BK BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
SENIOR SECONDARY CO-ED DAY CUM BOYS' RESIDENTIAL SCHOOL

PRE-BOARD -1 EXAMINATION 2024-25

MATHEMATICS (041)

Class: X   **Duration: 3 Hrs**
Date: 20 /11/24   **Max. Marks: 80**
**Name:**   **Exam R 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.
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 2marks questions of Section E
8. Draw neat figures wherever required. Take π =22/7 wherever required if not
   stated.

SECTION A

1.   If a pair of linear equations in two variables is inconsistent, then the lines   1m
      represented by two equations are
      (a) intersecting   (b) parallel   (c) always   (d) none of these
                                                     coincident
2.   The distance of the point (5, −4) from x -axis is   1m
      (a) 5 units   (b) 4 units   (c) 1 unit   (d) none of these
3.   In the given figure, $DE \parallel BC$, AD = 2 cm, BD = 2.5 cm and AE = 3.2 cm,   1m
      then AC is equal to
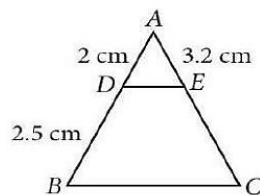
      (a) 2.4cm   (b) 3cm   (c) 4cm   (d) none of these
4.   ($\cos^4 x - \sin^4 x$) is equal to   1m
      (a) $2\sin^2 x$-1   (b)$1 - 2\cos^2 x$ (c) $\sin^2 x - \cos^2 x$ (d) $2\cos^2 x - 1$
5.   If probability of success is 0.9%, then probability of failure is   1m
      (a) 0.01 %   (b) 0.1%   (c) 99.1%   (d) none of these
6.   If 1 is a zero of the polynomial $p(x) = ax^2 - 3(a - 1)x - 1$, then find the   1m
      value of a .
      (a) 1   (b) 2   (c) -1   (d) none of these
7.   If P is a point on x -axis such that its distance from the origin is 3 units, then   1m
      the coordinates of a point P are
      (a) (3,0)   (b) (0,3)   (c) (0.-3)   (d) none of these

8. In a single throw of a pair of dice, the probability of getting the sum as a perfect square is   **1m**
(a) 7/36   (b) 5/36   (c) 8/36   (d) none of these

9. Determine k for which the system of equations has infinite solutions: $4x + y = 3$ and $8x + 2y = 5k$.   **1m**
(a) 5/6   (b) 6/5   (c)4/5   (d) none of these

10. $5\sin^2 30^0 + \cos^2 45^0 - 4\tan^2 30^0$ is equal to   **1m**
(a) 5/6   (b) 2/3   (c) 5/12   (d) none of these

11. The sum $(-6) + (0) + (6) + \cdots$. up to 13th term is   **1m**
(a) 390   (b) 1380   (c) 378   (d) none of these

12. From a point Q , the length of the tangent to a circle is 12 cm and the distance of Q from the centre is 15 cm. The radius of the circle is   **1m**
(a) 9 cm   (b) 12 cm   (c) 15 cm   (d) none of these

13 The mean of first ten odd natural numbers is   **1m**
(a) 5   (b) 10   (c) 19   (d) none of these

14 If LCM of a and 18 is 36 and HCF of a and 18 is 2 , then $a =$ **1m**
(a) 2   (b) 3   (c) 4   (d) none of these

15 In the given figure, $OA = 4$ cm, $OB = 6$ cm, $OD = 5$ cm and $OC = 7.5$ cm, then by which of the following similarity criterion $\triangle AOD \sim \triangle BOC$?   **1m**
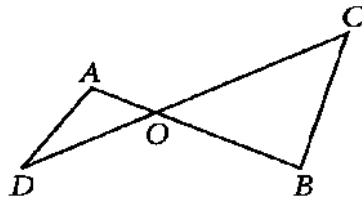
(a) AA   (b) SSS   (c) SAS   (d) none of these

16 The roots of the equation $f(x) = x^2 - 2\sqrt{2}x - 16$ are   **1m**
(a) $4\sqrt{2}, -2\sqrt{2}$ (b) - $4\sqrt{2}, -2\sqrt{2}$ (c) - $4\sqrt{2}, 2\sqrt{2}$ (d) none of these

17 The area of a circle is 38.5 cm^2 .The circumference of the circle is   **1m**
(a) 6.2 cm   (b) 12.1 cm   (c) 22 cm   (d) none of these

18 The volume of two spheres are in ratio 64:27, then ratio of their areas is   **1m**
(a) 8 : 9   (b) 16 : 9   (c) 8 : 3   (d) none of these

19 Assertion: The curved surface area of a cone of base radius 3 cm and height 4 cm is 15π cm^2 **1m**
Reason: Volume of cone = $\pi r^2 h$
(a) Both Assertion (A) and Reason (R) are the true and Reason (R) is a correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).
(c) Assertion (A) is true and Reason (R) is false.
(d) Assertion (A) is false and Reason (R) is true.

20 Assertion : 5 + 13 + 21 + … +181 = 2239   **1m**
Reason : Sum of n terms in an A.P is $n(a+a_n)/2$
(a) Both Assertion (A) and Reason (R) are the true and Reason (R) is a correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).
(c) Assertion (A) is true and Reason (R) is false.

(d) Assertion (A) is false and Reason (R) is true.

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SECTION B
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21   Prove that $3 + 2\sqrt{3}$ is an irrational number.   2m
<div align="center">OR</div>
     Prove that $\sqrt{3}$ is irrational.

22   If $\sin\alpha = 1/2$, then show that $(3\cos\alpha - 4\cos^3\alpha) = 0$.   2m

23   If $\triangle ABC \sim \triangle PQR$, $AB = 4$ cm, $PQ = 10$ cm, $QR = 15$ cm, $PR = 20$ cm,   2m
     then find the perimeter of $\triangle ABC$.
<div align="center">OR</div>
     In $\triangle DEF$, $AB \parallel EF$ such that $AD = 6$ cm, $AE = 18$ cm and $BF = 24$ cm.
     Find the length of DB.

24   Prove that lengths of tangents from an external point to the circle are equal.   2m

25   If α and β are zeroes of the polynomial $2x^2 - 5x + 7$, then find the value of   2m
     $\alpha^{-1} + \beta^{-1}$.

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SECTION C
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26   In a school, there are two Sections A and B of class X. There are 48 students in   3m
     Section A and 60 students in Section B. Determine the least number of books
     required for the library of the school so that the books can be distributed
     equally among all students of each section.

27   Represent the following pair of equations graphically and write the   3m
     coordinates of points where the lines intersect y-axis.
     $x + 3y = 6$ and $2x - 3y = 12$

28   Prove that: 3m
     $$\frac{\sin\theta - \cos\theta}{\sin\theta + \cos\theta} + \frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \frac{2}{2\sin^2\theta - 1}$$
<div align="center">Or</div>
     Prove that:

     $$\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta} = 2\operatorname{cosec}\theta$$

29   The incircle of an isosceles triangle ABC, in which AB = AC, touches the sides
     BC, CA and AB at D, E and F respectively. Prove that BD = DC.   3m

30   The sum of the radius of base and height of a solid right circular cylinder is 37   3m
     cm. If the total surface area of the solid cylinder is 1628 sq. cm, find the
     volume of the cylinder.

31   Three distinct coins are tossed together. Find the probability of getting   3m
     (i) at least 2 heads
     (ii) at most 2 heads.
<div align="center">Or</div>

A box consists of 100 shirts of which 88 are good, 8 have minor defects and 4 have major defects. Ramesh, a shopkeeper will buy only those shirts which are good but Kewal another shopkeeper will not buy shirts with major defects. A shirt is taken out of the box at random. What is the probability that:
(i) Ramesh will buy the selected shirt?
(ii) Kewal will buy the selected shirt?

SECTION D

32   A journey of 192 km from a town A to town B takes 2 hours more by a   5m
ordinary passenger train than a super fast train. If the speed of the faster train is 16 km/h more, find the speeds of the faster and the passenger train.
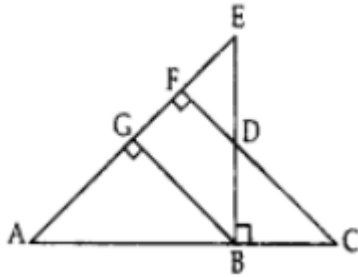
<center>Or</center>

If x = 2/3 and x = -3 are roots of the quadratic equation $ax^2 + 7x + b = 0$, find the values of a and b.

33   In given figure, EB ⊥ AC, BG ⊥ AE and CF ⊥ AE   5m
Prove that:
(a) ΔABG ~ ΔDCB
(b) BC/BD=BE/BA

<center>Or</center>

Prove that 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.

34   From a point on the ground, the angles of elevation of the bottom and top of a   5m
transmission tower fixed at the top of a 10 m high building are 30° and 60° respectively. Find the height of the tower.

35   Given below is the distribution of weekly pocket money received by students   5m
of a class. Calculate the pocket money that is received by most of the students.

| Pocket Money (in ₹)	No. of Students
0–20	2
20–40	2
40–60	3
60–80	12
80–100	18
100–120	5
120–140	2

SECTION E

36 As a part of this one-week long festival, students of Durgapura Higher   **4m**
Secondary School thought of planting trees in and around their school to
reduce air pollution. It was decided that each section of each class would plant
twice as many plants as class which they belong to. There were 4 sections of
each standard from 1 to 12. So, if there are four sections in class 1 say 1A, 1B ,
1C and I D, then each section would plant 2 trees. Similarly, each section of
class 2 would plant 4 trees and so on. Thus, the number of trees planted by
classes 1 to 12 formed an AP given by 8, 16, 24.... Ratan, who is a student of
Class 10 B decided to frame a set of questions and answers based on the above
information. Help him to do so.

(i)   Find the total number of trees planted by class 10 students of all the
        sections together.
        Or
        Write down expression to find nth term from end of an A.P.
(ii)   Also find the total number of trees planted by students of Ratan's
        class alone.
(iii)   The members of the Nature Club of the School decided to find the
        total number of trees planted by the students of the school
        altogether. Help them to do so.

37 In order to conduct Sports Day activities in your School, lines have been   **4m**
drawn with chalk powder at a distance of 1 m each, in a rectangular shaped
ground ABCD, 100 flowerpots have been placed at a distance of 1 m from each
other along AD, as shown in given figure below. Niharika runs 1/4 th the
distance AD on the 2nd line and posts a green flag. Preet runs 1/5 th distance
AD on the eighth line and posts a red flag.
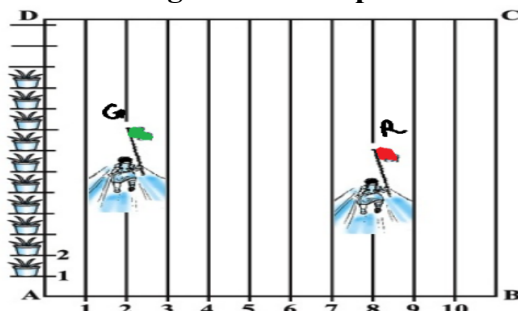
(i)   Find the position (coordinates) of green flag.
(ii)   Find the position (coordinates) of red flag.
(iii)   Find the distance between green and red flag.
                OR

What are the coordinates of mid-point of straight line joining green and red flag?

38   **A horse is tied to a peg at one corner of a square shaped grass field of side 15 m by means of a 5 m long rope.**   **4m**

    (i)   **What is the shape of area in which horse can graze?**

    (ii)   **Find the area of that part of the field in which the horse can graze.**

    (iii)   **Write down the formula for finding length of arc when central angle is given.**

    Or

    Find the remaining area of field after grazing.

****************BEST OF LUCK*****************