B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

TERM-1 EXAMINATION, 2025-26
MARKING SCHEME - MATHEMATICS (041)

Class: X — **Time: 3 hrs**
Date: 08/09/25 — **Max Marks: 80**
Adm No: — **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.
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. The graph of a quadratic polynomial p(x) passes through the points (-6,0), (0, -30), (4,-20) and (6,0). The zeroes of the polynomial are — 1m
(a) -6,0 (b) 4,6 (C) -30,-20 *(d) -6,6*

2. The value of k for which the system of equations 3x-ky= 7 and 6x+ 10y =3 is inconsistent, is — 1m
(a) -10 *(b) -5* (C) 5 (d) none of these

3. The distance of the point (-3,4) from the x-axis is — 1m
(a) 3 (b) -3 *(C) 4* (d) 5

4. If nth term of an A.P. is 7n-4 then the common difference of the A.P. is — 1m
(a) 7 (b) 7n (C) -4 (d) none of these

5. The pair of equations 2x + 3y = 5 and 4x + 6y = 15 has — 1m
(a) a unique solution (b) exactly two solutions (C) infinitely many solutions *(d) no solutions*

6. If tanθ = 5/ 2 then $\frac{4\sin\theta + \cos\theta}{4\sin\theta - \cos\theta}$ is equal to — 1m
(a) 11/9 (b) 3/2 (C) 9/11 (d) none of these

7. If one root of the equation $2x^2 + ax + 6 = 0$ is 2 the a is — 1m
(a) 7 (b) -7 (C) 7/2 (d) -7/2

8. A quadratic polynomial having zeroes - √5/ 2 and √5/ 2 is — 1m
(a $x^2 - 5\sqrt{2}$ x +1 (b) $8x^2-20$ (C) $15x^2-6$ *(d) none of these*

9. If $\theta = 30^0$ then the value of 3tanθ is — 1m
(a) 1 (b) 1/√3 (C) *3/√3* (d) none of these

10. What is the common difference of an A.P. where $a_{18} - a_{14} = 32$? — 1m
(a) 8 (b) -8 (C) 4 (d) -4

11. If sin α = ½ then cot α =? — 1m
(a) 1/√3 *(b) √3* (C) √3/2 (d) 1

12. **If cos α = 3/5 then tan α =?** **1m**

(a) 4/3 **(b) 3/5** **(C) 3/4** **(d) none of these**

13 **If the height of the vertical pole is equal to the length of its shadow on the ground, the angle of elevation of the sun is** **1m**

(a) 0^0 **(b) 30^0** *(C) 45^0* **(d) 60^0**

14 **If the length of the shadow of a tower is √3 times its height then the angle of elevation of the sun is** **1m**

(a) 0^0 **(b) 45^0** *(C) 30^0* **(d) 60^0**

15 **The area of a sector of a circle with a radius of 6 cm if the angle of the sector is 60°.** **1m**

(a) 142/7 **(b) 152/7** *(c) 132/7* **(d) none of these**

16 **A point on the x-axis divides the line segment joining the points A (2, -3) and B (5, 6) in the ratio 1:2.** **1m**

(a) (4,0) **(b) (7/2,3/2)** *(c) (3,0)* **(d) none of these**

17 **The mode and mean are given by 8 and 7, respectively. Then the median is:** **1m**

(a) 2/23 **(b) 3/22** *(c) 22/3* **(d) none of these**

18 **The class interval of a given observation is 20 to 25, then the class mark for this interval will be:** **1m**

(a) 10 **(b) 15** *(c) 22.5* **(d) none of these**

19 **Assertion (A):- If the value of mode and mean is 7 and 8 respectively, then the value of median is 23.** **1m**

Reason (R):- 3Median = mode + 2 mean.

(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 (A):- The point (a,0) lies on the x-axis.** **1m**

Reason (R):- Any point which lies on the y-axis is of the form (0,a).

(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.

SECTION B

21 **Prove that 5 + 2√5 is an irrational number.** **2m**

OR

Prove that 2x3x11 + 11 is a composite number .

A:- **Supposition** **1m**

Transformation and contradiction **1m**

Common factor and converse of distribution **1m**

Expression as product of 3 or more multiplier **1m**

22 **Solve 2x + 3y = 11 and 2x - 4y = -24 and hence find the value of m for which y = mx+3.** **2m**

A:-

✅ Step 1: Solve the system of equations

We will solve the first two equations using the **elimination method.**

Equations:

(1) $2x + 3y = 11$

(2) $2x - 4y = -24$

Subtract (2) from (1):

$$(2x + 3y) - (2x - 4y) = 11 - (-24)$$
$$2x + 3y - 2x + 4y = 11 + 24$$
$$7y = 35 \Rightarrow y = 5$$

Substitute $y = 5$ into equation (1):

$$2x + 3(5) = 11 \Rightarrow 2x + 15 = 11 \Rightarrow 2x = -4 \Rightarrow x = -2$$

✅ Solution of the system is:

$$x = -2, \quad y = 5$$

✅ Step 2: Use $y = mx + 3$

Substitute $x = -2, y = 5$ into this equation:

$$5 = m(-2) + 3 \Rightarrow 5 = -2m + 3 \Rightarrow -2m = 5 - 3 = 2 \Rightarrow m = -1$$

🎯 Final Answer:

$$\boxed{m = -1}$$

23 **Find the values of p for which the quadratic equation $4x^2 + px + 3 = 0$ has equal roots.** **2m**

A:-

Given: $4x^2 + px + 3 = 0$

Here a = 4, b = p. (= 3 ... [Equal roots

D = 0 (Equal roots) **1m**

As $b^2 - 4ac = 0$

$\therefore (p)^2 - 4(4)(3) = 0$

$= p^2 - 48 = 0 \Rightarrow p^2 = 48$

$\therefore p = \pm\sqrt{16 \times 3} = \pm 4\sqrt{3}$

1m

24 **A horse, a cow and a goat are tied, each by ropes of length 14m, at the corners A, B and C respectively, of a grassy triangular field ABC with sides of lengths 35m, 40m and 50 m. Find the area of grass field that can be grazed by them.** **2m**

OR

Find the area of the major segment (in terms of π) of a circle of radius 5cm, formed by a chord subtending an angle of 90° at the centre.

A:- area of grass field that can be grazed by them

$= \frac{\theta_1}{360°} \times \pi r^2 + \frac{\theta_2}{360°} \times \pi r^2 + \frac{\theta_3}{360°} x \pi r^2$

$= \frac{\pi r^2}{360°}(\theta_1 + \theta_2 + \theta_3)$ **1m**

$= \frac{\pi r^2}{360°} \times 180°$

$= \frac{22}{7} \times \frac{14 X 14}{2}$

$= 308 \text{ m}^2$ **1m**

Or

Area of minor segment= Area of sector – area of triangle

$=\frac{90°}{360°}\pi r^2 - \frac{1}{2}\times r^2$

$=(\frac{25}{4}\pi - \frac{25}{2})$ cm²

Area of major segment = Area of circle – Area of minor segment **1m**

$= \pi 5^2 - (\frac{25}{4}\pi - \frac{25}{2})$

$= 25\pi - \frac{25}{4}\pi + \frac{25}{2}$

$= (\frac{75}{4}\pi + \frac{25}{2})$ cm² **1m**

25 The sum of the first n terms of an AP is given by **2m**

$S_n = 5n^2 + 3n$

(a) Find the first term and the common difference of the AP.

(b) Find the 10th term of the AP.

.

A:- (a)

First term $a = S_1 = 5(1)^2 + 3(1) = 8$

$a_2 = S_2 - S_1 = [5(4) + 3(2)] - 8 = (20 + 6) - 8 = 18$

Common difference $d = a_2 - a_1 = 18 - 8 = 10$ **1m**

(b)

$a_{10} = S_{10} - S_9$

$S_{10} = 5(100) + 3(10) = 500 + 30 = 530$

$S_9 = 5(81) + 3(9) = 405 + 27 = 432$

$a_{10} = 530 - 432 = 98$ ✅ **1m**

SECTION C

26 Find the coordinates of the points of trisection of the line segment joining A(2, –2) and B(–7, 4). **3m**

A:- First point (1:2):

$$x = \frac{1\times(-7)+2\times 2}{1+2} = \frac{-7+4}{3} = \frac{-3}{3} = -1$$

$$y = \frac{1\times 4 + 2\times(-2)}{3} = \frac{4-4}{3} = 0$$ **1m**

Second point (2:1):

$$x = \frac{2\times(-7)+1\times 2}{3} = \frac{-14+2}{3} = \frac{-12}{3} = -4$$ **1m**

$$y = \frac{2\times 4 + 1\times(-2)}{3} = \frac{8-2}{3} = \frac{6}{3} = 2$$

Answer: Points are (–1, 0) and (–4, 2) **1m**

27 Solve the following pair of equations: **3m**

49x + 51y = 499

51x + 49 y = 501

Step 1: Add the two equations

$$(49x+51y)+(51x+49y)=499+501$$
$$(49x+51x)+(51y+49y)=1000$$
$$100x+100y=1000$$

Divide both sides by 100:

$$x+y=10 \quad \text{(Equation 3)}$$

Step 2: Subtract the second equation from the first

$$(49x+51y)-(51x+49y)=499-501$$
$$(49x-51x)+(51y-49y)=-2$$
$$-2x+2y=-2$$

Divide both sides by 2: **1m**

$$-x+y=-1 \quad \text{(Equation 4)}$$

Step 3: Solve the system of equations

From Equation (3):

$$x+y=10$$

From Equation (4):

$$-x+y=-1$$

Now add Equation (3) and Equation (4): **1m**

$$(x+y)+(-x+y)=10+(-1)$$
$$(0x+2y)=9$$
$$2y=9 \Rightarrow y=\frac{9}{2}=4.5$$

Substitute $y=4.5$ into Equation (3):

$$x+4.5=10 \Rightarrow x=10-4.5=5.5$$

Final Answer:

$$\boxed{x=5.5, \quad y=4.5}$$

1m

OR

Solve the following pair of linear equations for x and y:
(bx)/a+(ay)/b = $a^2 + b^2$; x + y = 2ab

A:- **Solution** **2m**

x = ab , y = ab **1m**

28 **Find the number of all three-digit natural numbers which are divisible by 8.** **3m**

A:- Step 1: First 3-digit number divisible by 8

Smallest 3-digit number = 100

$100 \div 8 = 12.5 \Rightarrow$ first multiple = $13 \times 8 = 104$

1m

Step 2: Last 3-digit number divisible by 8

Largest 3-digit number = 999

$999 \div 8 = 124.875 \Rightarrow$ last multiple = $124 \times 8 = 992$

1m

Step 3: Count

Numbers form an AP: $104, 112, 120, \ldots, 992$

Here: $a=104, d=8, l=992$

$$n=\frac{l-a}{d}+1=\frac{992-104}{8}+1=\frac{888}{8}+1=111+1=112$$ **1m**

29 **Prove that:**

$$\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$$ **3m**

A:- We start with

$$\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}.$$

1. Factor out $\sin\theta$ and $\cos\theta$:

$$= \frac{\sin\theta(1 - 2\sin^2\theta)}{\cos\theta(2\cos^2\theta - 1)}.$$

2. Use the identity $\sin^2\theta = 1 - \cos^2\theta$ to rewrite $1 - 2\sin^2\theta$: **1m**

$$1 - 2\sin^2\theta = 1 - 2(1 - \cos^2\theta) = 2\cos^2\theta - 1.$$

So the fraction becomes

$$\frac{\sin\theta(2\cos^2\theta - 1)}{\cos\theta(2\cos^2\theta - 1)}.$$

3. Cancel the common factor $2\cos^2\theta - 1$ (when it is nonzero) to get

$$\frac{\sin\theta}{\cos\theta} = \tan\theta.$$ **2m**

30 For the quadratic polynomial **3m**

$p(x) = 2x^2 - 5x + 3$

(a) Find the sum and product of its zeros.

(b) Form a quadratic polynomial whose sum of zeros is 4 and product of zeros is 3.

A:-

(a)

Sum of zeros $= -\frac{b}{a} = -\frac{-5}{2} = \frac{5}{2}$

Product of zeros $= \frac{c}{a} = \frac{3}{2}$ **2m**

(b)

Required polynomial:

$$x^2 - (\text{sum})x + \text{product} = x^2 - 4x + 3$$ **1m**

OR

The sum of the zeros of a quadratic polynomial is 3/2 and their product is 2.

(a) Find the polynomial.

(b) Verify the relationship between coefficients and zeros.

A:- (a) Polynomial:

$$x^2 - \left(\frac{3}{2}\right)x + 2 = 0$$

Multiply through by 2: **1m**

$$2x^2 - 3x + 4$$

(b) For $2x^2 - 3x + 4$:

Sum $= -\frac{-3}{2} = \frac{3}{2}$ ✅

Product $= \frac{4}{2} = 2$ ✅ **2m**

31 **Heights of students of class X are given in the following frequency distribution:** **3m**

Height (in cm)	Number of students
150–155	15
155–160	8
160–165	20
165–170	12
170–175	5

Find the modal height.

A:- Solution:

Height (in cm)	No. of students	
150–155	15	
155–160	8	f_0
160–165	20 (Maximum)	f_1
165–170	12	f_2
170–175	5	

Maximum frequency is 20

∴ Modal class is 160 – 165

$$\textbf{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$ **1m**

$$= 160 + \frac{20 - 8}{40 - 8 - 12} \times 5 = 160 + \frac{12 \times 5}{20}$$

$$= 160 + 3 = \mathbf{163}$$

∴ The modal height = 163 cm **2m**

SECTION D

32 **Is it possible to design a rectangular park of perimeter 80 m and area 400 m^2? If so, find its length and breadth.** **5m**

A:- Let the length of rectangular park be x

Then, the perimeter of rectangular park

$= 2(\text{Length} + \text{Breadth})$

$\Rightarrow 2(x + \text{Breadth}) = 80$

$\Rightarrow \text{Breadth} = 40 - x$ **2m**

∴ Area of rectangular park = Length × Breadth

$\Rightarrow x(40 - x) = 400$

$\Rightarrow 40x - x^2 = 400$

$\Rightarrow x^2 - 40x + 400 = 0$

$\Rightarrow x^2 - 20x - 20x + 400 = 0$

$\Rightarrow (x - 20)(x - 20) = 0$

$\Rightarrow x = 20$ **2m**

Thus, the rectangular park is **possible** to design. So, length of park = **20 m** and its breadth = 40 – 20 = **20 m.** **1m**

OR

Solve the following quadratic equation for x: $9x^2 - 6b^2x - (a^4 - b^4) = 0$

A:-

$$9x^2 - 6b^2x - (a^4 - b^4) = 0$$
$$\Rightarrow 9x^2 - 6b^2x - (a^2 - b^2)(a^2 + b^2) = 0$$
$$\Rightarrow 9x^2 + 3\left(a^2 - b^2\right)x - 3(a^2 + b^2)x - (a^2 - b^2)(a^2 + b^2) = 0$$ **2m**
$$\Rightarrow 3x\left[3x + (a^2 - b^2)\right] - (a^2 + b^2)\left[3x + (a^2 - b^2)\right] = 0$$
$$\Rightarrow \left[3x - (a^2 + b^2)\right]\left[3x + (a^2 - b^2)\right] = 0$$
$$\Rightarrow 3x - (a^2 + b^2) = 0 \text{ or } 3x + (a^2 - b^2) = 0$$
$$\Rightarrow x = \frac{a^2+b^2}{3} \text{ or } x = -\frac{a^2-b^2}{3}$$ **2m**
$$\Rightarrow x = \frac{a^2+b^2}{3} \text{ or } x = \frac{b^2-a^2}{3}$$

Hence, the factors are $\frac{a^2+b^2}{3}$ and $\frac{b^2-a^2}{3}$. **1m**

33 The angles of depression of two ships from the top of a lighthouse and on the same side of it are found to be 45° and 30°. If the ships are 200 m apart, find the height of the lighthouse. **5m**

A:-

Let:

Height of lighthouse = h m

Distance of nearer ship from base of lighthouse = x m

From **tan 45° = h / x**:

$$x = h$$

From **tan 30° = h / (x + 200)**:

$$\frac{1}{\sqrt{3}} = \frac{h}{h+200}$$
$$h + 200 = h\sqrt{3}$$
$$200 = h(\sqrt{3} - 1)$$ **3m**
$$h = \frac{200}{\sqrt{3} - 1}$$

Rationalising:

$$h = \frac{200(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)} = \frac{200(\sqrt{3}+1)}{3-1} = 100(\sqrt{3}+1)$$
$$h \approx 100(1.732 + 1) = 100 \times 2.732 = 273.2 \text{ m}$$ **2m**

OR

Two poles of equal heights are standing opposite to each other on either side of the road, which is 100 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30° respectively. Find the height of the poles.

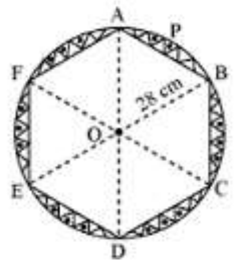
Let height = h, distances = x and $100 - x$

From tan 60°: $h = x\sqrt{3}$
From tan 30°: $h = \frac{100-x}{\sqrt{3}}$ **3m**

Equating: $x\sqrt{3} = \frac{100-x}{\sqrt{3}}$
$3x = 100 - x \Rightarrow x = 25$

$h = 25\sqrt{3} \approx 43.3 \text{ m}$ ✅ **2m**

34 **A round table cover has six equal designs as shown in Figure If the radius of the cover is 28 cm, find the cost of making the designs at the rate of Rs. 0.35 per cm^2. (Use √3 = 1.7)** **5m**



A: - **Formula** **1m**
Calculations **2m**
Cost formula **1m**
Calculations **1m**

35 **Find the values of x and y if the median for the following data is 31.** **5m**

Class	Frequency
0-10	5
10-20	x
20-30	6
30-40	y
40-50	6
50-60	5
Total	**40**

A:- Solution:

Class	f	$c.f.$
0–10	5	5
10–20	x	$5 + x$
20–30	6	$11 + x$
30–40	y	$11 + x + y$
40–50	6	$17 + x + y$
50–60	5	$22 + x + y$
Total	**40**	

2m

$\therefore \quad x + y + 22 = 40$

$x + y = 40 - 22 = 18$

$y = 18 - x \quad \ldots(i)$

$\frac{n}{2} = \frac{40}{2} = 20$

Median is 31 ...[Given

$\therefore$ Median class is 30 – 40

Median $= l + \left(\frac{\left(\frac{n}{2} - c.f.\right)}{f} \times h\right)$

$31 = 30 + \left(\frac{20 - (11 + x)}{y} \times 10\right)$

$\Rightarrow \quad 31 - 30 = \frac{(20 - 11 - x)}{18 - x} \times 10 \quad$ ...[From (i)

2m

$\Rightarrow 18 - x = (9 - x)10$

$\Rightarrow 18 - x = 90 - 10x$

$\Rightarrow -x + 10x = 90 - 18$

$\Rightarrow 9x = 72$

$\Rightarrow x = 8$

Putting the value of x in (i), we have

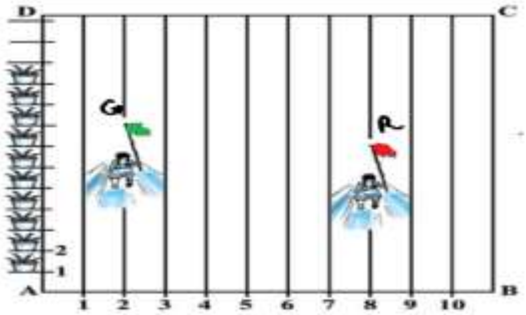
$y = 18 - 8 = 10$

$\therefore x = 8, y = 10$

1m

SECTION E

36 **In order to conduct Sports Day activities in your School, lines have been 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.** **4m**



(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?

A:- **(i) (2 , 25)** **1m**

(ii) (8, 20) **1m**

(iii) square root of 61

Or

(5 ,22.5) **2m**

37 **The owner of a taxi company decides to run all the taxis on CNG fuel instead of petrol/diesel. The taxi charges in the city are comprised of fixed charges** **4m**

together with the charge for the distance covered. For a journey of 12 km, the charge paid is Rs. 89; for a journey of 20 km, the charge is Rs.145.
(i) What are the equations formed for both conditions?
(ii) What will a person have to pay for travelling a distance of 30 km?
(iii)Why did he decide to use CNG for his taxi as fuel?

Or

If a customer sits in the car and get down immediately without travelling, how much he needs to pay?

A:- (i) x+ 12y = 89 **1m**
x+ 20y = 145
(ii) Values of x and y **1m**
Solution **1m**
(iii) Eco friendly **1m**
Or
Value of x

38 A stadium has rows of seats in AP. The first row has 50 seats, the second row has 54 seats, the third row has 58 seats, and so on. **4m**
(a) Write the first term and common difference of the AP formed by the seats in each row.
(b) Find the number of seats in the 15th row.
(c) Find the total number of seats in the first 15 rows.
OR
If the total number of seats is 2070, find the number of rows in the stadium.

A:- (a) $a = 50,\ d = 4$ **1m**

(b) $a_{15} = 50 + (15 - 1) \times 4 = 50 + 56 = 106$ seats **1m**

(c) $S_{15} = \frac{15}{2}[2 \times 50 + 14 \times 4] = \frac{15}{2} \times 156 = 1170$ seats

OR

$2070 = \frac{n}{2}[100 + (n-1) \times 4]$

$4140 = n(96 + 4n)$ **2m**

$4n^2 + 96n - 4140 = 0$

$n^2 + 24n - 1035 = 0$

$n = \frac{-24+66}{2} = \frac{42}{2} = 21$

Answer: 21 rows

****************ALL THE BEST*****************