INDIAN SCHOOL AL WADI AL KABIR

Post Mid-Term Marking Scheme (2023-24)

Class: IX	Sub: MATHEMATICS (Subject Code 041)	Max Marks: 80
Date: 03/12/2023	(SET 1)	Time:3 hours

General Instructions:

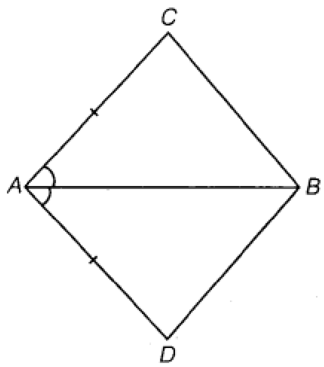
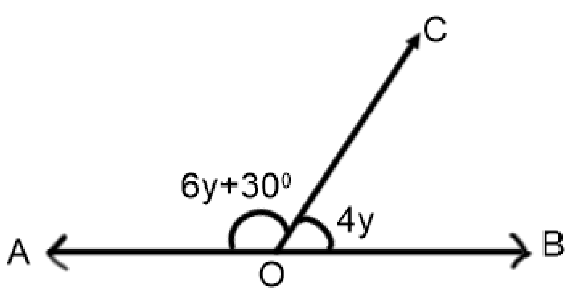
1. This question paper has 5 sections- A, B, C, D and E.
2. Section A- PART-1 (MCQ) comprises of 18 questions of 1 mark each
3. Section A- PART-2 (Assertion and Reason) comprises of 2 questions of 1 mark each.
4. *Section B*- (Short answer) comprises of 5 questions of 2mark each.
5. Section *C*- (Long answer) comprises of 6 questions of 3 marks each.
6. Section D- (Long answer) comprises of 4 questions of 5 marks each.
7. Section E – comprises of 3 Case study-based questions of 4 marks each with sub parts of the values 1, 1 and 2 marks each respectively.
8. All Questions are compulsory. However, an internal choice has been provided for certain questions.

Section A

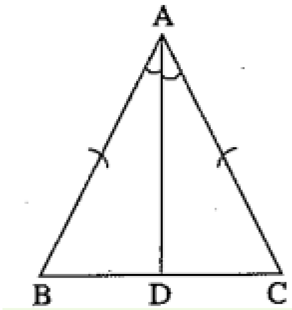
PART-1 MCQ (1 mark each)

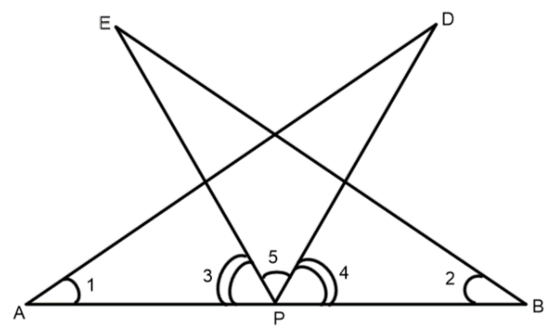
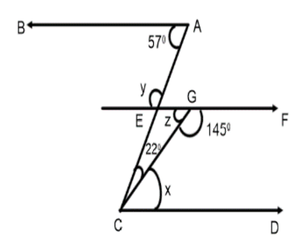
Q.1.	The coefficient of x in the expansion of $(x + 3)^3$ is _________.							
	A		**B**		**C**		**D**	27
Q.2.	The points whose abscissa and ordinate have different signs will be in:							
	A	II and IV quadrant	**B**		**C**		**D**	
Q. 3.	On dividing $6\sqrt{27}$ by $2\sqrt{3}$, we get:							
	A		**B**		**C**	9	**D**	

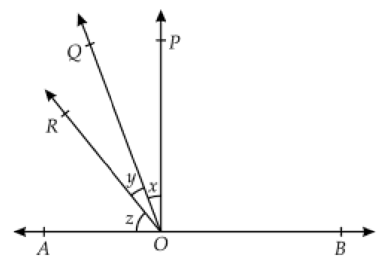
Q. 4.	Degree of the zero polynomial is _________.							
	A		**B**	Not defined	**C**		**D**	
Q. 5.	The value of $(4)^{\frac{3}{2}} \times (4)^{\frac{5}{2}}$ is ____________.							
	A	256	**B**		**C**		**D**	
Q. 6.	Euclid stated that “the whole is greater than the part” in the form of:							
	A		**B**		**C**	Axiom	**D**	
Q. 7.	Which of the following is an irrational number?							
	A		**B**		**C**		**D**	$\sqrt{5} + \sqrt{9}$
Q. 8.	In a frequency distribution table, the class interval **140 – 150** has a frequency **15**. Then the point on the frequency polygon corresponding to this is __________.							
	A		**B**	$(145,15)$	**C**		**D**	
Q. 9.	In how many chapters did Euclid divide his famous treatise “The Elements”?							
	A	13	**B**		**C**		**D**	
Q.10.	The perpendicular distance of the point P(4,3) from x-axis is:							
	A		**B**		**C**	3	**D**	
Q.11.	If AB = QR, BC = PR and CA = PQ, then:							
	A		**B**		**C**		**D**	$\Delta CBA \cong \Delta PRQ$
Q.12.	Two angles which are supplementary are in the ratio $2:7$. Then the measures of angles are:							
	A	$40°, 140°$	**B**		**C**		**D**	
Q.13.	If the class marks of a continuous frequency distribution are 10, 20, 30, 40...., then the class interval representing the class mark 30 is__________.							
	A		**B**	$25 - 35$	**C**		**D**	

<table>
<tr><td>Q.14.</td><td colspan="8">In the given figure, the congruency criterion used in proving $\Delta ACB \cong \Delta ADB$ is:

</td></tr>
<tr><td></td><td>A</td><td>SAS</td><td>B</td><td></td><td>C</td><td></td><td>D</td><td></td></tr>
<tr><td>Q.15.</td><td colspan="8">The length of each side of an equilateral triangle having an area of $9\sqrt{3}\ cm^2$ is ________.</td></tr>
<tr><td></td><td>A</td><td></td><td>B</td><td>6 cm</td><td>C</td><td></td><td>D</td><td></td></tr>
<tr><td>Q.16.</td><td colspan="8">The linear equation $4x - 5y = 12$ has ___________.</td></tr>
<tr><td></td><td>A</td><td></td><td>B</td><td></td><td>C</td><td>infinitely many solutions</td><td>D</td><td></td></tr>
<tr><td>Q.17.</td><td colspan="8">In the given figure, if $\angle BOC = 4y\ and\ \angle AOC = 6y + 30°$. What will be the value of y to make AOB a straight line?

</td></tr>
<tr><td></td><td>A</td><td>15°</td><td>B</td><td></td><td>C</td><td></td><td>D</td><td></td></tr>
<tr><td>Q.18.</td><td colspan="8">If 9 is the class mark and 6 is the lower limit of a class in a continuous frequency distribution, then the upper limit of the class is____________.</td></tr>
<tr><td></td><td>A</td><td></td><td>B</td><td></td><td>C</td><td></td><td>D</td><td>12</td></tr>
<tr><td>Q.19</td><td colspan="8">(c) Assertion (A) is true but Reason (R) is false.</td></tr>
</table>

Q.20	(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
	Section B S.A.(2 mark each)
Q.21.	**Sol.** a) Let $p(x) = 3x^3 + x^2 - 20x + 12$. $x - 2 = 0 \Rightarrow x = 2$ By factor theorem, $(x - 2)$ is a factor of $p(x)$, if $p(2) = 0$. $p(2) = 3(2)^3 + (2)^2 - 20 \times 2 + 12$ (1m) $= 24 + 4 - 40 + 12$ $= -12 + 12 = 0$ (1m) Hence $(x - 2)$ is a factor of $(3x^3 + x^2 - 20x + 12)$. OR **Sol.** b) Given : $p(x) = x^2 - kx + 2k$ Since $(x - 4)$ is a factor of the given polynomial $p(x)$, then $p(4) = 0$ $\Rightarrow (4)^2 - k(4) + 2k = 0$ (1m) $\Rightarrow 16 - 4k + 2k = 0$ $\Rightarrow -2k = -16$ $\Rightarrow k = \frac{-16}{-2} = 8$ (1m)
Q.22.	**Sol.** i. Number of teachers aged (45-50) – Number of teachers aged (20-25) $= 5 - 4 = 1$ (1m) ii. $30 - 35, 6$ (1m)
Q.23.	**Sol.** 2x = 50 2x ÷ 2 = 50 ÷ 2 (divide by 2 on both sides) x = 25. (1m) Axiom: Things which are halves of the same things are equal to one another. (1m)

Q.24.	<u>**Sol.**</u> i. The points identified by the coordinates (11,5) – C and (3,5) – A (½ + ½) ii. Find the sum of abscissa of point B and abscissa of point D. $Abscissa\ of\ B = 7$ $Ordinate\ of\ D = 1$ $Sum = 7 + 1 = 8.$ (1m)
Q.25.	a) Number line (1m) perpendicular + locating $\sqrt{5}$ on number line (1m) OR <u>**Sol.**</u> b) Let $x = 1.\overline{28}$ $x = 1.282828 \ldots$ …………(i) Multiply equation (i) by 100 $100x = 128.2828 \ldots$ …………(ii) (½ m) Subtracting equation (i) from equation (ii) $100x - x = 128.282828\ldots - 1.282828 \ldots$ $\therefore 99x = 127$ (1m) $\Rightarrow x = \frac{127}{99}$ (½ m)
	Section C S.A.(3 mark each)
Q.26.	<u>**Sol.**</u> a) Given: An isosceles triangle ABC, where AB = AC (½ m) To prove: $\angle B = \angle C$ Construction: Draw the bisector of ∠A Let D be the point of intersection of this bisector of $\angle A$ and BC. Therefore, by construction $\angle BAD = \angle CAD$. Proof: 

	In ΔBAD and ΔCAD, AB = AC (Given) ∠BAD = ∠CAD (By construction) AD = AD (Common side in both triangle) So, ΔBAD ≅ ΔCAD (By SAS rule) (2m) $\therefore \angle ABD = \angle ACD$ (CPCT) So, ∠B = ∠C (½ m) Hence proved. **OR**  **<u>Sol.</u>** b) Given : $\angle BAD = \angle ABE$ $\angle EPA = \angle DPB$ To prove: (i) $\Delta DAP \cong \Delta EBP$ (ii) AD = BE. Proof: (i) In Δ DAP and Δ EBP, AP = BP (P is the mid-point of AB) $\angle 1 = \angle 2$ (given) $\angle 3 = \angle 4$ (given) $\angle 3 + \angle 5 = \angle 4 + \angle 5$ ∠ APD = ∠ BPE ∴ Δ DAP ≅ Δ EBP (ASA congruence) (2 ½ m) (ii) AD = BE (CPCT) (½ m)
Q.27.	**<u>Sol.</u>** a) $y = 180° - 57° (co\ interior\ angles, \text{AB} \parallel EF)$ $= 123°$ (1m) $z = 180° - 145° (linear\ pair) = 35°$ (1m) 

	$x + 22° = 57°(alternate\ interior\ angles, \text{AB} \parallel CD)$ $x = 57° - 22° = 35°$ (1m) **OR** **Sol.** b) Given, $PO \perp AB$.  $\Rightarrow \angle POA = 90°$ Let the angles $x = a,\ y = 3a,\ z = 5a$ $so, a + 3a + 5a = 90°$ $\Rightarrow 9a = 90°$ $\Rightarrow a = \frac{90}{9} = 10°$ (1 ½ m) $\therefore x = 10°$ $y = 3 \times 10° = 30°$ $z = 5 \times 10° = 50°$ (1 ½ m)
Q.28.	**Sol.** Axis – (½ m) Plotting the points P, Q, R, S – (½ m each) Identify PQRS – Rectangle - (½ m)
Q.29.	**Sol.** Each postulate- 1m. $(1m \times 3 = 3m)$
Q.30.	**Sol.** $S = \frac{200+240+360}{2} = 400$ m $(S - a) = (400 - 200) = 200\ m$ $(S - b) = (400 - 240) = 160\ m,$ $(S - c) = (400 - 360) = 40\ m$ (1m) $Area = \sqrt{S(S-a)(S-b)(S-c)}$ $= \sqrt{400 \times 200 \times 160 \times 40}$ $= 16000\sqrt{2}\ m^2$ (1m) Cost of ploughing 1 m^2 = ₹ 5. Cost of ploughing $16000\sqrt{2}\ m^2$ = ₹ $5 \times 16000\sqrt{2}$ = ₹ $80{,}000\sqrt{2}$ (1m)

Q.31.	**<u>Sol.</u>** Axis (½ m) Solutions + Plotting (2m) Joining points (½ m)
	Section D L.A.(5 mark each)
Q. 32.	**<u>Sol.</u>** a) $p(x) = x^3 + x^2 - 4x - 4$ $factors\ of\ (-4) = \pm 1, \pm 2, \pm 4$ $p(-1) = (-1)^3 + (-1)^2 - 4 \times (-1) - 4 = 0$ $\therefore p(-1) = 0,$ (1 ½ m) $\Rightarrow (x + 1) is\ a\ factor\ of\ p(x)$ $\begin{array}{r\|rrrr} -1 & 1 & 1 & -4 & -4 \\ & 0 & -1 & 0 & 4 \\ \hline & 1 & 0 & -4 & 0 \end{array}$ → remainder (1 ½ m) $x^2 - 4$ (½ m) $p(x) = (x + 1)(x^2 - 4)$ $x^2 - 4 = (x + 2)(x - 2)$ (1m) $\Rightarrow p(x) = (x + 1)(x + 2)(x - 2)$ (½ m) **OR** **<u>Sol.</u>** b) $p(2) = (2)^4 - 3(2)^2 + 2 \times 2 + 5$ $= 16 - 12 + 4 + 5 = 13$ (1m) $p(1) = (1)^4 - 3(1)^2 + 2 \times 1 + 5$ $= 1 - 3 + 2 + 5 = 5$ (1m) $p(-1) = (-1)^4 - 3(-1)^2 + 2 \times (-1) + 5$ $= 1 - 3 - 2 + 5 = 1$ (1m) $p(0) = (0)^4 - 3(0)^2 + 2 \times 0 + 5 = 5$ (1m) $p(2) + p(1) + p(-1) - p(0) = 13 + 5 + 1 - 5 = 14$ (1m)

Q. 33.	**Sol.** a) Histogram – (3m), frequency polygon- (2m) OR b)

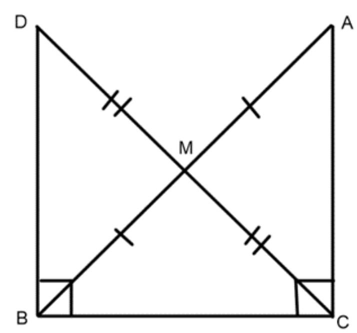
Class interval	Frequency	Class width	Adjusted frequency
0-10	6	10	$\frac{10}{10}\times 6 = 6$
10-30	28	20	$\frac{10}{20}\times 28 = 14$
30-60	12	30	$\frac{10}{30}\times 12 = 4$
60-70	20	10	$\frac{10}{10}\times 20 = 20$

Table –(2m) , Histogram – (3m)

Q.34. **Sol.** Given: $\angle C = 90°, \angle B = 90°$

M is the mid-point of hypotenuse AB

DM = CM.



To prove:

(i) $\Delta AMC \cong \Delta BMD.$

(ii) $\angle ACM = \angle BDM.$

(iii) $\Delta DBC \cong \Delta ACB.$

(iv) $AB = DC.$

Proof:

(i) In ΔAMC and ΔBMD,

AM = BM (M is the mid - point of AB)

∠AMC = ∠BMD (Vertically opposite angles)

CM = DM (Given)

	∴ ΔAMC ≅ ΔBMD (By SAS congruence rule) AC = BD (By CPCT) (2m) (ii) ∠ACM = ∠BDM (By CPCT from (i)) (½ m) (iii) In ΔDBC and ΔACB, DB = AC (Already proved in (i)) ∠DBC = ∠ACB = 90° (Given) BC = CB(Common) ∴ Δ DBC ≅ Δ ACB (SAS congruence rule) (2m) (iv) $AB = DC$ (By CPCT from (iii)) (½ m)
Q.35.	**Sol.** $\frac{\sqrt{11}-\sqrt{7}}{\sqrt{11}+\sqrt{7}} \times \frac{\sqrt{11}-\sqrt{7}}{\sqrt{11}-\sqrt{7}} = \frac{(\sqrt{11}-\sqrt{7})^2}{11-7}$ (1m) $= \frac{(\sqrt{11})^2-2\times\sqrt{11}\times\sqrt{7}+(\sqrt{7})^2}{4} = \frac{18-2\sqrt{77}}{4}$ (1m) $\frac{\sqrt{11}+\sqrt{7}}{\sqrt{11}-\sqrt{7}} \times \frac{\sqrt{11}+\sqrt{7}}{\sqrt{11}+\sqrt{7}} = \frac{(\sqrt{11}+\sqrt{7})^2}{11-7}$ (1m) $= \frac{(\sqrt{11})^2+2\times\sqrt{11}\times\sqrt{7}+(\sqrt{7})^2}{4} = \frac{18+2\sqrt{77}}{4}$ (1m) $\frac{\sqrt{11}-\sqrt{7}}{\sqrt{11}+\sqrt{7}} + \frac{\sqrt{11}+\sqrt{7}}{\sqrt{11}-\sqrt{7}} = \frac{18-2\sqrt{77}}{4} + \frac{18+2\sqrt{77}}{4} = \frac{18-2\sqrt{77}+18+2\sqrt{77}}{4} = \frac{36}{4} = 9$ (1m)
	Section E **CASE STUDY BASED QUESTIONS (4 mark each)**
Q.36.	**CASE STUDY-1** i. Let, the amount contributed by Lata = ₹ x the amount contributed by Meena = ₹ y Then amount contributed by Lata and Meena for Prime Minister's Relief Fund = ₹$(x + y)$ ∴ The required linear equation is $\mathbf{x + y = 240}$ (1m)

ii. We have, $x + y = 240$

$x = 124,$

then $y = 240 - 124 = 116$

$\therefore$ the amount contributed by Meena is ₹116. (1m)

iii. a) $3y = 7$

$\Rightarrow 0.x + 3y - 7 = 0$ is in the form of $ax + by + c = 0$ where, (1m)

$a = 0, b = 3, c = -7.$ (1m)

OR

b) $(2k - 3, k + 2) \Rightarrow x = (2k - 3), y = k + 2$

$2x + 3y + 15 = 0$

$\Rightarrow 2(2k - 3) + 3(k + 2) + 15 = 0$

$\Rightarrow 4k - 6 + 3k + 6 + 15 = 0$ (1m)

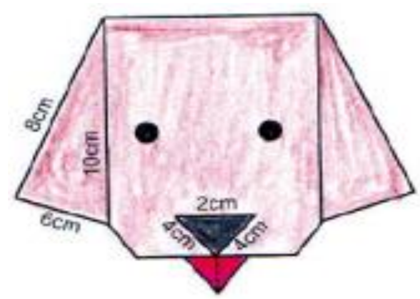
$\Rightarrow 7k + 15 = 0$

$\Rightarrow 7k = -15$

$\Rightarrow k = \frac{-15}{7}$ (1m)

Q.37.

CASE STUDY-II:



(i) a) $S = \frac{8+10+6}{2} = 12cm$

$(s - a) = (12 - 8) = 4\ cm,$

$(s - b) = (12 - 10) = 2\ cm,$

$(s - c) = (12 - 6) = 6\ cm$ (1m)

$Area = \sqrt{S(S-a)(S-b)(S-c)}$

$= \sqrt{12 \times 4 \times 2 \times 6} \quad = 24\ cm^2$ (1m)

Therefore, area of the paper used for making each ear of the puppy $= 24\ cm^2$.

OR

b) Let the sides of the triangle be,

$a = 3x, b = 5x, c = 7x.$

$then\ a + b + c = 300 \quad \Rightarrow 3x + 5x + 7x = 300\ \ cm$

$\Rightarrow 15x = 300cm$

$\Rightarrow x = \frac{300}{15} = 20\ cm \qquad \therefore a = 60\ cm,\ \ b = 100\ cm,\ \ c = 140\ cm$ (1m)

Given, $area = 5\sqrt{3} \times perimeter$

$\Rightarrow area = 5\sqrt{3} \times 300 = 1500\sqrt{3}$ cm^2 (1m)

(ii) Semi-perimeter, $S = \frac{a+b+c}{2} = \frac{4+4+2}{2} = \frac{10}{2} = 5\ cm$ (1m)

(iii) Area of the triangle = 18 cm^2

Let the length of each equal sides be 'a'

Area of the triangle = $\frac{1}{2} \times b \times h$

$\Rightarrow 18 = \frac{1}{2} \times \mathrm{a} \times \mathrm{a}$

$\Rightarrow 18 = \frac{1}{2} \times a^2$

$\Rightarrow 36 = a^2 \quad \Rightarrow \mathrm{a} = 6$

Length of each equal sides = 6 cm (1m)

Q.38. **CASE STUDY-III**

(i) a) Using the identity, $(\mathrm{a} - \mathrm{b})^3 = (a)^3 - 3(a)^2 b + 3a(b)^2 - (b)^3$

$(4\mathrm{a} - 2\mathrm{b})^3 = (4a)^3 - 3 \times (4a)^2 \times 2b + 3 \times 4a \times (2b)^2 - (2b)^3$ (1m)

$= 64(a)^3 - 3 \times 16(a)^2 \times 2b + 3 \times 4a \times 4(b)^2 - (2b)^3$

$= 64a^3 - 96a^2 b + 48ab^2 - 8b^3$ (1m)

OR

b) Using the identity, $(a + b + c)^2 = a^2 + b^2 + c^2 + 2\ ab + 2\ bc + 2\ ac$

$(x + y + z)^2 = (x)^2 + (y)^2 + z^2 + (2\times x \times y) + (2 \times y \times z) + (2\times x \times z)$

$(9)^2 = x^2 + y^2 + z^2 + 2\ [xy + yz + xz]$ (1m)

$(9)^2 = x^2 + y^2 + z^2 + 2 \times 7$

$x^2 + y^2 + z^2 = (9)^2 - 2 \times 7$

$= 81 - 14$

$= 67$ (1m)

(ii) Using identity, $x^2 - y^2 = (x + y)(x - y)$

$\frac{81}{16}x^2 - \frac{4}{25}y^2 = \left(\frac{9}{4}x\right)^2 - \left(\frac{2}{5}y\right)^2 = \left(\frac{9}{4}x + \frac{2}{5}y\right)\left(\frac{9}{4}x - \frac{2}{5}y\right)$ (1m)

(iii) $Let\ x = 10, y = -7, z = -3$

$x + y + z = 10 + (-7) + (-3) = 0$

$\therefore x^3 + y^3 + z^3 = 3xyz$

$\Rightarrow (10)^3 + (-7)^3 + (-3)^3 = 3 \times 10 \times -7 \times -3 = 630$ (1m)