is given by (2a + a$\sqrt{3}$, 5a). Reason (R): In an equilateral triangle, all the coordinates of three vertices can be rational.	1
Q.20	Assertion (A): H.C.F. of 12 and 77 is 1. Reason (R): L.C.M. of two coprime numbers is equal to their product.	1
	SECTION – B This section comprises of very short answer type-questions (VSA) of 2 marks each	
Q.21	A bag contains 6 red, 4 black and some white balls. (i) Find the number of white balls in the bag if the probability of drawing a white	2

	ball is 1/3 . (ii) How many red balls should be removed from the bag for the probability of drawing a white ball to be 1/2 ?	
Q.22	 ABCD is a parallelogram in fig . Point P divides AB in the ratio 2:3 and point Q divides DC in the ratio 4:1. Prove that OC is half of OA.	2
Q.23	Prove that: $\dfrac{\sin\theta}{\cot\theta+\operatorname{cosec}\theta}=2+\dfrac{\sin\theta}{\cot\theta-\operatorname{cosec}\theta}$. OR In ABC, right angled at B, AB = 24 cm, BC = 7 cm. Determine: i. Sin A cos A ii. Sin C cos C .	2
Q.24	A circle touches all the four sides of quadrilateral ABCD. Prove that AB + CD = AD + BC.	2
Q.25	Find the area of the unshaded region shown in the given figure.  OR A chord 10 cm long is drawn in a circle whose radius is 5√2 cm. Find the areas of both the segments. [Take π = 3.14.]	2
	SECTION – C **(This section comprises of short answer type questions (SA) of 3 marks each)**	
Q.26	Solve:- $\dfrac{2}{\sqrt{x}}+\dfrac{3}{\sqrt{y}}=2;\dfrac{4}{\sqrt{x}}-\dfrac{9}{\sqrt{y}}=-1, x, y>0$ OR A lending library has a fixed charge for the first three days and an additional charge for each day thereafter. Saritha paid Rs. 27 for a book kept for seven days, while	3

	Susy paid Rs. 21 for the book she kept for five days. Find the fixed charge and the charge for each extra day.	
Q.27	Prove that √3 is an irrational number.	3
Q.28	In the given figure  , O is the centre of two concentric circles of radii 4 cm and 6 cm respectively. PA and PB are tangents to the outer and inner circle respectively. If PA = 10 cm, find the length of PB up to one place of decimal. OR PQ is a chord of length 4.8 cm of a circle of radius 3 cm. The tangents at P and Q intersect at a point T as shown in the figure. Find the length of TP . 	3
Q.29	Read the following statement carefully and deduce about the sign of the constants p, q, and r. "The zeroes of a quadratic polynomial px^2+qx+r are both negatives."	3
Q.30	Prove that: sec A (1 - sin A) (sec A + tan A) = 1 .	3
Q.31	The length of 40 leaves of a plant are measured correct to nearest millimetre, and the data obtained is represented in the following table.	3

Length [in mm]	Number of leaves
118 – 126	3
127 – 135	5
136 – 144	9
145 – 153	12
154 – 162	5
163 – 171	4
172 – 180	2

Find the mean length of the leaves.

SECTION – D

(This section comprises of long answer-type questions (LA) of 5 marks each)

Q.32 A train travels 360km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train. **5**

OR

A train travels at a certain average speed for a distance 63 km and then travels a distance of 72 km at an average speed of 6 km/hr more than the original speed. If it takes 3 hours to complete total journey, what is its original average speed?

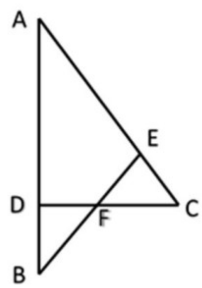
Q.33 The following table shows the marks scored by 140 students in an examination of a certain paper: **5**

Marks	0-10	10-20	20-30	30-40	40-50
Number of students	20	24	40	36	20

Calculate the average marks by using the two methods: direct method and assumed mean deviation (shortcut method) .

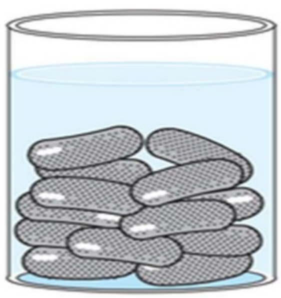
Q.34 (a) State and prove Basic Proportionality theorem. **5**

(b) In the given figure



$\angle CEF = \angle CFE$. F is the midpoint of DC. Prove that $\frac{AB}{BD} = \frac{AE}{FD}$.

Q.35 A gulab jamun, contains sugar syrup up to about 30% of its volume. Find approximately how much syrup would be found in 45 gulab jamuns, each shaped like cylinder with two hemispherical ends with length 5cm and diameter 2.8cm. **5**



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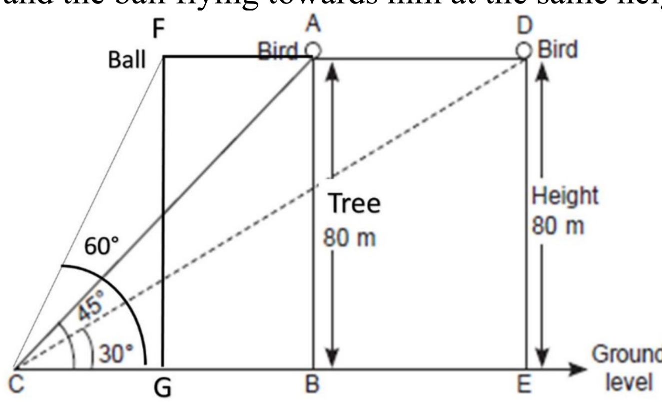
OR

A rocket is in the form of a right circular cylinder closed at the lower end and surmounted by a cone with the same radius as that of cylinder. The diameter and height of cylinder are 6 cm and 12 cm, respectively. If the slant height of the conical portion is 5 cm, then find the total surface area and volume of rocket. (Use $\pi = 3.14$)

SECTION – E

(This section comprises of 3 case study / passage – based questions of 4 marks each with two sub parts (i),(ii),(iii) of marks 1, 1, 2 respectively.The third case study question has two sub – parts of 2 marks each.)

Q.36	**CASE STUDY - 1** Read the text carefully and answer the questions: Your friend Varun wants to participate in a 200m race. He can currently run that distance in 51 seconds and with each day of practice it takes him 2 seconds less. He wants to do in 31 seconds. 	
i.	Write first four terms are in AP for the given situations. ...	1
ii.	How many second takes after 5th days?	1
iii.	What is the minimum number of days he needs to practice till his goal is achieved? OR Out of 41, 30, 37 and 39 which term is not in the AP of the above given situation?	2
Q.37	**CASE STUDY – 2** One evening, Kaushik was in a park. Children were playing cricket. Birds were singing on a nearby tree of height 80m. He observed a bird on the tree at an angle of elevation of 45°. When a sixer was hit, a ball flew through the tree frightening the bird to fly away. In 2 seconds, he observed the bird flying at the same height at an angle of elevation of 30° and the ball flying towards him at the same height at an  angle of elevation of 60°. Based on the above information, answer the following questions.	
i.	At what distance from the foot of the tree was he observing the bird sitting on the tree?	1
ii.	How far did the bird fly in the mentioned time? (or) After hitting the tree, how far did the ball travel in the sky when Kaushik saw the ball?	2
iii.	What is the speed of the bird in m/min if it had flown $20(\sqrt{3} + 1)$ m?	1
Q.38	**CASE STUDY - 3**	

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The Chief Minister of Delhi launched the, 'Switch Delhi', an electric vehicle mass awareness campaign in the National Capital. The government has also issued tenders for setting up 100 charging stations across the city. Each station will have five charging points. For demo charging station is set up along a straight line and has charging points at $A\left(-\frac{7}{3},0\right), B\left(0,\frac{7}{4}\right), C(3,4), D(7,7)$ and E(x, y). Also, the distance between C and E is 10 units.

i.	What is the distance DE ?	1
ii.	What is the ratio in which B divides AC ?	1
iii.	What is the value of x + y ? OR Points C, D, E are collinear or not ?	2
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