CBSE Board

Class IX Mathematics

Sample Paper 3

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

General Instructions:

1. **All** questions are **compulsory**.
2. The question paper consists of **30** questions divided into **four sections** A, B, C, and D. **Section A** comprises of **6** questions of 1 mark each, **Section B** comprises of **6** questions of 2 marks each, **Section C** comprises of **10** questions of 3 marks each and **Section D** comprises of **8** questions of 4 marks each.
3. Use of calculator is **not** permitted.

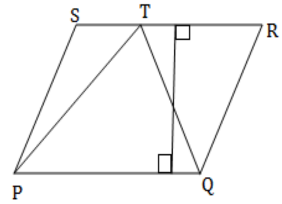
Section A

(Questions 1 to 6 carry 1 mark each)

1. If $\left(\sqrt{5}+\sqrt{6}\right)^2$ = a + b $\sqrt{30}$ then find the values of a and b.

2. p(x) = cx + d is a zero polynomial. What is the value of x?

3. In the given figure, PQRS is a parallelogram having base PQ = 6 cm and perpendicular height is also 6 cm, Find the area of ΔPTQ?



OR

ABCD is a parallelogram having an area of 60 cm^2. P is a point on CD. Calculate the area of Δ APB.

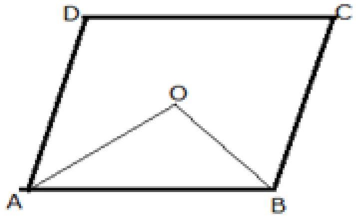
4. Check whether ($\frac{1}{2}$, 0) is the solution of the equation 2x + y = 1?

OR

If (4, 19) is a solution of the equation y = ax + 3 then find the value of a.

5. Define Median of a triangle.

6. ABCD is a parallelogram. If OA and OB are the angle bisectors of the consecutive angles, then $m\angle AOB$ =?

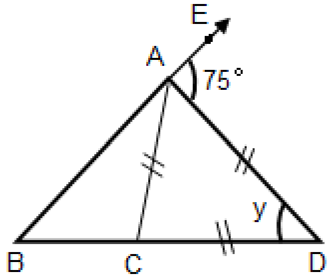


Section B
(Questions 7 to 12 carry 2 marks each)

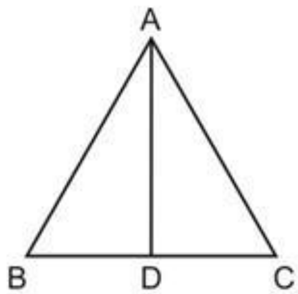
7. Express $0.\overline{975}$ in the form $\frac{p}{q}$, where *p* and *q* are integers and $q \neq 0$.

8. Factorise: $x^2+\frac{1}{x^2}+2-2x-\frac{2}{x}$

9. In the figure below, BC = AC = AD and $\angle$DAE = 75°. Find the value of y.

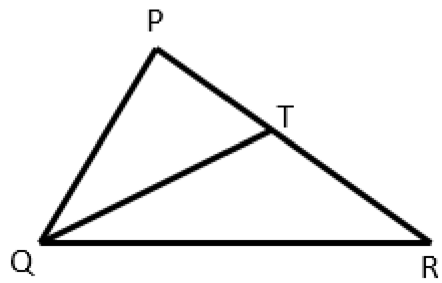


10. In the figure, AD is the bisector of ∠A; prove that AB > BD.



OR

In ΔPQR, PR > PQ and T is a point on PR such that PT = PQ. Prove that QR > TR.



11. The total surface area of a cube is 294 cm^2. Find its volume.

OR

Find the volume of a cube whose diagonal is $\sqrt{48}$ cm.

12. Check which of the following are solutions of the equation $7x - 5y = -3$.
   i. $(-1, -2)$
   ii. $(-4, -5)$

Section C

(Questions 13 to 22 carry 3 marks each)

13. Evaluate: $\sqrt[3]{(343)^{-2}}$

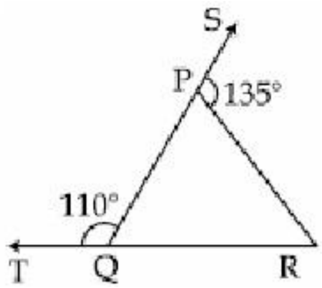
OR

Evaluate $\sqrt{\frac{1}{4}} + 0.01^{-\frac{1}{2}} - 27^{\frac{2}{3}}$

14. What is the zero of the polynomial $p(x) = (a^2 + b^2)x + (a - b)^2 + (a + b)^2$?

15. Use a suitable identity to factorise $27p^3 + 8q^3 + 54p^2q + 36pq^2$.

16. In the figure, sides QP and RQ of $\triangle PQR$ are produced to points S and T respectively. If $\angle SPR = 135°$ and $\angle PQT = 110°$, then find $\angle PRQ$.



17. Prove that in an isosceles triangle the angles opposite to the equal sides are equal.

OR

Prove that the medians corresponding to equal sides of an isosceles triangle are equal.

18. Fifty seeds each were selected at random from 5 bags of seeds, and were kept under standardized conditions favorable to germination. After 20 days, the number of seeds which had germinated in each collection were counted and recorded as follows:

Bags	1	2	3	4	5
Number of germinated seeds	40	48	42	39	41

What is the probability of

i. More than 40 seeds germinating in a bag?

ii. 49 seeds germinating in a bag?

iii. More than 35 seeds germinating in a bag?

OR

A survey was undertaken in 30 classes at a school to find the total number of fail students in each class. The table below shows the results:

No. of fail students	0	1	2	3	4	5
Frequency (no. of classes)	1	2	5	12	8	2

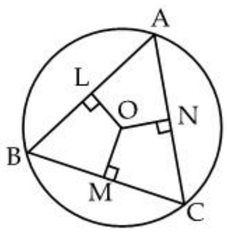
A class was selected at random.

(a) Find the probability that the class has 2 fail students.

(b) What is the probability that the class has at least 3 fail students?

(c) Given that the total number of students in the 30 classes is 960, find the probability that a student randomly chosen from these 30 classes is fail.

19. In the figure, O is the centre of the circle, OM ⊥ BC, OL ⊥ AB, ON ⊥ AC and OM = ON = OL.



Is ΔABC equilateral? Give reasons.

20. Show that if the diagonals of a quadrilateral are equal and bisect each other at right angles, then it is a square.

21. The relative humidity (in %) of a certain city for a month of 30 days was as follows:

98.1	98.6	99.2	90.3	86.5	95.3	92.9	96.3	94.2	95.1
97.3	89.2	92.3	97.1	93.5	92.7	95.1	97.2	93.3	95.2
89	96.2	92.1	84.9	90.2	95.7	98.3	97.3	96.1	92.1

i. Construct a grouped frequency distribution table with classes 84 - 86, 86 - 88
ii. Which month or season do you think this data is about?
iii. What is the range of this data?

22. A hemispherical bowl, made of steel, is 0.25 cm thick. The inner radius of the bowl is 5 cm. Find the outer curved surface area of the bowl.

OR

50 cylindrical pillars of a hall are to be painted. The diameter of each pillar is 5 m and the height is 21 m, what will be the cost of painting them at the rate of Rs 4.50 per m^2?

Section D
(Questions 23 to 30 carry 4 marks each)

23. Find the value of $\frac{1}{3-\sqrt{8}}-\frac{1}{\sqrt{8}-\sqrt{7}}+\frac{1}{\sqrt{7}-\sqrt{6}}-\frac{1}{\sqrt{6}-\sqrt{5}}+\frac{1}{\sqrt{5}-2}$

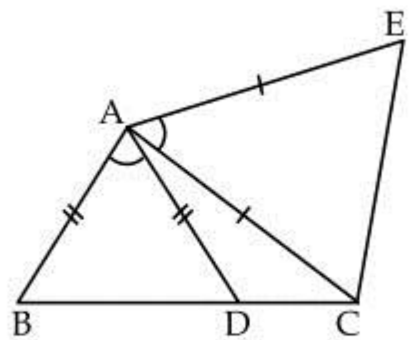
24. How does Euclid's fifth postulate imply the existence of parallel lines? Give a mathematical proof.

25. Find $x^3 + y^3$ when $x = \frac{1}{3-2\sqrt{2}}$ and $y = \frac{1}{3+2\sqrt{2}}$.

OR

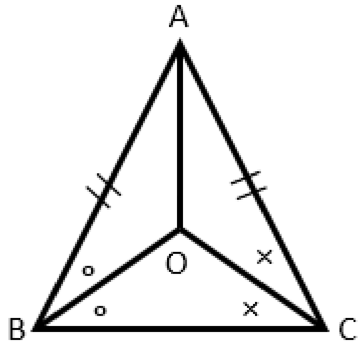
If p + q = 8 and p – q = 4, find:
(i) pq, (ii) $p^2 + q^2$

26. In the given figure, AC = AE, AB = AD and $\angle$BAD = $\angle$EAC. Prove that BC = DE.



OR

In ΔABC, AB = AC and the bisectors of angles B and C intersect at point O. Prove that BO = CO and the ray AO is the bisector of angle BAC.

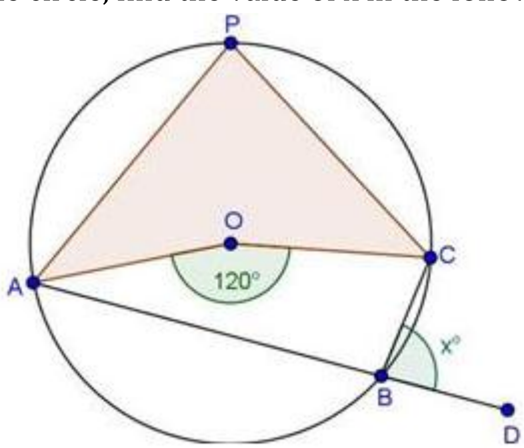


27. A garden is in the shape of quadrilateral. The sides of the garden are 9 m, 40 m, 28 m and 15 m, respectively, in consecutive order, and the angle between the first two sides is a right angle. Find the area of the garden.

OR

A horse is tied with a 21 m long rope to the corner of a field which is in the shape of an equilateral triangle. Find the area of the field over which it can graze.

28. If O is the centre of the circle, find the value of x in the following figure.



29. Construct a triangle having a perimeter of 12.5 cm and angles in the ratio of 3: 4: 5.

30. Draw the graph of the linear equation x + 2y = 8. From the graph, check whether (−1, −2) is a solution of this equation.

CBSE Board

Class IX Mathematics

Sample Paper 3 – Solution

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

Section A

1.

$$\text{L.H.S} = \left(\sqrt{5}+\sqrt{6}\right)^2 = \left(\sqrt{5}\right)^2 + 2\sqrt{5}\sqrt{6} + \left(\sqrt{5}\right)^2 \qquad \because (a+b)^2 = a^2 + 2ab + b^2$$

$$= 5 + 2\sqrt{30} + 6$$

$$= 11 + 2\sqrt{30}$$

On compairing with R.H.S,

$a + b\sqrt{30} = 11 + 2\sqrt{30}$

$\therefore$ a = 11 and b = 2

2. Since, p(x) is a zero polynomial,

$\therefore$ p(x) = 0

$\therefore$ cx + d = 0

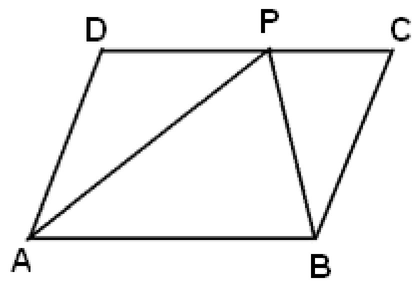
$\therefore$ cx = –d

$\therefore x = \dfrac{-d}{c}$

3. In ΔPTQ , base = PQ = 6 cm and height = 6 cm

$\therefore$ Area of $\Delta PTQ = \dfrac{1}{2} \times \text{base} \times \text{height} = \dfrac{1}{2} \times 6 \times 6 = 18 \text{ cm}^2$

OR



ar (Δ APB) = $\dfrac{1}{2}$ x ar(parallelogram ABCD)

(The area of a triangle is half that of a parallelogram on the same base and between the same parallels)

ar(Δ APB) = $\dfrac{1}{2}$ x 60 cm² = 30 cm²

4. Substituting $x = \frac{}{2}$ and y = 0 in the equation 2x + y = 1

$\therefore\ 2 \times \frac{1}{2} + 0 = 1$

$\therefore\ 1 = 1$

Since, L.H.S = R.H.S

The values of x and y are satisfying the given equation.

Therefore, $(\frac{1}{2}, 0)$ is the solution of 2x + y = 1.

OR

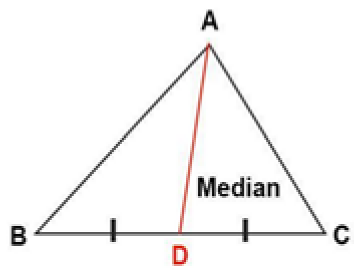
(4, 19) is a solution of the equation y = ax + 3 then (4, 19) must satisfy the equation.

$\therefore$ 19 = 4x + 3

$\therefore$ 4a = 16

$\therefore$ a = 4

5. **Median of a Triangle**: A median of a triangle is the line segment that joins any vertex of the triangle with the midpoint of its opposite side. In the given Triangle, the Median from A meets the midpoint of the opposite side, BC at point D.



6. In a parallelogram, the sum of consecutive angles are Supplementary.

Here ABCD is a parallelogram,

$\therefore \angle A + \angle B = 180°$

$\therefore\ \frac{1}{2}\angle A + \frac{1}{2}\angle B = 90^{\circ}$

In ΔAOB,

$\angle AOB + \angle OBA + \angle OAB = 180^{\circ}$

$\therefore \angle AOB + \frac{\angle B}{2} + \frac{\angle A}{2} = 180^{\circ}$ ....($\because$ OA and OB are the angle bisectors of $\angle A$ and $\angle B$)

$\therefore \angle AOB + 90^{\circ} = 180^{\circ}$

$\therefore \angle AOB = 90^{\circ}$

Section B

7. Let x = $0.\overline{975} = 0.975975975$ ....(1)

On multiplying both sides of equation (1) by 1000:

1000x = 975.975975 ....(2)

On subtracting equation (1) from equation (2),

999x = 975

$\Rightarrow x = \frac{975}{999} = \frac{325}{333}$

8.

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

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

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

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

9. Here $\angle ADC = y = \angle ACD$

Ext. $\angle ACD = \angle ABC + \angle BAC$

$\therefore 2\angle BAC = \angle ACD = y$

$\Rightarrow \angle BAC = \frac{y}{2}$

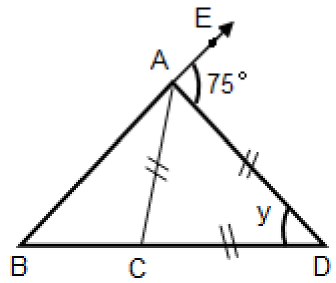
$\therefore \frac{y}{2} + (180° - 2y) = 180° - 75°$

$\Rightarrow \frac{y}{2} + 180° - 2y = 180° - 75$

$\Rightarrow \frac{y}{2} - 2y = -75°$

$\Rightarrow -\frac{3y}{2} = -75°$

$\Rightarrow y = 50°$



10. AD is the bisector of $\angle A$

$\therefore \angle BAD = \angle CAD$

Exterior $\angle BDA > \angle CAD$

$\therefore \angle BDA > \angle BAD$

$\Rightarrow AB > BD$ (side opposite the bigger angle is longer)

OR

In ΔPQT, we have

$PT = PQ$ ... (1)

In ΔPQR,

$PQ + QR > PR$

$PQ + QR > PT + TR$

$PQ + QR > PQ + TR$ [Using (1)]

$QR > TR$

Hence, proved.

11. Let 'l' be the length of the cube.

Now, T.S.A. of the cube = 294 cm^2 ...(given)

$\therefore 6l^2 = 294$

$\therefore l^2 = \frac{294}{6} = 49$

$\therefore$ Side (l) = 7 cm.

Volume of cube = $l \times l \times l = 7 \times 7 \times 7 = 343\ cm^3$

OR

Given that:

Diagonal of a cube **=** $\sqrt{48}$ cm

i.e., $\sqrt{3} \times l = \sqrt{48}$ [$\because$ Diagonal of cube = $\sqrt{3} \times l$]

$l = \frac{\sqrt{48}}{\sqrt{3}}$

$l = \sqrt{\frac{48}{3}}$

$= \sqrt{16}$

12. Given equation is $7x - 5y = -3$

i. $(-1, -2)$

Putting $x = -1$ and $y = -2$ in the L.H.S. of the given equation, we get

$7x - 5y = 7(-1) - 5(-2) = -7 + 10 = 3 \neq$ R.H.S.

$\therefore$ L.H.S.$\neq$ R.H.S.

Hence, $(-1, -2)$ is not a solution of this equation.

ii. $(-4, -5)$

Putting $x = -4$ and $y = -5$ in the L.H.S. of the given equation, we get

$7x - 5y = 7(-4) - 5(-5) = -28 + 25 = -3 =$ R.H.S.

$\therefore$ L.H.S. = R.H.S.

Hence, $(-4, -5)$ is a solution of this equation.

Section C

13.

$\sqrt[3]{(343)^{-2}}$

$= (343)^{-2/3}$

$= [(7)^3\}^{-2/3}$

$= 7^{3 \times -2/3}$

$= 7^{-2} = \frac{1}{49}$

OR

$\sqrt{\frac{1}{4}} + 0.01^{-\frac{1}{2}} - 27^{\frac{2}{3}}$

$= \left(\frac{1}{2^2}\right)^{\frac{1}{2}} + 0.1^{-1} - 3^2$

$= \frac{1}{2} + 0.1^{-1} - 3^2$

$= \frac{1}{2} + \frac{1}{0.1} - 9$

$= \frac{1}{2} + \frac{10}{1} - 9$

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

14. p(x) = 0

$\Rightarrow (a^2 + b^2)\, x + (a - b)^2 + (a + b)^2 = 0$

$\Rightarrow (a^2 + b^2)x + (a^2 + b^2 - 2ab) + (a^2 + b^2 + 2ab) = 0$

$\Rightarrow (a^2 + b^2)x + 2\,(a^2 + b^2)x = 0$

$\Rightarrow (a^2 + b^2)x = -2\,(a^2 + b^2)$

$\Rightarrow x = -2$

Thus, the zero of the given polynomial is –2.

15. $27p^3 + 8q^3 + 54p^2q + 36pq^2$

$= (3p)^3 + (2q)^3 + 18pq(3p + 2q)$

$= (3p)^3 + (2q)^3 + 3 \times 3p \times 2q\,(3p + 2q)$

$= (3p + 2q)^3$ [$(a + b)^3 = a^3 + b^3 + 3ab(a + b)$ where a = 3p and b = 2q]

$= (3p + 2q)(3p + 2q)(3p + 2q)$

16. ∠SPR + ∠QPR = 180° (Linear Par)

$\Rightarrow$ ∠135° + ∠QPR = 180°

$\Rightarrow$ ∠QPR = 45°

In ΔPQR,

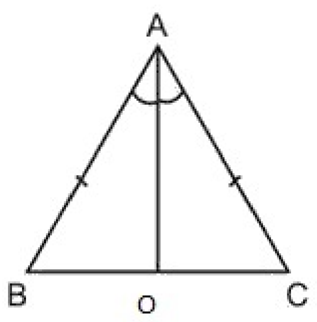
∠TQP = ∠QPR + ∠PRQ [Exterior angle property]

$\Rightarrow$ 110° = 45° + ∠PRQ

$\Rightarrow$ ∠PRQ = 110° – 45° = 65°

17. Let ABC be an isosceles triangle with AB = AC.

Construction: Draw the bisector AO of ∠A.



In ΔABO and ΔACO, we have:

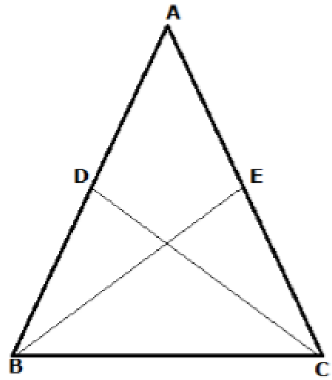
AB = AC (Given)

AO = OA (Common)

∠BAO = ∠CAO (By Construction)

ΔABO ≅ ΔACO (By SAS congruence criteria) $\Rightarrow$ ∠B = ∠C (By C.P.C.T)

OR



Let ABC be an isosceles triangle with AB=AC.
Let D and E be the mid points of AB and AC.
Join BE and CD.
Then BE and CD are the medians of this isosceles triangle.
In $\triangle$ ABE and $\triangle$ ACD
AB=AC (given)
AD=AE (D and E are mid points of AB and AC)
$\angle A = \angle A$ (common angle)
Therefore, $\triangle ABE \cong \triangle ACD$ (SAS criteria)
Hence, BE = CD c. s. c. t.

18. Total number of bags is 5.

i. Number of bags in which more than 40 seeds germinated out of 50 seeds is 3.

P(germination of more than 40 seeds in a bag) = $\frac{3}{5} = 0.6$

ii. Number of bags in which 49 seeds germinated = 0

P(germination of 49 seeds in a bag) = $\frac{0}{5} = 0$

iii. Number of bags in which more than 35 seeds germinated = 5

The required probability = $\frac{5}{5} = 1$

OR

Let S be the sample space.
Thus, n(S) = 30
(a) Let A be the event of a class having 2 fail students.
$\therefore$ n(A) = 5
$\therefore P(A) = \frac{5}{30} = \frac{1}{6}$

(b) Let B be the event of a class having at least 3 fail students.

$\therefore$ n(B) = 12 + 8 + 2 = 22

$$\therefore P(B) = \frac{22}{30} = \frac{11}{15}$$

(c) First find the total number of fail students:

No. of failure students, x	0	1	2	3	4	5
Frequency, f (no. of classes)	1	2	5	12	8	2
fx	0	2	10	36	32	10

Total number of fail students = 2 + 10 + 36 + 32 + 10 = 90

Here, the sample space is the total number of students in the 30 classes, which was given as 960.

Let T be the sample space and C be the event that a student is fail.

n(T) = 960

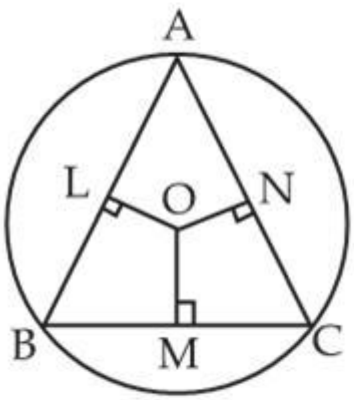
n(C) = 90

$$\therefore P(C) = \frac{90}{960} = \frac{3}{32}$$

19. OL $\perp$ AB, OM $\perp$ BC and ON $\perp$ AC

OM = ON = OL

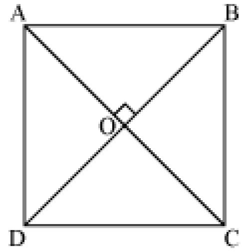
Perpendicular distances of chords from the centre of a circle are equal.



$\therefore$ AB = BC = AC [chords equidistant from the centre of a circle are equal.]

$\therefore$ ΔABC is an equilateral triangle.

20. Let us consider a parallelogram ABCD in which the diagonals AC and BD intersect each other at O.



Given that the diagonals of ABCD are equal and bisect each other at right angles. So, AC = BD, OA = OC, OB = OD and m∠AOB = m∠BOC = m∠COD = m∠AOD = 90°. To prove ABCD is a square, we need to prove ABCD is a parallelogram, AB = BC = CD = AD and one of its interior angle is 90°.

Now, in ΔAOB and ΔCOD

AO = CO (Diagonals bisect each other)

OB = OD (Diagonals bisect each other)

∠AOB = ∠COD (Vertically opposite angles)

∴ ΔAOB ≅ ΔCOD (SAS congruence rule)

∴ AB = CD (by CPCT) ... (1)

And ∠OAB = ∠OCD (by CPCT)

But these are alternate interior angles for line AB and CD and alternate interior angle are equal to each other only when the two lines are parallel.

∴ AB || CD ... (2)

From equations (1) and (2), we have

ABCD is a parallelogram

Now, in ΔAOD and ΔCOD

AO = CO (Diagonals bisect each other)

∠AOD = ∠COD (Given that each is 90º)

OD = OD (common)

∴ ΔAOD ≅ ΔCOD (SAS congruence rule)

∴ AD = DC ... (3)

But, AD = BC and AB = CD (opposite sides of parallelogram ABCD)

∴ AB = BC = CD = DA

So, all the sides quadrilateral ABCD are equal to each other

Now, in ΔADC and ΔBCD

AD = BC (Already proved)

AC = BD (given)

DC = CD (Common)

∴ ΔADC ≅ ΔBCD (SSS Congruence rule)

∴ ∠ADC = ∠BCD (by CPCT)

But m∠ADC + m∠BCD = 180° (co-interior angles)

⇒ m∠ADC + m∠ADC = 180°

⇒ 2∠ADC = 180°

⇒ m∠ADC = 90°

One of interior angle of ABCD quadrilateral is a right angle

Now, we have ABCD is a parallelogram, AB = BC = CD = AD and one of its interior angle is 90°. Therefore, ABCD is a square.

21.

i. To construct a grouped frequency distribution table of class size 2.
Class intervals will be as follows 84 – 86, 86 – 88, 88 – 90, and so on.

Relative humidity (in %)	Number of days (frequency)
84 – 86	1
86 – 88	1
88 – 90	2
90 – 92	2
92 – 94	7
94 – 96	6
96 – 98	7
98 – 100	4
Total	30

ii. Since relative humidity is high so the data must be of a month of rainy season.

iii. Range of data = maximum value – minimum value = 99.2 – 84.9 = 14.3

22. Inner radius of hemispherical bowl = 5 cm

Thickness of the bowl = 0.25 cm

∴ Outer radius (r) of hemispherical bowl = (5 + 0.25) cm = 5.25 cm

Outer C.S.A. of hemispherical bowl = $2\pi r^2 = 2 \times \frac{22}{7} \times (5.25)^2 = 173.25 \text{ cm}^2$

Thus, the outer curved surface area of the bowl is 173.25 cm^2.

OR

Diameter of each pillar = 5 m

∴ Radius (r) = 2.5 m

Height (h) = 21 m

L.S.A. of 1 pillar = 2 x π x r x h

$= 2 \times \frac{22}{7} \times 2.5 \times 21$

= 330 m^2

∴ L.S.A. of 50 pillars = 330 x 50

= 16500 m^2

Cost of painting the pillars = 16500x Rs 4.50

= Rs 74250

Section D

23.

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

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

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

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

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

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

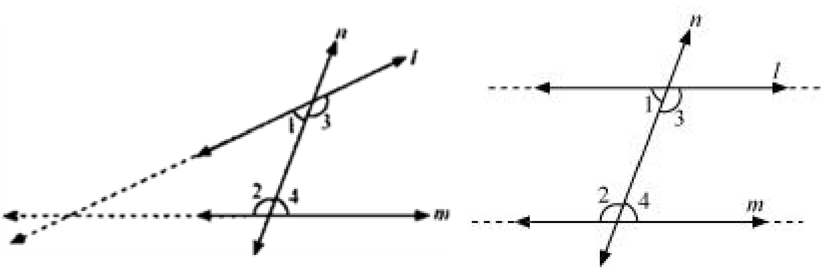
$$=3+\sqrt{8}-\left(\sqrt{8}+\sqrt{7}\right)+\left(\sqrt{7}+\sqrt{6}\right)-\left(\sqrt{6}-\sqrt{5}\right)+\left(\sqrt{5}+2\right)$$

$$=5$$

24. Euclid's 5^{th} 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.

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

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

$$= \frac{3+2\sqrt{2}}{9-8}$$

$$= 3+2\sqrt{2}$$

And,

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

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

$$= \frac{3-2\sqrt{2}}{9-8} = 3-2\sqrt{2}$$

$$\Rightarrow x+y = 3+2\sqrt{2}+3-2\sqrt{2} = 6$$

$$\Rightarrow xy = \left(3+2\sqrt{2}\right)\left(3-2\sqrt{2}\right) = 9-8 = 1$$

$$\Rightarrow x^3+y^3 = (x+y)^3 - 3xy(x+y)$$

$$= 6^3 - 3.1.6$$

$$= 216-18$$

$$= 198$$

OR

(i) $(p + q)^2 = (8)^2$

$p^2 + q^2 + 2pq = 64$ ...(i)

$(p - q)^2 = (4)^2$

$p^2 + q^2 - 2pq = 16$

$p^2 + q^2 = 16 + 2pq$ ...(ii)

Using (ii) in (i), we get:

$16 + 2pq + 2pq = 64$

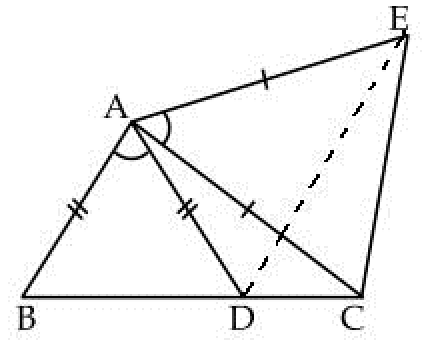
$\Rightarrow 4pq = 64 - 16 = 48$

$\Rightarrow pq = 12$

(ii) Putting $pq = 12$ in (i) we get:

$p^2 + q^2 = 64 - 2(12) = 64 - 24 = 40$

26. Join DE.



∠ BAD = ∠ EAC

∠ BAD + ∠ DAC = ∠ EAC + ∠ DAC

∠ BAC = ∠ DAE --------- (i)

In ΔABC & Δ ADE

AB = AD (Given)

∠ BAC = ∠ DAE (from (i))

AC =AE

So, By SAS congrience criteria

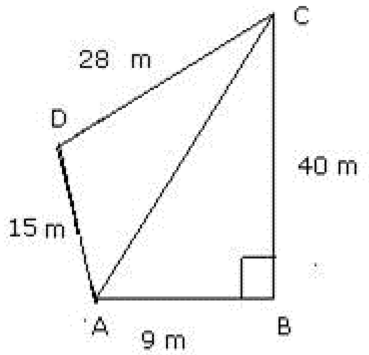
ΔABC ≅ ΔADE

BC = DE (CPCT)

OR

In Δ ABC,
Since AB = AC
∠C= ∠B (angles opposite to the equal sides are equal)
BO and CO are angle bisectors of ∠B and ∠C respectively
Hence, ∠ABO= ∠OBC = ∠BCO = ∠ACO
Join AO to meet BC at D
In Δ ABO and Δ ACO and
AO = AO
AB = AC
∠C= ∠B
Therefore, Δ ABO ≅ Δ ACO (SAS criteria)
Hence, ∠ BAO= ∠CAO
⇒AO bisects angle BAC
In Δ ABO and Δ ACO
AB = AC
AO = AO
∠BAD = ∠CAD (proved)
Δ ABO ≅ Δ ACO (SAS criteria)
Therefore,

27. Let ABCD be the garden.



Δ ABC,

$AC^2 = 9^2 + 40^2 = 1681$

AC = 41

Area of the garden = Area of Δ ABC + area of ΔACD

Area of Δ ABC $= \frac{1}{2} \times b \times h = \frac{1}{2} \times 9 \times 40 = 180cm^2$

Area of $\Delta ACD = \sqrt{s(s-a)(s-b)(s-c)}$

$\left[\because s = \frac{15+28+41}{2} = 42m \right]$

$\therefore$ Area of $\Delta ACD = \sqrt{42 \times 27 \times 14 \times 1} = 7 \times 3 \times 3 \times 2 = 126m^2$

$\therefore$ Area of the garden = 180 + 126 = 306 m^2.

OR

A horse tethered to the corner of an equilateral triangle by a rope can graze the quarter of a circle with radius =

Length of the rope = 21m

Each angle of an equilateral triangle=60°

The Area of a the sector of a circle with radius r = $\frac{\pi r^2}{4}$

The Area of a the quarter of a circle with radius 21 m

The Area of a Sector with radius r = $\frac{\theta}{360^\circ} \times \pi r^2$

The Area of a Sector with radius 21m = $\frac{60^\circ}{360^\circ} \times \pi (21)^2 = \frac{1}{6} \times \frac{22}{7} \times 441 = 231m^2$

28. We have m∠AOC = 120°

By the degree measure theorem,

m∠AOC = 2m∠APC

$\therefore$ 120° = 2m∠APC

$\therefore$ m∠APC = 60°

Now, m∠APC + m∠ABC = 180° ....(Opposite angles of a cyclic quadrilateral)

∴ 60° + m∠ABC = 180°

∴ m∠ABC = 180° – 60° = 120°

m∠ABC + m∠DBC = 180° ....(Linear pair of angles)

∴ 120° + x° = 180°

∴ x = 180° – 120° = 60°

29. The angles of the triangle are:

$$m\angle A = \frac{3}{12} \times 180° = 45°$$

$$m\angle B = \frac{4}{12} \times 180° = 60°$$

$$m\angle B = \frac{5}{12} \times 180° = 75°$$

Steps of construction:

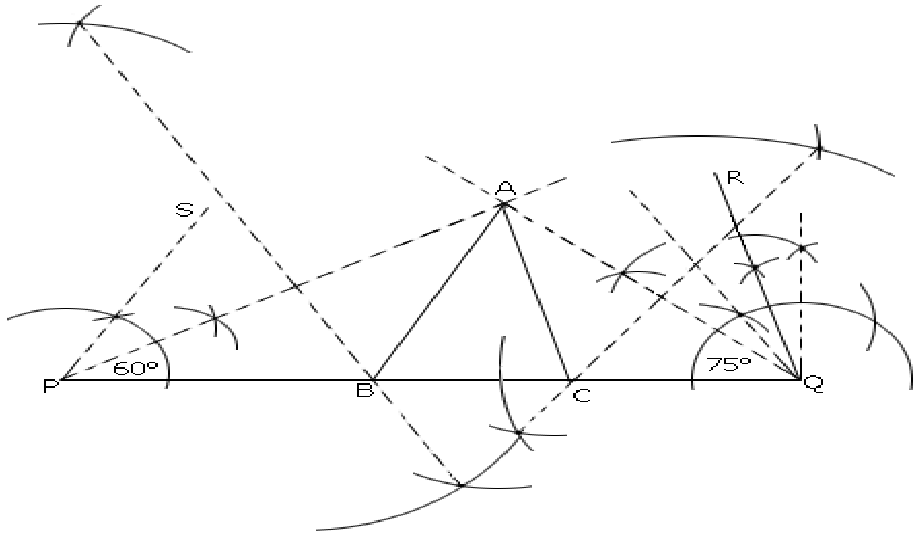
(a) Draw a line PQ = 12.5 cm.

(b) At P, construct m∠SPQ = 60° and at Q, construct m∠RQP = 75°.

(c) Draw the bisectors of ∠SPQ and ∠RQP, intersecting at A.

(d) Draw perpendicular bisectors of AP and AQ and cause them to intersect PQ at B and C respectively.

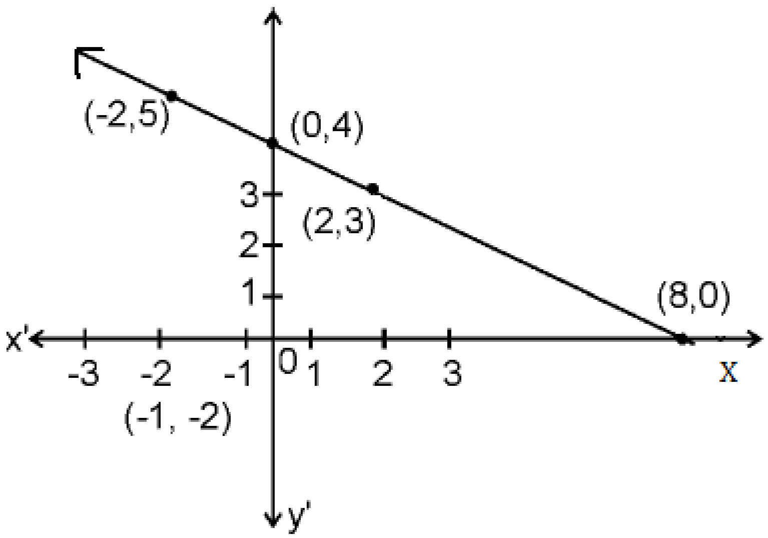
(e) Join A to B and A to C. ΔABC is the required triangle.



30. $x + 2y = 8$

$\Rightarrow y = \frac{1}{2}(8 - x)$

x	−2	0	2
y	5	4	3



From the graph it is clear that (−1, −2) does not lie on the line.
Therefore, (−1, −2) is not a solution of line $x + 2y = 8$.