BK BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS

SENIOR SECONDARY CO-ED DAY CUM BOYS' RESIDENTIAL SCHOOL

MID-TERM EXAMINATION 2023-24

MATHEMATICS (041)

Class : X
Date :09-10-2023
Admission No.:

Duration : 3 Hrs
Max. Marks : **80**
Roll No.:

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, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.

SECTION A

1 4 Bells toll together at 9.00 am. They toll after 7, 8, 11 and 12 seconds respectively. How many times will they toll together again in the next 3 hours? 1

(a) 3 (b) 4 (c) 5 (d) 6

2 The class interval of a given observation is 10 to 15, then the class mark for this interval will be: 1

(a) 11.5 (b) 12.5 (c) 12 (d) 14

3 The quadratic polynomial whose sum of zeroes is 3 and product of zeroes is –2 is : 1

(a) $x^2 + 3x - 2$ (b) $x^2 - 2x + 3$ (c) $x^2 - 3x + 2$ (d) $x^2 - 3x - 2$

4 Graph of a quadratic polynomial is a 1

(a) straight line (b) circle (c) parabola (d) ellipse

5 At some time of the day, the length of the shadow of a tower is equal to its height , then the sun's altitude at that time is : 1

(a) 30^0 b) 60^0 (c) 90^0 (d) 45^0

6 The mean of the data : 4 , 10 , 5 , 9 and 12 is 1

(a) 8 (b) 10 (c) 9 (d) 15

7 PT is a tangent of length 4 cm to the circle and its radius is 3 cm then its length OP is. 1

(a) 16 cm (b) 25 cm (c) 5 cm (d) 17 cm

8 PA and PB are tangents from P to a circle with centre O. If ∠AOB = 130°, then ∠APB is : 1

(a) 40° (b) 55° (c) 50° (d) 60°

9 Find the distance of the point (–6, 8) from the origin. 1

(a) 8 (b) 11 (c) 10 (d) 9

10 Find the ratio in which the line joining the points (6, 4) and (1, –7) is divided by x-axis. 1
(a) 1 : 3 (b) 2 : 7 (c) 4 : 7 (d) 6 : 7

11 The distance between two parallel tangents of a circle of radius 4 cm is 1
(a) 2 cm (b) 4 cm (c) 6 cm (d) 8 cm

12 One of the methods for determining mode is 1
(a) Mode = 2 Median -3 Mean (b) Mode = 3 Median – 2 Mean
(c) Mode = 2 Mean – 3 Median (d) Mode = 3 Mean – 2 Median

13 If the length of the shadow of a tree is decreasing then the angle of elevation is: 1
(a) Increasing (b) Decreasing (c) Remains the same (d) None of the these

14 If the difference of Mode and Median of a data is 24, then the difference of median and mean is 1
(a) 8 (b) 12 (c) 24 (d) 36

15 If x tan 60°cos 60°= sin60°cot 60°, then x = 1
(a) cos30° (b) tan30° (c) sin30° (d) cot30°

16 If sinθ + cosθ = √2, then tanθ + cot θ = 1
(a) 1 (b) 2 (c) 3 (d) 4

17 If sin A = $\frac{1}{2}$, then the value of cot A is 1
(a) √3 (b) $\frac{1}{\sqrt{3}}$ (c) $\frac{\sqrt{3}}{2}$ (d) 1

18 $1 - \cos^2 A$ is equal to 1
(a) $\sin^2 A$ (b) $\tan^2 A$ (c) $1 - \sin^2 A$ (d) $\sec^2 A$

19. **DIRECTION:** In the question number 19 and 20, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option

Statement A (Assertion): If product of two numbers is 5780 and their HCF is 17, then their LCM is 340
Statement R(Reason) : HCF is always a factor of LCM
(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

20 **Statement A (Assertion)**: If the co-ordinates of the mid-points of the sides AB and AC of ΔABC are D(3,5) and E(-3,-3) respectively, then BC = 20 units 1

Statement R(Reason) : The line joining the mid points of two sides of a triangle is parallel to the third side and equal to half of it.

(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.

SECTION B

21 Following is the distribution of the long jump competition in which 250 students participated. Find the median distance jumped by the students. Interpret the median 2

Distance (in m)	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5
Number of Students	40	80	62	38	30

OR

The distribution given below shows the runs scored by batsmen in one-day cricket matches. Find the mean number of runs.

Runs scored	0 - 40	40 - 80	80 - 120	120 - 160	160 - 200
Number of batsmen	12	20	35	30	23

22 Find the largest number which divides 70 and 125 leaving remainder 5 and 8 2

23 Find a relation between x and y such that the point P(x, y) is equidistant from the points A (2, 5) and B (-3, 7). 2

24 If in a right angled ΔABC, tan B = $\frac{12}{5}$, then find sin B. 2

OR

Prove that : (Sec A + tan A) (1 – Sin A) = Cos A

25. If PA and PB from a point P to a circle with centre O are inclined to each other at an angle of 80^0 , then find $\angle POA$. 2

SECTION C

26 If the zeroes of the polynomial x^2 + p x + q are double in value to the zeroes of $2x^2 - 5x - 3$, find the value of p and q. 3

27 Two vertical poles of different heights are standing 20m away from each other on the level ground. The angle of elevation of the top of the first pole from the foot of the second pole is 60° and angle of elevation of the top of the second pole from the foot of the first pole is 30°. Find the difference between the heights of two poles. (Take √3 = 1.73) 3

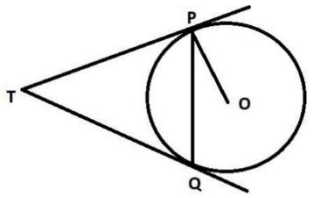
OR

A boy 1.7 m tall is standing on a horizontal ground, 50 m away from a building. The angle of elevation of the top of the building from his eye is 60°. Calculate the height of the building. (Take √3 = 1.73)

28 Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact to the centre. 3

OR

Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$



29 Find the mode of the following frequency distribution. 3

Marks	10 - 20	20-30	30 - 40	40-50	50-60
Frequency	12	35	45	25	13

30 Prove that 3

$$\frac{\sin\theta - \cos\theta}{\sin\theta + \cos\theta} + \frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \frac{2}{2\sin^2\theta - 1}$$

31 If the coordinates of one end of a diameter of a circle are (2, 3) and the coordinates of its centre are (-2, 5), then what are the coordinates of the other end of the diameter? 3

SECTION D

32 An army contingent of 616 members is to march behind an army band of 32 members in a parade. The two groups are to march in the same number of columns. What is the maximum number of columns in which they can march? **5**

OR

Two tanks contain 504 and 735 litres of milk respectively. Find the maximum capacity of a container which can measure the milk of both tank an exact number of times.

33 The lengths of 40 leaves in a plant are measured correctly to the nearest millimetre, and the data obtained is represented as in the following table: Find the median length of the leaves. **5**

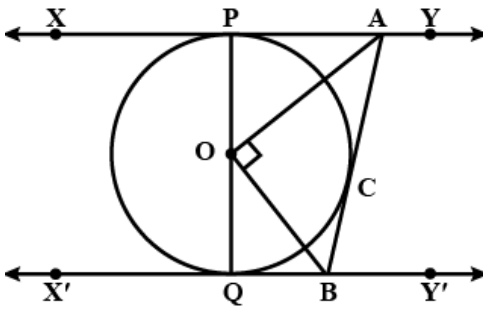
Length (mm)	Number of leaves
118-126	3
127-135	5
136-144	9
145-153	12
154-162	5
163-171	4
172-180	2

34. From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60°, and the angle of depression of its foot is 45°. Determine the height of the tower. **5**

OR

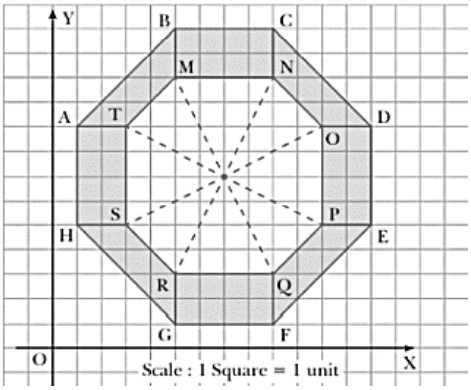
From a point on the ground, the angles of elevation of the bottom and the top of transmission tower fixed at the top of a 20 m high building are 45° and 60°, respectively. Find the height of the tower.

35. XY and X'Y' are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting XY at A and X'Y' at B. Prove that ∠ AOB = 90°. **5**



SECTION E

36. The top of a table is shown in the figure given below:



(i) Find the coordinates of the points H and G are respectively **1**
(ii) What is the distance between the points A and B is 2
iii) Which points in the above figure have same ordinate? 1

37. Pankaj's father gave him some money to buy avocado from the market at the rate of p(x) = x^2- 24 x + 128

Let α and β are the zeroes of (x), based on the information answer the following.

i) Find the value of α and β, where α < β **2**

(ii) Find the value of α + β + αβ. 1
(iii) Find the value of p (2). 1

38. A group of students of class X visited India Gate on an education trip. The teacher and students had interest in history as well. The teacher narrated that India Gate, official name Delhi Memorial, originally called All-India War Memorial, monumental sandstone arch in New Delhi, dedicated to the troops of British India who died in wars fought between 1914 and 1919. The teacher also said that India Gate, which is located at the eastern end of the Rajpath (formerly called the Kingsway), is about 138 feet (42 metres) in height.

i) What is the angle of elevation if they are standing at a distance of 42m away from the monument? **2**

ii) If the altitude of the Sun is at 60^{o}, find the height of the vertical tower that will cast a shadow of length 20 m . **1**

iii) The ratio of the length of a rod and its shadow is 1:1. Find the angle of elevation of the Sun . **1**

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