Meghalaya Board
Class IX
Mathematics
Sample Paper – 1 Solution

Time: 3 hrs **Total Marks: 80**

Section A

1. Correct answer: C
π - 10

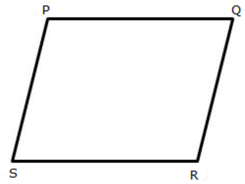
2. Correct answer: C
$p(x) = x^3 + 10x^2 + px$
(x – 1) is the factor of p(x)
So p(1) = 0
1 + 10 + p = 0
P = -11

3. Correct answer: B
Two triangles will be congruent by SAS axiom if 2 sides and the included angle of one triangle are equal to the two sides and included angle of the other triangle. Thus, the triangles will be congruent when AC=DE.

4. Correct answer: C
An inconsistent system of two linear equations in two variables will have no solution.

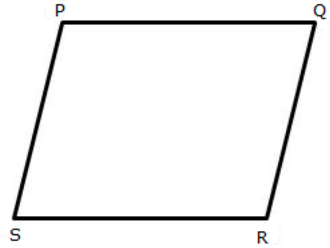
5. Correct answer: C
Arranging the data in the ascending order: 35, 36, 39, 40, 41, 55, 61, 62, 65, 70, 71, 75
Range = Maximum value – Minimum value = 75 – 35 = 40

6. Correct answer: B
∠R and ∠S are consecutive interior angles on the same side of the transversal SR.
Therefore, m∠R + m∠S = 180°

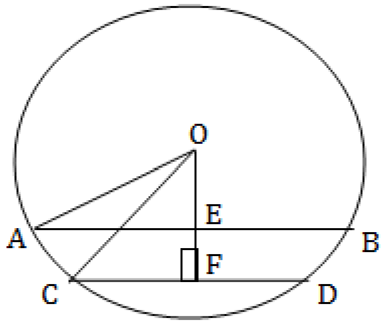


7. Correct answer: C
Arranging the data in the ascending order: 35, 36, 39, 40, 41, 55, 61, 62, 65, 70, 71, 75
Range = Maximum value – Minimum value = 75 – 35 = 40

8. Correct answer:B
∠R and ∠S are consecutive interior angles on the same side of the transversal SR.
Therefore, m∠R + m∠S = 180°



9. Correct answer:C



$AE = \frac{1}{2}AB \Rightarrow AE = 8 \text{ cm}$

$CF = \frac{1}{2}CD \Rightarrow CF = 6 \text{ cm}$

Let EF = x.

We have, Radius = OA = 10 cm

$OE = \sqrt{(10)^2 - (8)^2} = \sqrt{100 - 64} = \sqrt{36} = 6\,\text{cm}$

$OF = \sqrt{(10)^2 - (6)^2} = \sqrt{100 - 36} = \sqrt{64} = 8\,\text{cm}$

⇒ x = OF – OE = 8 – 6 = 2 cm

10. Correct answer: C

An inconsistent system of two linear equations in two variables will have no solution

Section B

11.

$$\left(\frac{81}{16}\right)^{-3/4} \times \left(\frac{25}{9}\right)^{-3/2}$$

$$= \left[\left(\frac{3}{2}\right)^4\right]^{-\frac{3}{4}} \times \left[\left(\frac{5}{3}\right)^2\right]^{-\frac{3}{2}}$$

$$= \left(\frac{3}{2}\right)^{-3} \times \left(\frac{5}{3}\right)^{-3}$$

$$= \left(\frac{2}{3}\right)^{3} \times \left(\frac{3}{5}\right)^{3}$$

$$= \frac{2^3}{3^3} \times \frac{3^3}{5^3} = \frac{2^3}{5^3} = \frac{8}{125}$$

12.

$$x^2 + \frac{1}{x^2} + 2 - 2x - \frac{2}{x}$$

$$= \left(x^2 + \frac{1}{x^2} + 2\right) - 2\left(x + \frac{1}{x}\right)$$

$$= \left(x + \frac{1}{x}\right)^2 - 2\left(x + \frac{1}{x}\right)$$

$$= \left(x + \frac{1}{x}\right)\left(x + \frac{1}{x} - 2\right)$$

13.

(A) Point of the form (a, 0) lie on the x axis.
The point (-4, 0) will lie on the negative side of the x axis.

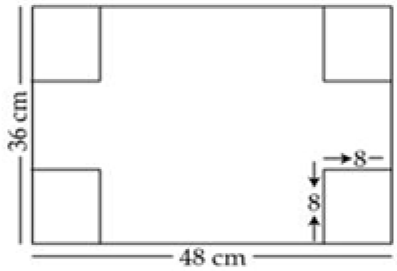
(B) (-, +) are the sign of the coordinate of points in the II quadrant.
∴The point (-10, 2) lies in the II quadrant.

(C) Point of the form (0, a) lie on the y axis.
So, the point (0, 8) will lie on the positive side of y axis.

(D) (+, +) are the sign of the coordinates of points in the I quadrant.
∴ The point (10, 4) lies in the I quadrant.

14. ΔACB and ΔACF lie on the same base AC and are between the same parallel lines AC and BF.
∴ area(ΔACB) = area(ΔACF)

15. Length of the box = l = 48 – 8 – 8 = 32 cm
Breadth of the box = b = 36 – 8 – 8 = 20 cm
Height = h = 8 cm
Volume of the box formed = l × b × h = 32 × 20 × 8
= 5120 cm^3



16.

$$\frac{(25)^{\frac{3}{2}} \times (343)^{\frac{3}{5}}}{16^{\frac{5}{4}} \times 8^{\frac{4}{3}} \times 7^{\frac{3}{5}}}$$

$$= \frac{\left(5^2\right)^{\frac{3}{2}} \times \left(7^3\right)^{\frac{3}{5}}}{\left(2^4\right)^{\frac{5}{4}} \times \left(2^3\right)^{\frac{4}{3}} \times 7^{\frac{3}{5}}}$$

$$= \frac{5^3 \times 7^{\frac{9}{5}}}{2^5 \times 2^4 \times 7^{\frac{3}{5}}}$$

$$= \frac{5^3 \times 7^{\frac{9}{5}}}{2^9 \times 7^{\frac{3}{5}}}$$

$$= \frac{5^3 \times 7^{\frac{6}{5}}}{2^9}$$

Section C

17. Let $p(x) = x^3 + 13x^2 + 32x + 20$

$p(-1) = -1 + 13 - 32 + 20 = -33 + 33 = 0$

Therefore $(x + 1)$ is a factor of $p(x)$.

On dividing $p(x)$ by $(x + 1)$ we get

$p(x) \div (x + 1) = x^2 + 12x + 20$

Thus,

$x^3 + 13x^2 + 32x + 20 = (x + 1)(x^2 + 12x + 20)$

$= (x + 1)(x^2 + 10x + 2x + 20)$

$= (x + 1)[x(x + 10) + 2(x + 10)]$

$= (x + 1)(x + 2)(x + 10)$

Hence, $x^3 + 13x^2 + 32x + 20 = (x + 1)(x + 2)(x + 10)$.

18.

LM = MN &. Given

$\Rightarrow \angle MLN = \angle MNL$ (angles opposite equal sides are equal)

$\Rightarrow \angle MLQ = \angle MNP$

LP = QN (Given)

$\Rightarrow LP + PQ = PQ + QN$ (adding PQ on both sides)

$\Rightarrow LQ = PN$

In ΔLMQ and ΔNMP

LM = MN

$\angle MLQ = \angle MNP$

LQ = PN

$\Delta LMQ \cong \Delta NMP$ (SAS congruence rule)

19. When $p(x) = ax^3 + 3x^2 - 3$ is divided by $(x - 4)$, the remainder is given by

$R_1 = a(4)^3 + 3(4)^2 - 3 = 64a + 45$

When $q(x) = 2x^3 - 5x + a$ is divided by $(x - 4)$, the remainder is given by

$R_2 = 2(4)^3 - 5(4) + a = 108 + a$

Given: $R_1 + R_2 = 0$

$\Rightarrow 65a + 153 = 0$

$\Rightarrow a = \frac{-153}{65}$

By hit and trial we find x = 3 is factor of given polynomial, as

$2(3)^3 - 9 - 39 - 6 = 54 - 54 = 0$

By dividing $2x^3 - x^2 - 13x - 6$ by $x - 3$ we get

$2x^2 + 5x + 2$ as quotient.

Factorising this further

$2x^2 + 5x + 2 = 2x^2 + 4x + x + 2 = 2x(x + 2) + 1(x + 2) = (2x + 1)(x + 2)$

So, $2x^3 - x^2 - 13x - 6 = (2x + 1)(x + 2)(x - 3)$

20. In $\triangle DCB$, $\angle DBC = \angle DCB$ (given)

DC = DB [Side opp. To equal $\angle$'s are equal]…..(i)

In $\triangle ABD$ and $\triangle ACD$

AB = AC (given)

BD = CD [from (i)]

AD = AD common

$\triangle ABD \cong \triangle ACD$ [SSS Rule]

$\angle BAD = \angle CAD$ (CPCT)

Hence, AD is bisector of $\angle BAC$

21. Total number of outcomes = n(S) = 52

(a) Let A be the event when the card drawn is a queen.

Total number of queen cards = 4

$\therefore$ n(A) = 4

$$\therefore P(A) = \frac{n(A)}{n(S)} = \frac{4}{52} = \frac{1}{13}$$

(b) Let B be the event when the card drawn is a non-ace card.

Non–ace cards = 52 – 4 = 48

$\therefore$ n (B) = 48

$$\therefore P(B) = \frac{n(B)}{n(S)} = \frac{48}{52} = \frac{12}{13}$$

(c) Let C be the event when the card drawn is a black card.

Number of black cards = 26

$\therefore$ n(C) = 26

$$\therefore P(C) = \frac{n(C)}{n(S)} = \frac{26}{52} = \frac{1}{2}$$

Or

Total number of times the coins were tossed = 200

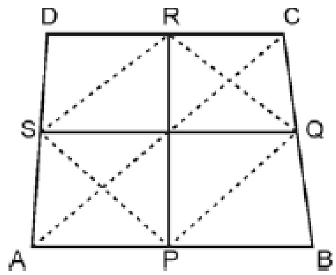
Number of times 2 heads come up = 72

$$P(\text{2 heads will come up}) = \frac{\text{Number of times 2 heads come up}}{\text{Total number of times the coins were tossed}}$$

$$= \frac{72}{200}$$

$$= \frac{9}{25}$$

22. Let ABCD be a quadrilateral. P, Q, R, and S are the mid points of AB, BC, CD and DA respectively.



Join PQ, QR, RS and SP.
Join AC.
In ΔDAC, SR ∥ AC
And $SR = \frac{1}{2}AC$ (Mid-point theorem)
In ΔBAC, PQ ∥ AC
And $PQ = \frac{1}{2}AC$
Clearly, PQ ∥ SR and PQ = SR
In quadrilateral PQRS, one pair of opposite sides is equal and parallel to each other and hence it is a parallelogram.
Now, PR and SQ are the diagonals of PQRS and hence PR and SQ bisect each other.

Section D

23.

$$\frac{1}{3-\sqrt{8}} = \frac{1}{3-\sqrt{8}} \times \frac{3+\sqrt{8}}{3+\sqrt{8}} = \frac{3+\sqrt{8}}{9-8} = 3+\sqrt{8}$$

$$\frac{1}{\sqrt{8}-\sqrt{7}} = \frac{1}{\sqrt{8}-\sqrt{7}} \times \frac{\sqrt{8}+\sqrt{7}}{\sqrt{8}+\sqrt{7}} = \frac{\sqrt{8}+\sqrt{7}}{8-7} = \sqrt{8}+\sqrt{7}$$

$$\frac{1}{\sqrt{7}-\sqrt{6}} = \frac{1}{\sqrt{7}-\sqrt{6}} \times \frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}+\sqrt{6}} = \frac{\sqrt{7}+\sqrt{6}}{7-6} = \sqrt{7}+\sqrt{6}$$

$$\frac{1}{\sqrt{6}-\sqrt{5}} = \frac{1}{\sqrt{6}-\sqrt{5}} \times \frac{\sqrt{6}+\sqrt{5}}{\sqrt{6}+\sqrt{5}} = \frac{\sqrt{6}+\sqrt{5}}{6-5} = \sqrt{6}-\sqrt{5}$$

$$\frac{1}{\sqrt{5}-2} = \frac{1}{\sqrt{5}-2} \times \frac{\sqrt{5}+2}{\sqrt{5}+2} = \frac{\sqrt{5}+2}{5-4} = \sqrt{5}+2$$

$$\frac{1}{3-\sqrt{8}} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-2}$$

$$= 3+\sqrt{8} - \left(\sqrt{8}+\sqrt{7}\right) + \left(\sqrt{7}+\sqrt{6}\right) - \left(\sqrt{6}-\sqrt{5}\right) + \left(\sqrt{5}+2\right)$$

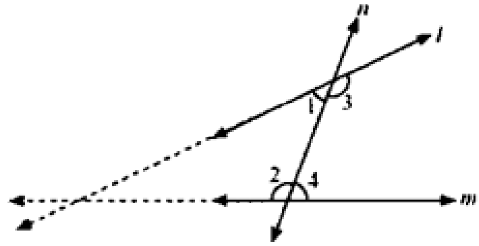
$$= 5$$

24. Euclid's 5th postulate states that:

If a straight line falling on two straight lines makes the interior angles on the same side of it taken together less than two right angles, then the two straight lines, if produced indefinitely, meet on that side on which the sum of angles is less than two right angles.

This implies that if n intersects lines l and m and if

$\angle 1+\angle 2 < 180^0$, then $\angle 3+\angle 4 > 180^0$. In that case, producing line l and further will meet in the side of $\angle 1$ and $\angle 2$ which is less than 180^o



If $\angle 1+\angle 2 < 180^0$, then $\angle 3+\angle 4 > 180^0$

In that case, the lines l and m neither meet at the side of $\angle 1$ and $\angle 2$ nor at the side of $\angle 3$ and $\angle 4$ implying that the lines l and m will never intersect each other. Therefore, the lines are parallel.

25. Consider $\dfrac{(a^2-b^2)^3+(b^2-c^2)^3+(c^2-a^2)^3}{(a-b)^3+(b-c)^3+(c-a)^3}$

We know that,

If x + y + x = 0 then $x^3 + y^3 + z^3 = 3xyz$

Now, $a^2 - b^2 + b^2 - c^2 - a^2 = 0$

And, a − b +b − c + c − a = 0

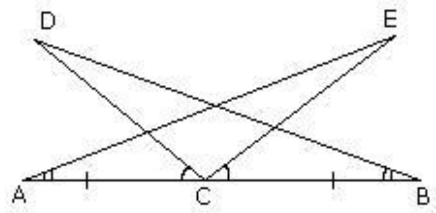
$$\therefore \frac{(a^2-b^2)^3+(b^2-c^2)^3+(c^2-a^2)^3}{(a-b)^3+(b-c)^3+(c-a)^3}$$

$$=\frac{3(a^2-b^2)(b^2-c^2)(c^2-a^2)}{3(a-b)(b-c)(c-a)}$$

$$=\frac{3(a-b)(a+b)(b-c)(b+c)(c-a)(c+a)}{3(a-b)(b-c)(c-a)}$$

$$=(a+b)(b+c)(c+a)$$

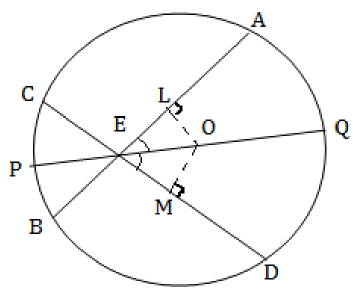
26.



Given that ∠DCA = ∠ECB
⇒ ∠DCA + ∠ECD = ∠ECB + ∠ECD
⇒ ∠ECA = ∠DCB .....(i)
Now in ΔDBC and ΔEAC
∠DCB = ∠ECA [from (i)]
BC = AC (Given)
∠DBC = ∠EAC (Given)
Δ DBC ≅ Δ EAC (ASA Congruence)
Therefore, BD =AE (CPCT)

Or

Given that AB and CD are two chords of a circle with centre O, intersecting at a point E. PQ is the diameter through E, such that ∠AEQ = ∠DEQ.



To prove that AB= CD.
Draw perpendiculars OL and OM on chords AB and CD respectively.
Now, m∠ LOE = 180° – 90° – m∠ LEO ... [Angle sum property of a triangle]
= 90° – m∠ LEO
⇒ m∠ LOE = 90° – m∠ AEQ
⇒ m∠ LOE = 90° – m∠ DEQ
⇒ m∠ LOE = 90° – m∠ MEQ
⇒ ∠ LOE = ∠ MOE
In ΔOLE and ΔOME,
∠ LEO = ∠ MEO
∠ LOE = ∠ MOE
EO = EO
ΔOLE ≅ ΔOME
OL = OM
Therefore, cords AB and CD are equidistant from the centre.
Hence AB = CD

Section E

27. Let the radius of the cylinder be 'r' cm.

$$\therefore \text{Volume of cylinder} = \pi r^2 h = \frac{22}{7}\times r^2 \times 28$$

$$\therefore 6358 = 88r^2$$

$$\therefore r^2 = \frac{6358}{88} = \frac{289}{4}$$

$$\therefore r = \frac{17}{2}\text{ cm} = 8.5\text{ cm}$$

$$\text{Curved surface area of cylinder} = 2\pi rh = 2\times\frac{22}{7}\times\frac{17}{2}\times 28 = 1496\text{ cm}^2.$$

Thus, the radius of the cylinder is 8.5 cm and its curved surface area is 1796 cm^2.

Or

Edge of the cubical tank = 1.5 m = 150 cm

Surface area of the tank = 5 × 150 × 150 cm^2

Area of each square tile = side × side = 25 × 25 cm^2

$$\therefore \text{Number of tiles required} = \frac{\text{Surface area of the tank}}{\text{area of each tile}} = \frac{5\times150\times150}{25\times25} = 180$$

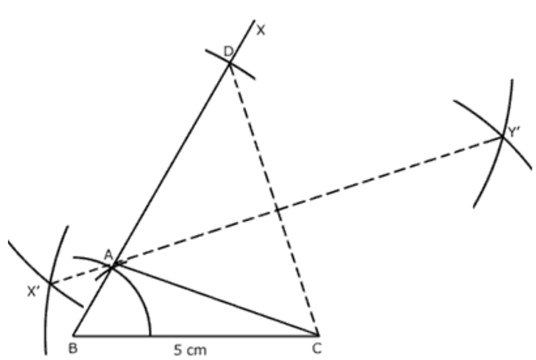
Cost of 1 dozen tiles, i.e. cost of 12 tiles = Rs. 360

Cost of one tile = Rs. $\frac{360}{12}$ = Rs. 30

Thus, the cost of 180 tiles = 180 × 30 = Rs. 5400

28. Steps of construction:

i. Draw BC = 5 cm
ii. Draw m∠CBX = 60° and cut off BD = 7.7 cm.
iii. Join CD and draw its perpendicular bisector meeting BD at A.
iv. Join AC. ΔABC is the required triangle.



29. According to the given condition,

x + y = 100 …(i)

Now, put the value x = 0 in equation (i).

0 + y = 100 ⇒ y = 100.

The solution is (0, 100)

Putting the value x = 50 in equation (i)

We get,

50 + y = 100 ⇒ y = 100 – 50 ⇒ y = 50.

The solution is (50, 50).

Put the value x = 100 in equation (i).

100 + y = 100,

y = 100 – 100 ⇒ y = 0.

The solution is (100, 0).

x	0	50	100
y	100	50	0

Now, plot the points (0, 100), (50, 50), (100, 0) and draw lines passing through the points.

30. Total observations in the given data set, n = 10 (even)

$$\therefore \text{Median} = \frac{\left(\frac{n}{2}\right)^{th} \text{observation} + \left(\frac{n}{2}+1\right)^{th} \text{observation}}{2}$$

$$\therefore 63 = \frac{\left(\frac{10}{2}\right)^{th} \text{observation} + \left(\frac{10}{2}+1\right)^{th} \text{observation}}{2}$$

$$\therefore 63 = \frac{5^{th} \text{ observation} + 6^{th} \text{ observation}}{2}$$

$$\therefore 63 = \frac{(x)+(x+2)}{2}$$

$$\therefore 63 = \frac{2x+2}{2}$$

$$\therefore 63 = x+1$$

$$\therefore x = 62$$