BK BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS

Senior Secondary co-ed day cum boys' residential school, Shirgaon

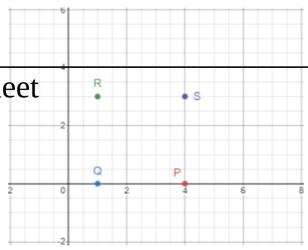
MID-TERM EXAMINATION 2023-24

MATHEMATICS (041)

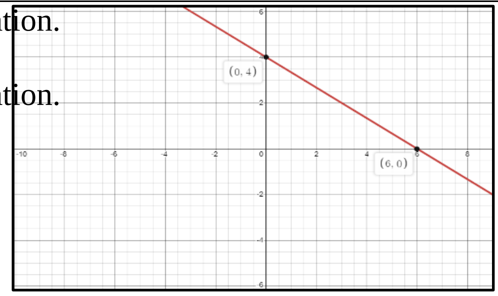
Class: IX — Duration: 3 Hrs

Date: 21-10-2023 — MARKING SCHEME — Max. Marks: 80

Question	Answer	Scheme
1	$3\sqrt{8} = 3 \times 2\sqrt{2} = irrational$	B
2	$\sqrt{2} + \sqrt{3}\ remains\ irrational. But\ \sqrt{2} + \left(-\sqrt{2}\right) = 0\ becomes\ rational$	C
3	Coefficient of x^2 in the given polynomial is $-\frac{\pi}{2}$	C
4	$f(2) = 0\ implies\ f(2) = 2^3 - 3 \times 2 + 5a = 0;\ \therefore 8 - 6 + 5a = 0, So\ a = -\frac{2}{5}$	D
5	Any point in the 3rd quadrant has both coordinates negative.	D
6	It lies on the axis between 3rd quadrant and 4th quadrant.	B
7	Parallel to the x-axis	A
8	Both components have to be same. Therefore, (1, 1) is the answer	C
9	They are known as co-interior angles. They are supplementary.	B
10	Both x and y are equal. Because they are alternate interior angles. $\angle x = \angle y = 130^0$	C
11	The value of $\frac{3\sqrt{4\times3}}{6\sqrt{3\times3\times3}} = \frac{3\times2\times\sqrt{3}}{6\times3\times\sqrt{3}} = \frac{2}{6} = \frac{1}{3}$	D
12	To rationalise the denominator we have to multiply by $\frac{a-\sqrt{b}}{a-\sqrt{b}}$	D
13	The zero of the polynomial $p(x) = 9x + 4$ is $x = -\frac{4}{9}$	C
14	Area of an equilateral triangle = $\frac{\sqrt{3}}{4}a^2 = 16\sqrt{3}$. Therefore, $a^2 = 64, that\ is\ a = 8$ Perimeter of the triangle = 8+8+8=24 cm	B
15	S=$\frac{5+12+13}{2} = 15; Area = \sqrt{15(15-5)(15-12)(15-13)} = \sqrt{15 \times 10 \times 3 \times 2}$ $=\sqrt{900} = 30\ square\ centimetre$	B
16	The point which lies on the y-axis and whose ordinate 4 is (0, 4)	B
17	We use corresponding angles; vertically opposite angles; Now angles at the point on L2 is $= 37 + 58 + x = 180;\ \therefore x = 180 - 95 = 85^0$	B
18	An equation in two variables has infinitely many solutions.	D
19	In fourth quadrant the ordered pair is (+, -). Therefore, the statement is true In second quadrant the ordered pair is (-, +). Therefore, the statement is true Reason is not in support of Assertion	B
20	Assertion : TRUE, Reason: FALSE	C

21	Given $y = 3x$. Substitute this in the given equation we get $2x + 5(3x) = 17$. Therefore, $17x = 17$ becomes $x = \frac{17}{17} = 1$	1 1
22	PQRS to form a square, we have $S(4, 3)$. Show on the graph sheet 	2

23	$(3a + 2b + 4c)^2 = 9a^2 + 4b^2 + 16c^2 + 12ab + 16bc + 24ca$	2
OR	$P(x)$ is divided by $(x - a)$. Now $P(a) = a^3 - a \times a^2 + 6a - a = 5a$ The remainder is 5a.	1 1
24	Given $y = 3x + 20$. Two angles are not supplementary. So, $x + y = 180$ becomes $x + 3x + 20 = 180; 4x = 180 - 20 = 160. So, x = 40^0$	1 1
OR	To find 3 rational numbers between 3 and 4 we have to multiply and divide by 4 both the numbers. We get $\frac{12}{4}$ *and* $\frac{16}{4}$. In between we have $\frac{13}{4}, \frac{14}{4}, \frac{15}{4}$.	1 1
25	Draw a line through R parallel to PQ and ST. Angles at the vertex R are all supplementary. Use co-interior angles; (110, 70) and (130, 50). So, angle QRS = 60 degrees	1 1

26	Rationalize: $\frac{5}{\sqrt{5} - \sqrt{3}} \times \frac{\sqrt{5} + \sqrt{3}}{\sqrt{5} + \sqrt{3}} = \frac{5(\sqrt{5} + \sqrt{3})}{5 - 3} = \frac{5}{2}(\sqrt{5} + \sqrt{3})$	1 1 1
27	$x - 1$ is a factor. Therefore, put $x = 1$ in the polynomial. $P(1) = k(1)^2 - 3(1) + k = 0; 2k - 3 = 0; so, k = \frac{3}{2}$	1 1 1
OR	Write in perfect square form: $\left(\frac{5x}{2}\right)^2 - \left(\frac{y}{3}\right)^2 = \left(\frac{5x}{2} + \frac{y}{3}\right)\left(\frac{5x}{2} - \frac{y}{3}\right)$	1 1 1
28	To find the point on x-axis, put y = 0 in the equation. Therefore $2x = 12$ and so $x = 6. (6,0)$ To find the point on y-axis, put x = 0 in the equation. Therefore, $3y = 12$ and so $y = 4. (0,4)$  	1 1 1
29	In right triangle, $\angle y + 43 = 90; \therefore \angle y = 90 - 43 = 47^0$ Now $\angle x + 53 = 65 + 47$ exterior angle theorem; Therefore, $\angle x = 112 - 53 = 59^0$	1 1 1
30	Given $\angle BAE = \angle CAE. Using\ angles\ sum\ property, (\angle B + \angle C + \angle A = 180)$; Now $60 + 35 + \angle A = 180; \therefore \angle BAC = 180 - 95 = 85^0$ Further $\angle EAC + \angle ECA = \angle BEA; \therefore \angle BEA = 42.5 + 35 = 77.5$ In right triangle DAE, $\angle DAE + \angle DEA = 90; \therefore \angle DAE = 90 - 77.5 = 12.5^0$	1 1 1
31	$3x + 5x + 7x = 300;\ 15x = 300;\ x = 20$. Therefore, sides are $60, 100, 140$ *and* $s = 150$ Now $Area = \sqrt{150(150 - 60)(150 - 100)(150 - 140)} = \sqrt{150 \times 90 \times 50 \times 10}$ Area=$100\sqrt{5 \times 3 \times 3 \times 3 \times 5} = 1500\sqrt{3}\ m^2$	1 1 1
OR	Since AB || CD, sum of the co-interior angles is 180 degrees. Therefore, $y + 2y + y + 5y = 180$; so $9y = 180$; therefore, $y = 20$	1 1

SECTION – D

32	Perimeter of the triangle = $32\ cm$ Therefore , $s = 16, the\ third\ side = 32 - (8 + 11) = 13\ cm$ Area of the triangle = $\sqrt{s(s-a)(s-b)(s-c)} = \sqrt{16(16-8)(16-11)(16-13)}$ =$\sqrt{16 \times 8 \times 5 \times 3} = 8\sqrt{30}\ square\ centimetre$	1 1 1 1 1

33	In $\Delta ABC, \angle A + \angle B + \angle C = 180^0$; $\angle A + 2x + 2y = 180^0$; Therefore, $x + y = 90 - \frac{\angle A}{2}$. Given BO and CO are angle bisectors at vertices B and C respectively. Now in $\Delta BOC, \angle B + \angle BOC + \angle C = 180^0; or\ x + \angle BOC + y = 180$ Therefore, $\angle BOC = 180 - (x + y) = 180 - \left(90 - \frac{\angle A}{2}\right) = 90 + \frac{\angle A}{2}$. Hence proved	1 1 1 1 1
OR	Check $l \| \| m$ in each case. Figure (1);$126 + 44 = 170 \neq 180$; co-interior angles are not supplementary. False Figure (2); alternate interior angles are equal. Therefore, lines are parallel Figure (3); vertically opposite angles; co-exterior angles are supplementary. Because 123+57=180 Figure (4); vertically opposite angles; co-exterior angles are not supplementary. Because 98+72=170	1 1 1 1 1
34	These points $(1,2), (-1,-16)\ and\ (0,-7)$ satisfy the equation $y = 9x - 7$. Show them by substitution and confirm. Draw the graph of the equation and check these points Actually lie on the line.	1 1 1 1 1
35	Expansion of $\left(4 - \frac{x}{3}\right)^3 = 4^3 - 3 \times 4^2 \times \frac{x}{3} + 3 \times 4 \times \frac{x^2}{9} - \frac{x^3}{27} = 64 - 16x + \frac{4x^2}{3} - \frac{x^3}{27}$ Expansion of $\left(3a + \frac{b}{3}\right)^3 = (3a)^3 + 3 \times (3a)^2 \times \frac{b}{3} + 3 \times 3a \times \frac{b^2}{9} + \frac{b^3}{27}$ $=27a^3 + 9a^2b + ab^2 + \frac{b^3}{27}$	1 1 1 1 1
OR	Factorize: $1 + 64x^3 = (1 + 4x)(1 - 4x + 16x^2)$ Factorize: $a^3 - 2\sqrt{2}b^3 = \left(a - \sqrt{2}b\right)\left(a^2 + \sqrt{2}ab + 2b^2\right)$	2.5 2.5

SECTION – E

36a	Coordinates of Ashok's ball = $(3, 4)$	1
36b	Coordinates of Deepak's ball = $(-4, 4)$	1
36c	Abscissa of Deepa's ball = 2 Ordinate of Arjun's ball = -3	1 1
OR	Ashok's ball = (3, 4) in first quadrant Deepak's ball = (-4, 4) in second quadrant Arjun's ball = (-3, -3) in third quadrant Deepa's ball = (2, -3) in fourth quadrant	0.5 0.5 0.5 0.5
37a	Vertically opposite angles are equal. Therefore, $x = 4y = 4 \times 24 = 96^0$ On line AB, $4y + 60 + y = 180; or\ 5y = 180 - 60; 5y = 120\ or\ y = 24^0$	0.5 0.5
37b	On line AB, $4y + 60 + y = 180; or\ 5y = 180 - 60; 5y = 120\ or\ y = 24^0$	1
37c	Relation between y and z: $4y + 2z = 180; 96 + 2z = 180; 2z = 180 - 96 = 84^0$ Therefore, $z = 42; or\ z = y + 18$	1 1
OR	Set of angles forming supplementary angles are: $(4y, 2z), (2z, x), (x, y, 60)\ and\ (y, 60, 4y)$ There are 4 such groups that could form supplementary angles on the whole	1 1
38a	Option (B) is not a polynomial. In second term the exponent on the variable is negative	1
38b	It is a quadratic polynomial as its degree is 2.	1
38c	Now $p(1) = 4(1)^3 + 3(1)^2 - 4(1) + k = 0\ implies\ k = -3$	2
OR	The factors of polynomial $x^2 - 1\ are\ (x - 1) and\ (x + 1)$	2