MARKING SCHEME MATHEMATICS MODEL PAER CLASS 9

SCORING KEYS SECTION: A (MCQs)

Marks: 15

MCQs No.	Correct Option
1	B
2	B
3	A
4	D
5	C
6	A
7	A
8	D
9	B
10	B
11	A
12	D
13	C
14	B
15	A

RUBRICS

SECTION- B

Question No.2- Attempt any Eight of the following.

i. If A= $\begin{bmatrix} 2 & 1 \\ 0 & 7 \end{bmatrix}$ and B= $\begin{bmatrix} -5 & 7 \\ 9 & 2 \end{bmatrix}$ are matrices show that A+B=B+A .

Checking Hints:

Total Marks:4=1+1+1+1

Solution:

A+B= $\begin{bmatrix} 2 & 1 \\ 0 & 7 \end{bmatrix} + \begin{bmatrix} -5 & 7 \\ 9 & 2 \end{bmatrix}$

A+B= $\begin{bmatrix} 2-5 & 1+7 \\ 0+9 & 7+2 \end{bmatrix}$ 1

A+B= $\begin{bmatrix} -3 & 8 \\ 9 & 9 \end{bmatrix} \longrightarrow$ ➊ 1

Now,

B+A= $\begin{bmatrix} -5 & 7 \\ 9 & 2 \end{bmatrix} + \begin{bmatrix} 2 & 1 \\ 0 & 7 \end{bmatrix}$

B+A= $\begin{bmatrix} -5+2 & 7+1 \\ 9+0 & 2+7 \end{bmatrix}$ 1

B+A= $\begin{bmatrix} -3 & 8 \\ 9 & 9 \end{bmatrix} \longrightarrow$ ➋

From eq ➊ and eq ➋, it is proved: A+B=B+A. 1

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ii. Find the product $(a-1)(a^2+a+1)$

Checking Hints:

Total Marks:4=1+1+1+1

Solution:

$(a-1)(a^2+a+1)$

By Using Formula: $\left[(a-b)(a^2+ab+b^2)= a^3-b^3\right]$ 1

$(a-1)(a^2+(a)(1)+1^2)$ 1

$(a)^3-(1)^3$ 1

a^3-1 1

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iii. Factorize $4x^4+81$

Checking Hints:

Total Marks:4=1+1+1+1

Solution:

$(2x^2)^2+ (9)^2+2(2x^2)(9)-2(2x^2)(9)$ 1

$(2x^2+ 9)^2 -36 x^2$ 1

$(2x^2+ 9)^2-(6 x)^2$ 1

$(2x^2+ 9+6 x) (2x^2+ 9-6 x)$ ❖ $(a+b)(a-b)= a^2-b^2$

$(2x^2+ 6 x+9) (2x^2-6 x+ 9)$ 1

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iv. Divide $Z_1=2+3i$, by $Z_2=5-i$

Checking Hints:

Total Marks:4=1+1+1+1

Solution:

$\frac{Z1}{Z2} = \frac{2+3i}{5-i}$

$\frac{Z1}{Z2} = \frac{2+3i}{5-i} X \frac{5+i}{5+i}$ 1 Multiplying and Dividing by(5+i)

$$\frac{Z1}{Z2} = \frac{10+2i+15i+3i^2}{5^2-i^2} \longrightarrow 1$$

$$\frac{Z1}{Z2} = \frac{10+17i+3(-1)}{25-(-1)} \longrightarrow 1 \qquad ❖(i^2 = -1)$$

$$\frac{Z1}{Z2} = \frac{10+17i-3}{25+1}$$

$$\frac{Z1}{Z2} = \frac{10-3+17i}{26}$$

$$\frac{Z1}{Z2} = \frac{7+17i}{26}$$

$$\frac{Z1}{Z2} = \frac{7}{26} + \frac{17}{26}i \longrightarrow 1$$

v. If x = $\sqrt{3} - \sqrt{2}$, find the value of $x - \frac{1}{x}$.

Checking Hints:

Total Marks:4=1+1+1+1

Solution:

$$x = \sqrt{3} - \sqrt{2}$$

$$\frac{1}{x} = \frac{1}{\sqrt{3}-\sqrt{2}}$$

$$\frac{1}{x} = \frac{1}{\sqrt{3}-\sqrt{2}} \times \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}} \longrightarrow 1$$

$$\frac{1}{x} = \frac{\sqrt{3}+\sqrt{2}}{(\sqrt{3})^2-(\sqrt{2})^2}$$

$$\frac{1}{x} = \frac{\sqrt{3}+\sqrt{2}}{3-2} \longrightarrow 1$$

$$\frac{1}{x} = \frac{\sqrt{3}+\sqrt{2}}{1}$$

$$\frac{1}{x} = \sqrt{3} + \sqrt{2} \longrightarrow 1$$

Now,

$$x - \frac{1}{x} = \sqrt{3} - \sqrt{2} - (\sqrt{3} + \sqrt{2})$$

$$x - \frac{1}{x} = \cancel{\sqrt{3}} - \sqrt{2} - (\cancel{\sqrt{3}} + \sqrt{2})$$

$$x - \frac{1}{x} = -2\sqrt{2} \longrightarrow 1$$

vi. Find L.C.M by factorization of x+y, x^2-y^2

Checking Hints:

Total Marks:4=1+1+1+1

Solution:

$$x + y = x + y \longrightarrow 1$$

$$x^2 - y^2 = (x+y)(x-y) \longrightarrow 1$$

$$\text{L.C.M=Common Factors x Non-Common Factors} \longrightarrow 1$$

$$= (x+y)\text{x}(x-y)$$

$$= (x+y)(x-y)$$

$$\text{L.C.M}=x^2 - y^2 \longrightarrow 1$$

vii. Sum of three consecutive integers is 39, find the integers

Checking Hints:

Total Marks:4=1+1+1+1

Solution:

1^{st} Positive Integer = x
2^{nd} Positive Integer = x+1
3^{rd} Positive Integer = x+2 $\rightarrow$ 1

According to given Condition:

$x + (x+1) + (x+2) = 39$ $\rightarrow$ 1

$x + x + x + 1 + 2 = 39$

$3x + 3 = 39$

$3x = 39 - 3$

$3x = 36$

$x = \frac{36}{3}$

$x = 12$ $\rightarrow$ 1

1^{st} Positive Integer = x=12
2^{nd} Positive Integer = x+1=12+1=13
3^{rd} Positive Integer = x+2=12+2=14 $\rightarrow$ 1

viii. Find the solution set of the equation 6x-5=2x+9

Checking Hints:

Total Marks:4=1+1+1+1

Solution:

$6x - 5 = 2x + 9$

$6x - 2x = 9 + 5$ $\rightarrow$ 1

4x=14

$\frac{4x}{4} = \frac{14}{4}$ $\rightarrow$ 1

$x = \frac{7}{2}$ $\rightarrow$ 1

Solution Set = $\{\frac{7}{2}\}$ $\rightarrow$ 1

ix. Show that A(-1, 2), B(7, 5) and C(2,6) are the vertices of scalene triangle.

Checking Hints:

Total Marks:4=1+1+1+1

Solution:

$|\overline{AB}| = \sqrt{[7-(-1)]^2 + (5-2)^2}$

$|\overline{AB}| = \sqrt{[7+1]^2 + (3)^2}$

$|\overline{AB}| = \sqrt{8^2 + 9}$

$|\overline{AB}| = \sqrt{64 + 9}$

$|\overline{AB}| = \sqrt{73} \longrightarrow$ ❶ $\rightarrow$ 1

Now,

$$|\overline{BC}| = \sqrt{(2-7)^2 + (6-5)^2}$$
$$|\overline{BC}| = \sqrt{(-5)^2 + (1)^2}$$
$$|\overline{BC}| = \sqrt{25+1}$$
$$|\overline{BC}| = \sqrt{26} \longrightarrow ❷$$

1

And,

$$|\overline{CA}| = \sqrt{(-1-2)^2 + (2-6)^2}$$
$$|\overline{CA}| = \sqrt{(-3)^2 + (-4)^2}$$
$$|\overline{CA}| = \sqrt{9+16}$$
$$|\overline{CA}| = \sqrt{25}$$
$$|\overline{CA}| = 5 \longrightarrow ❸$$

1

From eq ❶,❷ and ❸.

$$|\overline{AB}| \neq |\overline{BC}| \neq |\overline{CA}|$$

1

Hence points A,B, and C are the vertices of scalene triangle.

x. Prove that $\log_b pq = \log_b p + \log_b q$.

Checking Hints:

Total Marks:4=1+1+1+1

Solution:

Let,

$$\log_b p = x \longrightarrow ❶ \text{ and } \log_b q = y \longrightarrow ❷$$

1

In Exponential Form:

$b^x = p$ and $b^y = q$

1

Now,

$$pq = b^x \times b^y$$
$$pq = b^{x+y} \text{ or}$$
$$b^{x+y} = pq$$

1

Now in logarithmic form:

$$\log_b pq = x + y$$
$$\log_b pq = \log_b p + \log_b q$$

1

❖(by eq ❶ and ❷)

xi. If two angles of a triangle are congruent then the sides opposite to them are also congruent.

Checking Hints:

Total Marks:4=1+1+1+1

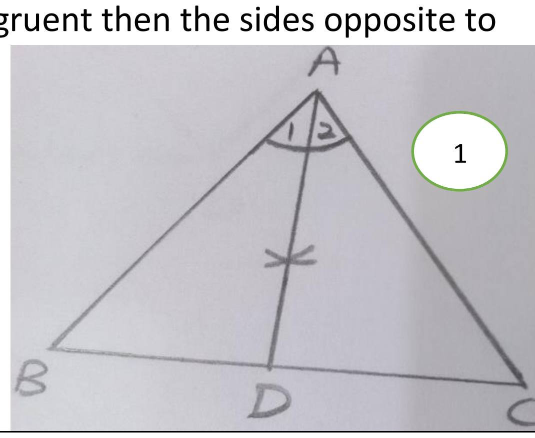
Solution:

In $\Delta ABC, \angle B \cong \angle C$

To prove:

$$\overline{AB} \cong \overline{AC}$$

1



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<u>Construction</u>:

Draw bisector of <A cutting $\overline{BC}$ at point D.

Proof:

Statements	Reasons
In $\Delta ABD \leftrightarrow \Delta ACD$	
$\overline{AD} \cong \overline{AD}$	Common Side
$< 1 \cong < 2$	Construction
$< B \cong < C$	Given
$\Delta ABC \cong \Delta ACD$	A.A.S ≅ A.A.S 2
Hence $\overline{AB} \cong \overline{AC}$	Corresponding sides of congruent triangles

xii. Prove that each diagonal of a parallelogram divides it into two congruent triangles.

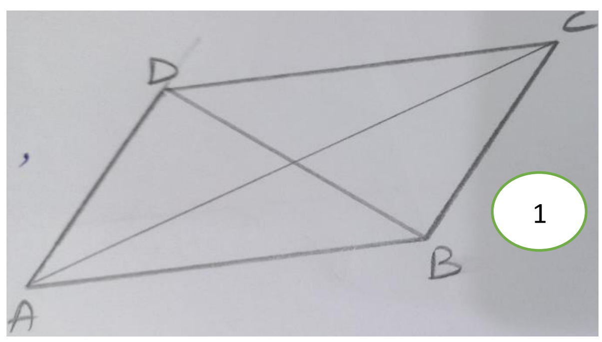
Checking Hints:

Total Marks:4=1+1+1+1

Solution:

In parallelogram ABCD

$\overline{AC}$ and $\overline{BD}$ are two diagonals.



To Prove:

1 $\Delta ABC \cong \Delta ACD$

& $\Delta ABD \cong \Delta BCD$

Proof:

Statements	Reasons
In $\Delta ABC \leftrightarrow \Delta ADC$	
$\overline{AC} \cong \overline{AC}$	Common Side
$\overline{AB} \cong \overline{CD}$	Opposite sides of the parallelogram
$\overline{AD} \cong \overline{BC}$	Opposite sides of the parallelogram
$\Delta ABC \leftrightarrow \Delta ADC$	S.S.S ≅ S.S.S
Hence Diagonal $\overline{AC}$ divides parallelogram ABCD into two congruent triangles ΔABC and ΔADC. Similarly diagonal $\overline{BD}$ divides the parallelogram ABCD into two congruent triangles ΔABD and ΔBCD.	2

SECTION-C

Attempt any 4 of the following.

Q2. The bisectors of angles of triangle are concurrent.

Checking Hints:

Total Marks:6=1+1+1+1+1+1

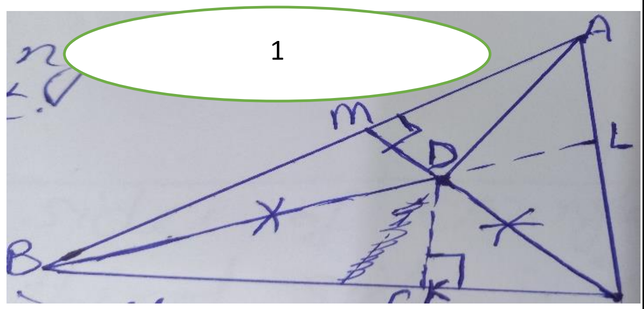
Solution:

Given:

$\overline{BD}$ and $\overline{CD}$ are the bisectors of $\angle$B and $\angle$C of ΔABC, which intersect each other at D. D is joined to A.

To Prove:

1 $\overline{DA}$ is the bisector of $\angle$A.



Construction:

1 From D, draw $\overline{DK} \perp \overline{BC}$ and $\overline{DL} \perp \overline{CA}$ and $\overline{DM} \perp \overline{AB}$.

Proof:

3

Statements	Reasons
Since D lies on the bisector of $\angle$B.	Given
$\overline{DK} \cong \overline{DM} \longrightarrow$ ❶	Distance of D from the arms of $\angle$B.
Similarly, D lies on the bisector of $\angle$C.	
$\overline{DK} \cong \overline{DL} \longrightarrow$ ❷	Distance of D from the arms of $\angle$C.
Hence $\overline{DL} \cong \overline{DM}$	From ❶ and ❷.
i.e. D lies on the bisector of $\angle$A. OR AD is the bisector of $\angle$A. OR the bisectors of the angles of the angles of the Triangle ABC are concurrent.	D is equidistant from L and M.

Q3. The lengths of two sides of triangle are 11 and 23 and the length of third side is X. Find the range of possible values of X.

Checking Hints:

Total Marks: 6=1+1+1+1+1+1

Solution:

We use triangle inequality theorem to write and solve inequalities. 1

Small Values	Large Values

2 2

x+11>23 x>23-11 x>12	11+23>x 34>x X<34

1 The length of the third side must be greater than 12 and less than 34.

Q4. If a line segment intersects the two sides of a triangle in the same ratio then it is parallel to third side.

Checking Hints:

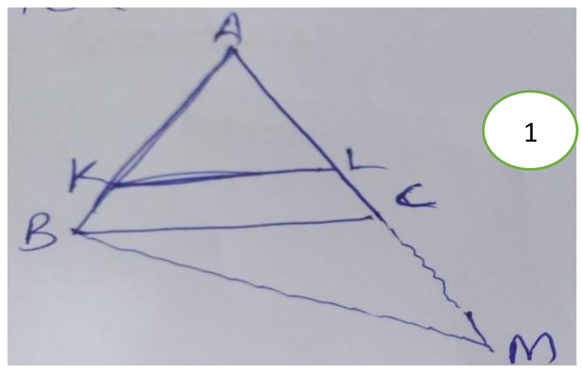
Total Marks: 6=1+1+1+1+1+1

Solution:

1 **Given:**

$\overleftrightarrow{KL}$ intersects two sides $\overline{AB}$ and $\overline{AC}$ of ΔABC at K and L such that:

$$\frac{m\overline{AK}}{m\overline{KB}} = \frac{m\overline{AL}}{m\overline{LC}}$$



1

1 To Prove:

$\overline{KL} \parallel \overline{BC}$

Proof:

3

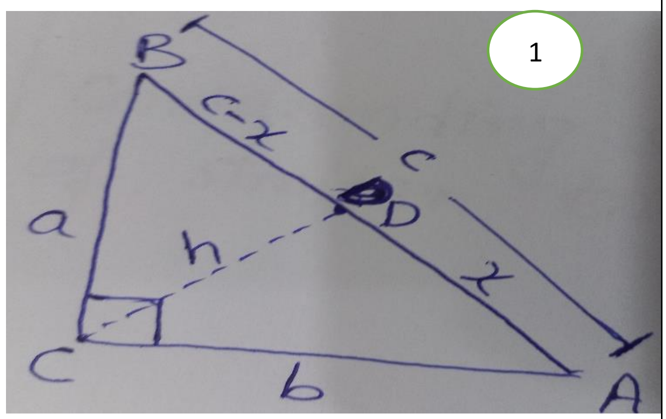
Statements	Reasons
Suppose $\overleftrightarrow{KL}$ is not parallel to $\overline{BC}$, then let $\overline{BM}$ be drawn through B, parallel to $\overline{KL}$, meeting $\overrightarrow{AC}$ at M.	
$\frac{m\overline{AK}}{m\overline{KB}} = \frac{m\overline{AL}}{m\overline{LM}} \longrightarrow$ ❶	Proportional segments are cut by line parallel to one side of the triangle.
But $\frac{m\overline{AK}}{m\overline{KB}} = \frac{m\overline{AL}}{m\overline{LC}} \longrightarrow$ ❷	Given
$\frac{m\overline{AL}}{m\overline{LM}} = \frac{m\overline{AL}}{m\overline{LC}}$	From ❶ and ❷.

m$\overline{LM}$= m$\overline{LC}$ This is possible only when C and M coincide, hence. Hence our supposition is wrong and $\overline{KL} \parallel \overline{BC}$.	Denominators of equal fractions.

Q5. In a right-angled triangle, the square of the length of hypotenuse is equal to the sum of the squares of the lengths of the other two sides.

Checking Hints:

Total Marks:6= 1+1+ 1 +1+1+1



Solution:

Given

ABC is a right-angled triangle,
having right angle at ‘C’, where ‘a’, ‘b’ and ‘c’ are the
measures of sides $\overline{BC}$, $\overline{CA}$ and $\overline{AB}$ respectively.

To Prove:

1 $c^2 = a^2 + b^2$

Construction:

1 Draw $\overline{CD} \perp \overline{AB}$,let m$\overline{CD}$=h and $\overline{AD}$=x, therefore $\overline{BD}$=c-x

Proof:

3

Statements	Reasons
In	
$\Delta ABC \leftrightarrow \Delta CDA$	
∠BCA ≅ ∠CDA	Right Angles
∠A ≅ ∠A	Self-Congruent
And	
∠ABC ≅ ∠ACD	Complement of ∠A
$\Delta BCA \cong \Delta CDA$	By Definition
Hence	
$\frac{c}{b} = \frac{b}{x}$	Corresponding Sides of similar triangles.
i.e cx= $b^2 \longrightarrow$ ❶	
Again in	
$\Delta ABC \leftrightarrow \Delta BDC$	
$\angle BCA \cong \angle BDC$	Right Angles
$\angle B \cong \angle B$	Self-Congruent
And	
$\angle CAB \cong$ ∠DCB	Complement of ∠B
$\Delta BCA \cong \Delta BDC$	by definition.
Hence	

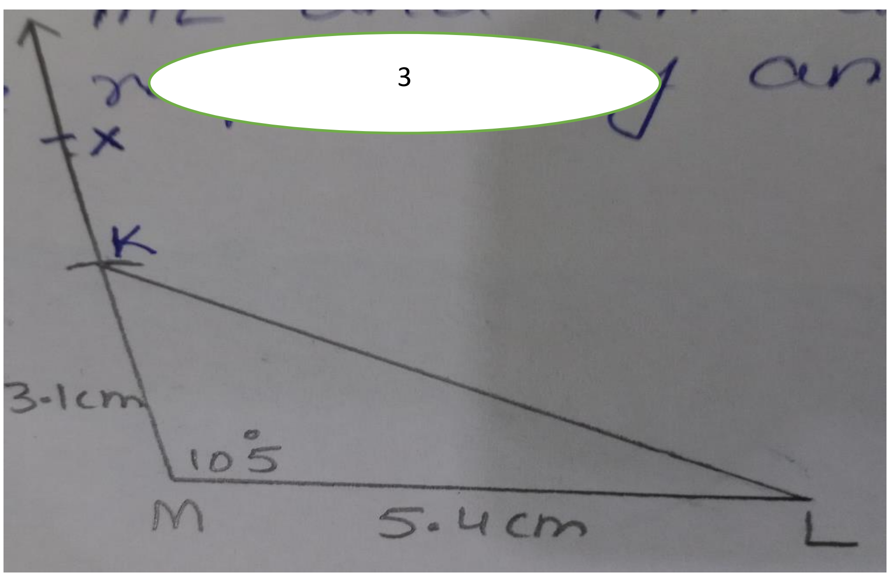
$\frac{c}{a} = \frac{a}{c-x}$ $c(c-x) = a^2$ $c^2 - cx = a^2 \longrightarrow$ ❷ Adding ❶ and ❷ we get, $cx + c^2 - cx = b^2 + a^2$ $c^2 = a^2 + b^2$	Corresponding of similar angles.

Q8: Construct triangle **KML** when length of its two sides **ML** and **KM** are 5.4 cm and 3.1 cm respectively and **m < M = 105⁰**

Checking Hints:

Total Marks: 6=1+1+1+1+1+1

Solution:



3

Steps of Construction:

1. Draw a line segment m $\overline{ML}$=5.4cm.
2. Draw an angle m$\angle$M=105°
3. Taking M as center, draw an arc of 3.1cm which cuts $\overrightarrow{MX}$ at point K.
4. Join point K and L.

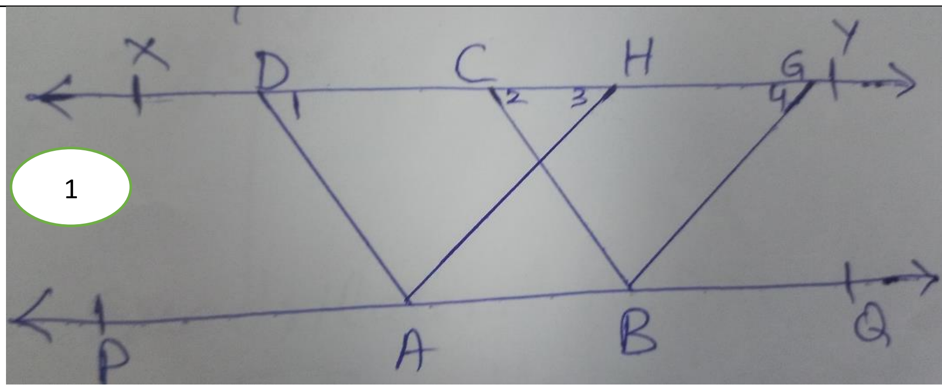
ΔKLM is formed which the required triangle.

Q9: Parallelogram on the same base and lying between the same parallel lines (or of the same altitude) are equal in area.

Checking Hints:

Total Marks: 6=1+1+1+1+1+1

Solution:



Given:

1 ABCD and ABGH are two parallelograms having the same base $\overline{AB}$ and lying between two parallel lines $\overleftrightarrow{XY}$ and $\overleftrightarrow{PQ}$ (i.e., both have same altitude).

1 To Prove:

Parallelogram ABCD and ABGH are equal in area.

Statements	Reasons
In	
$\Delta ADH \leftrightarrow \Delta BCG$	
∠AH ≅ ∠BG	Opposite sides of Parallelogram
$\angle 1 \cong \angle 2$	Corresponding Angles
$\angle 3 \cong \angle 4$	Corresponding Angles
∴ ADH ≅ ∠BCG	A.A.S ≅ A.A.S
3 Or ΔADH and ΔBCG are equal in area.	
Subtracting each triangle from the whole figure ABDG, we get	
Quadrilateral ABDG-ΔADH ≅ Quadrilateral ABDG-ΔBCG.	
Parallelogram ABCD≅ Parallelogram ABGH	
Or Both the Parallelograms are equal in area.	