Class - X Session- 2022-23
Subject- Mathematics (Standard)
CBSE Model Sample Question Paper – 03
Math Magic - CBSE

Time Allowed: 3 Hrs. 02 February 2023 Maximum Marks : 80

General Instructions:

1. This Question Paper has 5 Sections A-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 subparts 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 have been provided. An internal choice has been provided in the 2 marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated

	Section - A	
	"Section A consists of 20 questions of 1 mark each"	
Q1.	If the angle between the radii of a circle is 100, then the angle between the tangents at the end of these two radii is a) 50 b) 60 c) 80 d) 90	1
Q2.	If P(E) = 0.05, what will be the probability of 'not E'? a) 0.55 b) 0.59 c) 0.95 d) 0.095	1
Q3.	The points (-4,0), (4,0) and (0,3) are the vertices of a a) right triangle b) isosceles triangle c) equilateral triangle d) scalene triangle	1

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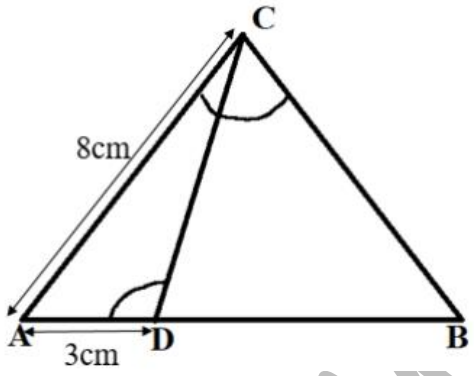
Q4.	The angle of depression of a car parked on the road from the top of a 150m high tower is 30. The distance of the car from the tower in meters is a) 86.6 b) 259.8 c) 212.1 d) 75	1
Q5.	If 4 tanβ = 3, then $\frac{4\ sin\beta - 3\cos\beta}{4\sin\beta + 3\cos\beta} =$ (a) 0 (b) ⅓ (c) ⅔ (d) ¾	1
Q6.	In the given figure, ∠ACB = ∠CDA, AC = 8cm, AD = 3cm, then BD is  (a) 22/3 cm (b) 26/3 cm (c) 55/3 cm (d) 64/3 cm	1
Q7.	Find the value of m so that the quadratic equation $mx(5x - 6) = 0$ has two equal roots. (a) 3 (b) 4 (c) 5 (d) 6	1
Q8.	If tan A = cot B , then the value of A + B is (a) 90° (b) 120° (c) 60° (d) 180°	1

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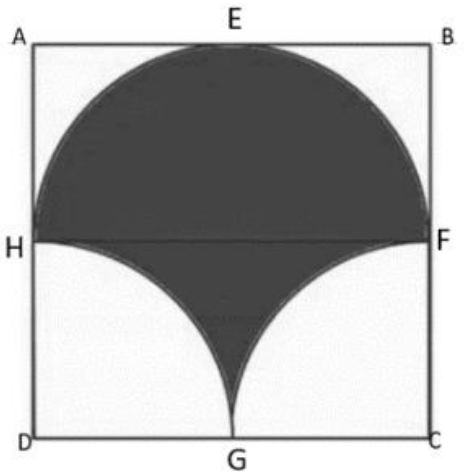
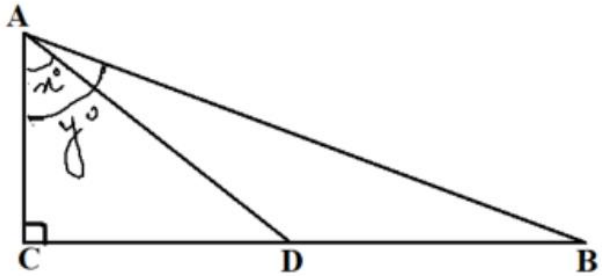
Q9.	The distance between the points $(\cos\theta,\sin\theta)(\sin\theta,-\cos\theta)$ is (a) 1.732 (b) 1.414 (c) 1.000 (d) 2.000	1
Q10.	While computing mean of a grouped data, we assume that the frequencies are (a) centered at the lower limits of the classes (b) centered at the upper limits of the classes (c) centered at the class marks of the classes (d) evenly distributed over all the classes	1
Q11.	In the figure given below, ABCD is a square of side 14 cm with E, F, G and H as the mid points of sides AB, BC, CD and DA respectively. The area of the shaded portion is  (a) 44cm² (b) 49 cm² (c) 98 cm² (d) 49π/2 cm²	1
Q12.	In the given figure, D is the mid-point of BC, then the value of $\frac{\cot y}{\cot x}$ is  (a) 2 (b) 1/2 (c) 1/3 (d) 1/4	1

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Q13.	If the angles of ΔABC are in ratio 1:1:2, respectively (the largest angle being angle C), then the value of $\frac{\sec A}{\text{cosec } B} - \frac{\tan A}{\cot B}$ is (a) 0 (b) 1/2 (c) 1 (d) √3/2	1
Q14.	There is a circular path around a sports field. Priya takes 18 minutes to drive one round of the field. Harish takes 12 minutes. Suppose they both start at the same point and at the same time and go in the same direction. After how many minutes will they meet ? (a) 36 minutes (b) 18 minutes (c) 6 minutes (d) They will not meet	1
Q15.	A hollow cube of internal edge 22 cm is filled with spherical marbles of diameter 0.5 cm and it is assumed that 1/8 space of the cube remains unfilled. Then the number of marbles that the cube can accommodate is (a) 142296 (b) 142396 (c) 142496 (d) 142596	1
Q16.	From a point on a bridge across a river the angle of depression of the banks on opposite sides of the river are 30° and 45° respectively. If the bridge is at the height of 30 m from the banks, the width of the river is (a) 30(1 + √3) m (b) 30(√3 – 1) m (c) 30√3 m (d) 60√3 m	1
Q17.	Given below is the picture of the Olympic rings made by taking five congruent circles of radius 1 cm each, intersecting in such a way that the chord formed by joining the point of intersection of two circles is also of length 1 cm. Total area of all the dotted regions assuming the thickness of the rings to be negligible is	1

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	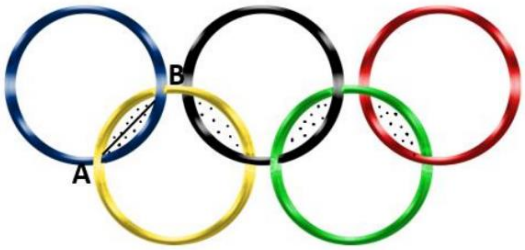 (a) 4(π/12-√3/4) cm² (b) (π/6 - √3/4) cm² (c) 4(π/6 - √3/4) cm² (d) 8(π/6 - √3/4)	
Q18.	The number of solutions of $3^{x+y} = 243$ and 243^{x-y} is (a) 0 (b) 1 (c) 2 (d) infinite	1
	DIRECTION: "In question number 19 and 20, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option"	
Q19.	**Statement A (Assertion):** Two identical solid cubes of side 5 cm are joined end to end. The total surface area of the resulting cuboid is 300 sq cm **Statement R(Reason) :** Total surface area of a cuboid is 2(lb + bh + lh) (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.	**Statement A (Assertion):** Common difference of the AP -5 , -1 , 3, 7, ... is 4. **Statement R(Reason) :** Common difference of the AP a, a+d, a+2d..... is given by $d = a_2 - a_1$ (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

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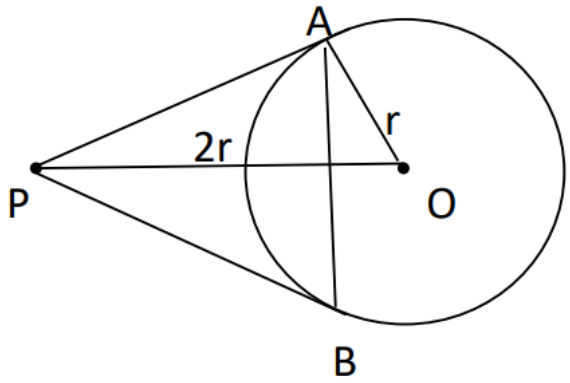
	Section – B ***"Section A consists of 5 questions of 2 mark each"***	
21	The 17th term of an A.P. is 5 more than twice the 8th term, if the 11th term of the A.P. is 43, then find its nth term.	2
22	If Rita were younger by 5 years than what she really is, then the square of her age would have been 11 more than five times her present age. What is her Present age?	2
23	From a point P, two tangents PA and PB are drawn to a circle C(0, r). If OP = 2r, then find $\angle APB$. What type of triangle is APB?  	2
24	Find the coordinates of the point of trisection of the line segment joining the points (3,-1) and (6,8). OR Find the area of the quadrilateral whose vertices are (1, 1), (7, -3), (12, 2) and (7, 21)	2
25	Tree Plantation Drive A Group Housing Society has 600 members, who have their houses in the campus and decided to hold a Tree Plantation Drive on the occasion of New Year Each household was given the choice of planting a sampling of its choice. The number of different types of saplings planted were (i) Neem - 125 (ii) Peepal - 165 (iii) Creepers - 50 (iv) Fruit plants - 150 (v) Flowering plants - 110 At the opening ceremony, one of the plants is selected randomly for a prize. After reading the above passage, answer the following questions. What is the probability that the selected plant is (i) A fruit plant or a flowering plant ? (ii) Either a Neem plant or a Peepal plant ?	2

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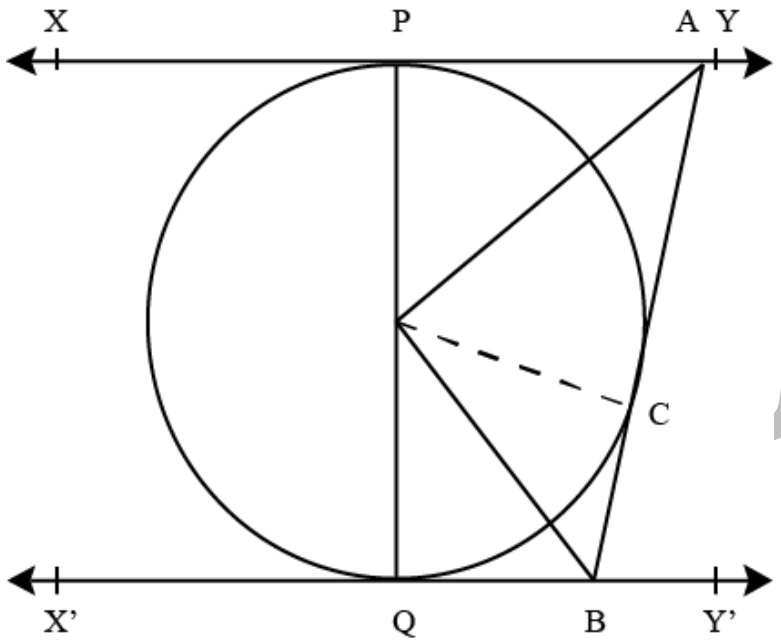
	Section – C ***"Section C consists of 6 questions of 3 mark each"***	
26	Prove that $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} = \frac{1}{\sec\theta - \tan\theta}$	3
27	In the given figure, XY and X'Y' are two parallel tangents to a circle with centre O and another tangent AB with point of contact C, is intersecting XY at A and X'Y' at B. Prove that ∠AOB = 90∘  	3
28	If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio OR If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.	3
29	If the ratio of the sum of first n terms of two A.P. 's is (7n + 1): (4n + 27), find the ratio of their mth terms.	3
30	If the zeroes of the polynomial $x^3 - 3x^2 + x + 1$ are a – b, a, a + b, find a and b	3
31	Prove that $\sqrt{3}$ is an irrational number. Hence, show that $7 + 2\sqrt{3}$ is also an irrational number. (PTO)	3

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	Section – D ***"Section D consists of 4 questions of 5 mark each"***	
32	i) The sum of 4th and 8th terms of an AP is 24 and the sum of the 6th and 10th terms is 44. Find the first three terms of the AP. ii) Thobiyas saved Rs 5 in the first week of a year and then increased his weekly savings by Rs 1.75. If in the nth week, his weekly savings become Rs 20.75, find n.	5
33	If the angles of elevation of a cloud from a point h meters above a lake is α and the angle of depression of its reflection in the lake is β, prove that the height of the cloud is $\frac{h(tan\,\beta+tan\,\alpha)}{tan\,\beta-tan\,\alpha}$	5
34	Sides of a right triangular field are 25 m, 24 m and 7 m. At the three corners of the field, a cow, a buffalo and a horse are tied separately with ropes of 3.5 m each to graze in the field. Find the area of the field that cannot be grazed by these animals.	5
35	.Due to heavy floods in a state, thousands were rendered homeless. 50 schools collectively decided to provide place and the canvas for 1500 tents and share the whole expenditure equally. The lower part of each tent is cylindrical with base radius 2.8 m and height 3.5 m and the upper part is conical with the same base radius, but of height 2.1 m. If the canvas used to make the tents costs ₹120 per m2, find the amount shared by each school to set up the tents. OR There are two identical solid cubical boxes of side 7cm. From the top face of the first cubea hemisphere of diameter equal to the side of the cube is scooped out. This hemisphere is inverted and placed on the top of the second cube's surface to form a dome. Find (i) the ratio of the total surface area of the two new solids formed (ii) volume of each new solid formed	5
	Section – E ***"Case based questions are compulsory" Internal choice has been provided in question 36 and 37. Either (iii) or (iv) should be attempted. However, in question 38 both parts are compulsory. In 36 and 37 the weightage will be (1+1+2) and in 38 it will be (2+2)*** ***(PTO)***	

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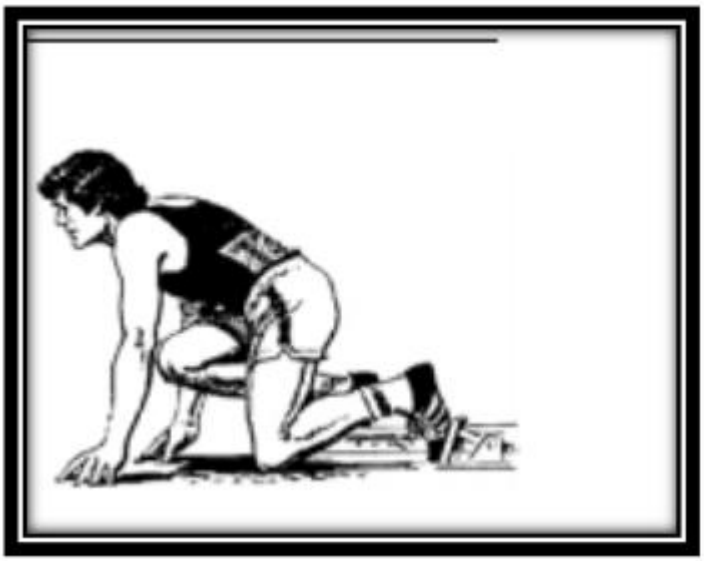


4

A stopwatch was used to find the time that it took a group of students to run 100m.

Time (in sec)	0-20	20-40	40-60	60-80	80-100
No. of students	8	10	13	6	3

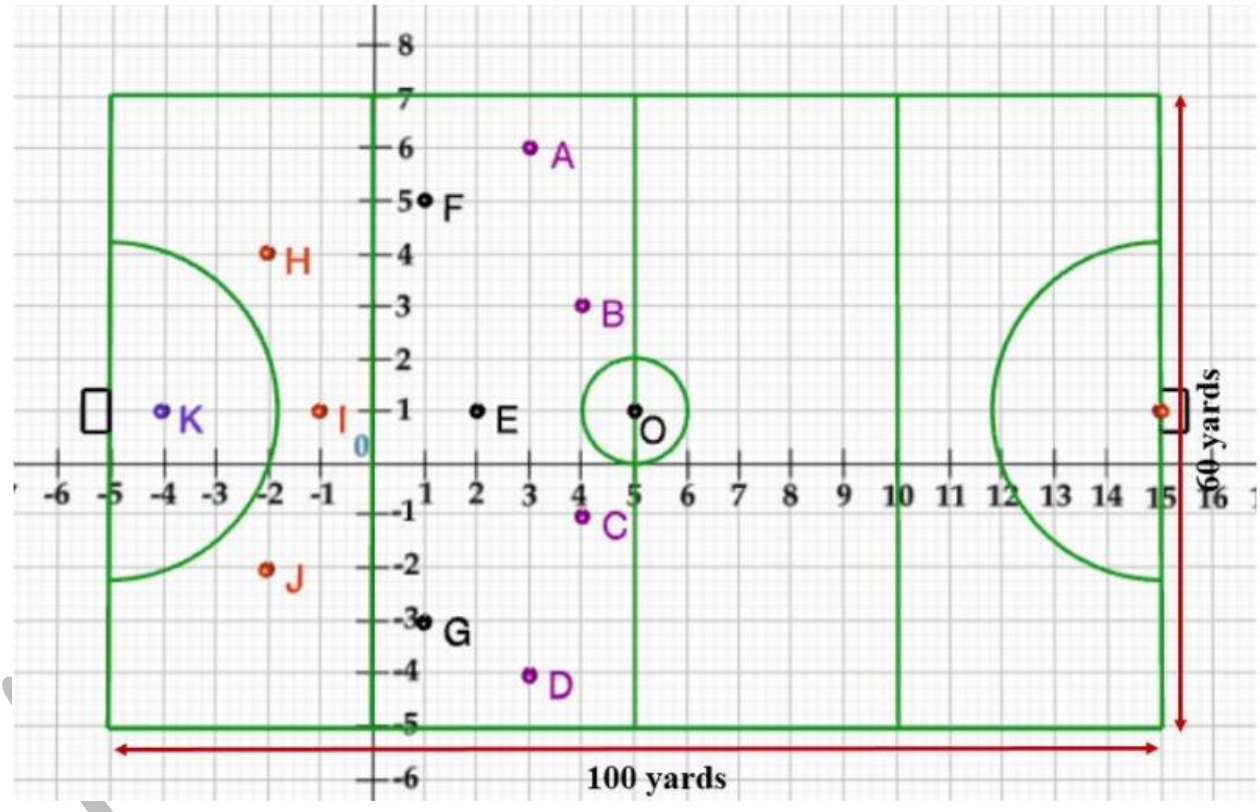
(I) Estimate the mean time taken by a student to finish the race.
(II) What wiil be the upper limit of the modal class ?
(III) The sum of lower limits of median class and modal class is

OR

(IV) How many students finished the race within 1 minute?

(PTO)

Math Magic for SE

37	A hockey field is the playing surface for the game of hockey. Historically, the game was played on natural turf (grass) but nowadays it is predominantly played on an artificial turf. It is rectangular in shape - 100 yards by 60 yards. Goals consist of two upright posts placed equidistant from the center of the backline, joined at the top by a horizontal crossbar. The inner edges of the posts must be 3.66 meters (4 yards) apart, and the lower edge of the crossbar must be 2.14 meters (7 feet) above the ground. Each team plays with 11 players on the field during the game including the goalie. Positions you might play include- **Forward:** As shown by players A, B, C and D. **Midfielders:** As shown by players E, F and G. **Fullbacks:** As shown by players H, I and J. **Goalie:** As shown by player K Using the picture of a hockey field below, answer the questions that follow:  (i) If a player P needs to be at equal distances from A and G, such that A, P and G are in straight line, then position of P will be given by ? (ii) The point on x axis equidistant from I and E is? (iii) What are the coordinates of the position of a player Q such that his distance from K is twice his distance from E and K, Q and E are collinear? OR (iv) The point on y axis equidistant from B and C is ?	4

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38	Trigonometry in the form of triangulation forms the basis of navigation, whether it is by land, sea or air. GPS a radio navigation system helps to locate our position on earth with the help of satellites. A guard, stationed at the top of a 240m tower, observed an unidentified boat coming towards it. A clinometer or inclinometer is an instrument used for measuring angles or slopes(tilt). The guard used the clinometer to measure the angle of depression of the boat coming towards the lighthouse and found it to be 30°.  i) Make a labeled figure on the basis of the given information and calculate the distance of the boat from the foot of the observation tower. ii) After 10 minutes, the guard observed that the boat was approaching the tower and its distance from tower is reduced by $240(\sqrt{3} - 1)$ m. He immediately raised the alarm. What was the new angle of depression of the boat from the top of the observation tower?	4

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--------- END OF QUESTION PAPER ----------

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