Class IX Session 2025-26
Subject - Mathematics
Sample Question Paper - 4

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment carrying 04 marks each.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

Section A

1. The point whose ordinate is 6 and which point lies on the y-axis? **[1]**

a) (0, 6) b) (6, 6)

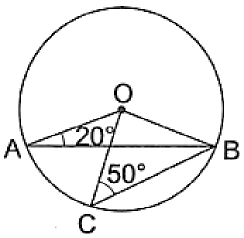
c) (6, 4) d) (6, 0)

2. The length of the sides of a triangle are 5x, 5x and 8x. The area of the triangle is : **[1]**

a) $24\ x^2$ sq. units b) $144\ x^2$ sq. units

c) $12\ x^2$ sq. units d) $100\ x^2$ sq. units

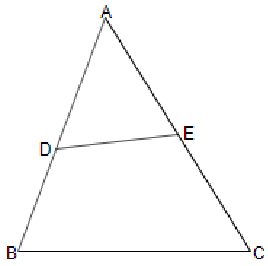
3. In the given figure, O is the centre of a circle in which ∠OAB = 20° and ∠OCB = 50°. Then, ∠AOC = ? **[1]**



a) 20° b) 70°

c) 50° d) 60°

4. In fig D is mid-point of AB and DE || BC then AE is equal to **[1]**

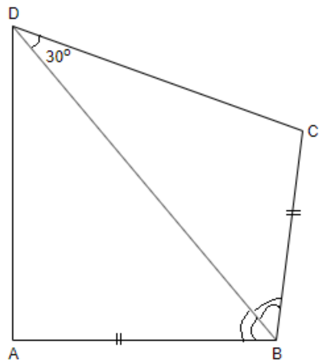


a) EC
b) AD
c) DB
d) BC

5. $\sqrt{12} \times \sqrt{15} =$ **[1]**

a) $6\sqrt{5}$
b) 5
c) 6
d) $5\sqrt{6}$

6. In the adjoining figure, AB = BC and $\angle ABD = \angle CBD$, then another angle which measures 30° is **[1]**



a) $\angle BCD$
b) $\angle BAD$
c) $\angle BCA$
d) $\angle BDA$

7. Which of the following point does not lie on the line y = 2x + 3? **[1]**

a) (-5, -7)
b) (3, 7)
c) (3, 9)
d) (-1, 1)

8. 8 is a polynomial of degree **[1]**

a) 2
b) 8
c) 1
d) 0

9. If $x = \frac{2}{3+\sqrt{7}}$, then $(x - 3)^2$ **[1]**

a) 7
b) 1
c) 6
d) 3

10. The triangle formed by joining the mid-points of the sides of a right angled triangle is **[1]**

a) Scalene
b) Right angled
c) Equilateral
d) Isosceles

11. A rational number between -3 and 3 is **[1]**

a) 0
b) -4.3
c) -3.4
d) 1.101100110001 ...

12. Which of the following pair is a solution of the equation 3x – 2y = 7? **[1]**

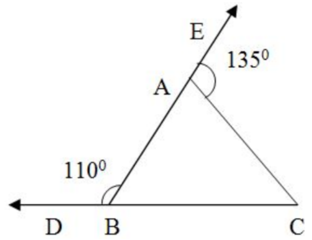
a) (-2, 1)

b) (5, 1)

c) (1, -2)

d) (1, 5)

13. In the given figure, sides CB and BA of $\triangle ABC$ have been produced to D and E respectively such that $\angle ABD = 110°$ and $\angle CAE = 135°$. Then $\angle ACB$ =? **[1]**



a) 35°

b) 65°

c) 45°

d) 55°

14. The value of $\left\{8^{\frac{-4}{3}} \div 2^{-2}\right\}^{\frac{1}{2}}$, is **[1]**

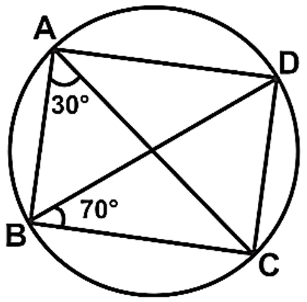
a) $\frac{1}{2}$

b) 4

c) 2

d) $\frac{1}{4}$

15. In the given figure, the measure of $\angle BCD$ is **[1]**



a) 100^o

b) 70^o

c) 30^o

d) 80^o

16. Points (1, -1), (2, -2), (4, -5), (-3, -4) **[1]**

a) lie in IV quadrant

b) lie in III quadrant

c) lie in II quadrant

d) Do not lie in the same quadrant

17. The graph of the line y = 3 passes through the point **[1]**

a) (2, 3)

b) (3, 2)

c) (0, 3)

d) (3, 0)

18. If p(x) = x + 3, then p(x) + p(-x) is equal to **[1]**

a) 3

b) 6

c) 2x

d) 0

19. **Assertion (A):** In ΔABC, E and F are the midpoints of AC and AB respectively. The altitude AP at BC intersects FE at Q. Then, AQ = QP. **[1]**

Reason (R): Q is the midpoint of AP.

a) Both A and R are true and R is the correct

b) Both A and R are true but R is not the explanation of A. correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

20. **Assertion (A):** $2+\sqrt{6}$ is an irrational number. **[1]**

Reason (R): Sum of a rational number and an irrational number is always an irrational number.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

21. Look at the Fig. Show that length AH > sum of lengths of AB + BC + CD. **[2]**

22. Does Euclid's fifth postulate imply the existence of parallel lines ? Explain. **[2]**

23. In which quadrant will the point lie, if : **[2]**

(i) The y-coordinate is 3 and the x-coordinate is –4?

(ii) The x-coordinate is –5 and the y-coordinate is –3?

(iii) The y-coordinate is 4 and the x-coordinate is 5?

(iv) The y-coordinate is 4 and the x-coordinate is –4?

24. Assuming that x is a positive real number and a, b, c are rational numbers, show that: $\left(\frac{x^a}{x^b}\right)^{\frac{1}{ab}}\left(\frac{x^b}{x^c}\right)^{\frac{1}{bc}}\left(\frac{x^c}{x^a}\right)^{\frac{1}{ac}} = 1$ **[2]**

OR

Evaluate: $\left[(16)^{\frac{1}{2}}\right]^{\frac{1}{2}}$.

25. Parveen wanted to make a temporary shelter for her car, by making a box-like structure with tarpaulin that covers all the four sides and the top of the car (with the front face as a flap which can be rolled up). Assuming that the stitching margins are very small, and therefore negligible, how much tarpaulin would be required to make the shelter of height 2.5 m, with base dimensions 4 m × 3 m? **[2]**

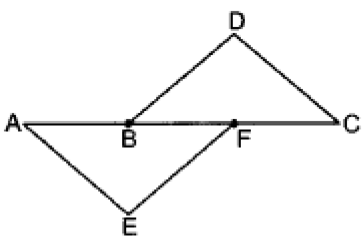
OR

A room is 16 m long, 9 m wide and 3 m high. It has two doors, each of dimensions (2 m $\times$ 1.5 m) and three windows, each of dimensions (1.6 m $\times$ 75 cm). Find the cost of distempering the walls of the room from inside at the rate of Rs. 50 per square metre.

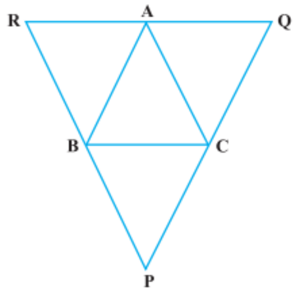
Section C

26. Express in the form of $\frac{p}{q}$:$0.\overline{38}+1.\overline{27}$ **[3]**

27. In given figure, it is given that AB = CF, EF = BD and $\angle$AFE = $\angle$CBD. Prove that $\triangle$AFE $\cong$ $\triangle$CBD. **[3]**

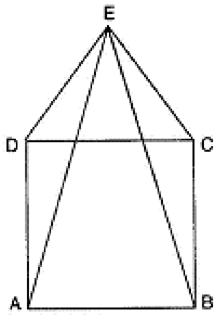


28. Through A, B and C, lines RQ, PR and QP have been drawn, respectively parallel to sides BC, CA and AB of a $\triangle$ABC as shown in Fig., Show that $BC = \frac{1}{2}QR$ **[3]**



29. Draw the graphs of the equations : $3x - 2y = 4$ and $x + y - 3 = 0$ in the same graph and find the co-ordinates of the point where two lines intersect. **[3]**

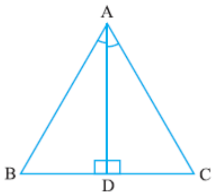
30. ABCD is a square and DEC is an equilateral triangle. Prove that AE = BE. **[3]**



OR

AD is an altitude of an isosceles triangle ABC in which AB = AC. Show that:

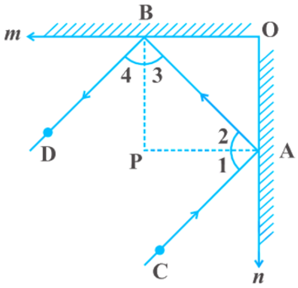
i. AD bisects BC.
ii. AD bisects $\angle A$



31. Factorise : $x^3 - 23x^2 + 142x - 120$ **[3]**

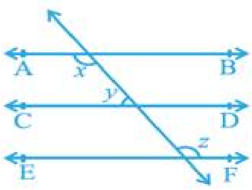
Section D

32. In figure, m and n are two plane mirrors perpendicular to each other. Show that the incident ray CA is parallel to reflected ray BD. **[5]**



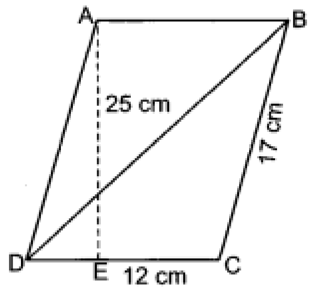
OR

In the given figure, if AB || CD, CD || EF and y: z = 3: 7, find x.



33. Each side of a rhombus is 10 cm long and one of its diagonals measures 16 cm. Find the length of the other diagonal and hence find the area of the rhombus. **[5]**

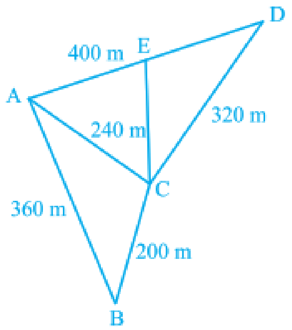
34. Find the area of a parallelogram given in Fig. Also find the length of the altitude from vertex A on the side DC. **[5]**



OR

Kamla has a triangular field with sides 240 m, 200 m, 360 m, where she grew wheat. In another triangular field with sides 240 m, 320 m, 400 m adjacent to the previous field, she wanted to grow potatoes and onions.

She divided the field in two parts by joining the mid-point of the longest side to the opposite vertex and grew potatoes in one part and onions in the other part. How much area (in hectares) has been used for wheat, potatoes and onions? [1 hectare = 1000 m^2, $\sqrt{2}$ = 1.41]



35. The polynomial $p(x) = x^4 - 2x^3 + 3x^2 - ax + 3a - 7$ when divided by x + 1 leave 19 as remainder. Also, find the remainder when p(x) is divided by x + 2. **[5]**

Section E

36. **Read the following text carefully and answer the questions that follow:** **[4]**

In the Meharali, New DTC bus stop was constructed. The bus stop is barricaded from the remaining part of the road, by using 50 hollow cones. Each hollow cone is made of recycled cardboard.

Each cone has a base diameter of 40 cm and a height of 1 m.

i. Find the curved surface area of the cone. (1)

ii. What is the volume of a cone? (1)

iii. If the outer side of each of the cones is to be painted and the cost of painting is ₹12 per m^2, what will be the cost of painting all these cones? (2)

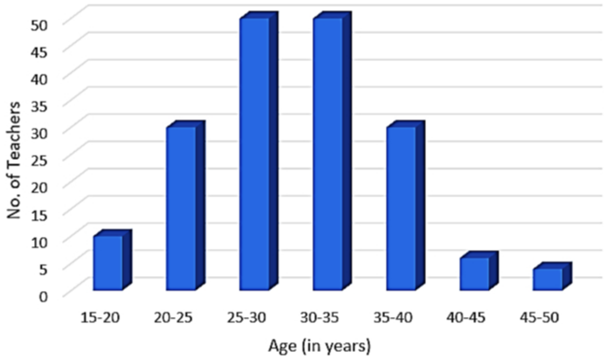
OR

If the cost of cardboard is ₹100 per m^2 then what will be cost of cardboard for 50 cones? (2)

37. **Read the following text carefully and answer the questions that follow:** **[4]**

A teacher is a person whose professional activity involves planning, organizing, and conducting group activities to develop student's knowledge, skills, and attitudes as stipulated by educational programs. Teachers may work with students as a whole class, in small groups or one-to-one, inside or outside regular classrooms. In this indicator, teachers are compared by their average age and work experience measured in years.

For the same in 2015, the following distribution of ages (in years) of primary school teachers in a district was collected to evaluate the teacher on the above-mentioned criterion.



i. What is the total no of teachers? (1)

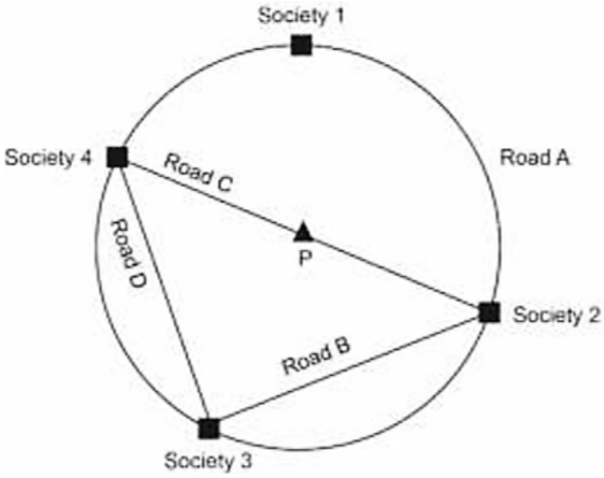
ii. Find the class mark of class 15 - 20, 25 - 30 and 45 - 50? (1)

iii. What is the no of teachers of age range 25 - 40 years? (2)

OR

Which classes are having same no. of teachers? (2)

38. Given below is the map giving the position of four housing societies in a township connected by a circular road A. **[4]**



Society 2 and 3 are connected by straight road B, society 4 and 2 are connected by straight road C and society 4 and 3 are connected by road D. Point P denotes the position of a park. The park is equidistant to all four societies.

Rubina claims that it is not possible to construct another circular road connecting all four societies.

i. Which of the following options justifies Rubina's claim?

a. Equal chords of congruent circles subtend equal angles at the centre.

b. The perpendicular from the centre of a circle to a chord bisects the chord.

c. There is a unique circle passing through three non-collinear points.

d. Points equidistant from a given point will lie on a circle.

ii. What is the position of the park P with respect to road A?

a. Chord

b. Centre

c. Sector

d. Segment

iii. The length of Road B is equal to the length of Road D.

Which of the following options can be true for the roads in the township?

a. Road B bisects Road D.
b. Road B and Road make an acute angle.
c. Road B, Road C and Road D are of equal length.
d. Road B and Road D subtend equal angles at society 1.

iv. Alex says, "The angle made by road B on road D is a right angle". Jai and Angad give different justifications to support Alex's claim. Jai says, Angles in the same segment of a circle are equal. Angad says, The angle in a semicircle is a right angle. Who has given the correct justification?

Solution

Section A

1. **(a)** (0, 6)

   Explanation:

   Since the ordinate or y-coordinate of a point is 6 and this point lies on y-axis.

   And the abscissa or x-coordinate of a point lying on y-axis is 0.

   Therefore, the coordinate of the point is (0, 6).

2.

   (c) 12 x^2 sq. units

   Explanation:

   s = $\frac{5x+5x+8x}{2}$ = 9x cm

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

   = $\sqrt{9x(9x-5x)(9x-5x)(9x-8x)}$

   = $\sqrt{9x \times 4x \times 4x \times x}$

   = $12x^2$ sq. cm

3.

   (d) 60°

   Explanation:

   OA = OB $\Rightarrow$ $\angle$OBA = $\angle$OAB = 20°.

   In $\triangle$OAB,

   $\angle$OAB + $\angle$OBA + $\angle$AOB = 180°

   $\Rightarrow$ 20° + 20° + $\angle$AOB = 180°

   $\Rightarrow$ $\angle$AOB = 140°.

   OB = OC $\Rightarrow$ $\angle$OBC = $\angle$OCB = 50°.

   In $\triangle$OCB,

   $\angle$OCB + $\angle$OBC + $\angle$COB = 180°

   $\Rightarrow$ 50° + 50° + $\angle$COB = 180°

   $\Rightarrow$ $\angle$COB = 80°.

   $\angle$AOB = 140° $\Rightarrow$ $\angle$AOC + $\angle$COB = 140°

   $\Rightarrow$ $\angle$AOC + 80° = 140°

   $\Rightarrow$ $\angle$AOC = 140° - 80°

   $\Rightarrow$ $\angle$AOC = 60°.

4. **(a)** EC

   Explanation:

   By midpoint theorem of a triangle E is the midpoint of AC, hence AE = EC

5. **(a)** $6\sqrt{5}$

   Explanation:

   $\sqrt{12} = \sqrt{3 \times 2^2} = 2\sqrt{3}$ and $\sqrt{15} = \sqrt{5} \times \sqrt{3}$

   so, $\sqrt{12} \times \sqrt{15} = 2\sqrt{3} \times \sqrt{3} \times \sqrt{5}$

   $= 2 \times 3\sqrt{5} = 6\sqrt{5}$

6.

   (d) $\angle$BDA

   Explanation:

   In triangle ABD and CBD

   AB = BC and $\angle$ABD = $\angle$CBD (Given)

BD (Common)

Therefore In triangle ABD and CBD are congruent by SAS criteria.

Therefore, $\angle BDA = 30^o$ (by CPCT)

7.

(b) (3, 7)

Explanation:

Let us put x = 3 in the give equation,

Then, y = 2(3) + 3

y = 6 + 3 = 9

So, the point will be (3, 9)

For x = 3, y = 9. But in the given option, y = 7

So, the given point (3, 7) will not lie on the line y = 2x + 3.

8.

(d) 0

Explanation:

Since 8 is a constant term.

Therefore its degree is 0.

9. **(a)** 7

Explanation:

$x = \frac{2}{3+\sqrt{7}}$

$= \frac{2}{3+\sqrt{7}} \times \frac{3-\sqrt{7}}{3-\sqrt{7}}$

$= \frac{2(3-\sqrt{7})}{(3)^2-(\sqrt{7})^2}$

$= \frac{2(3-\sqrt{7})}{9-7}$

$= \frac{2(3-\sqrt{7})}{2}$

$= 3 - \sqrt{7}$

Now $(x - 3)^2 = (3 - \sqrt{7} - 3)^2$

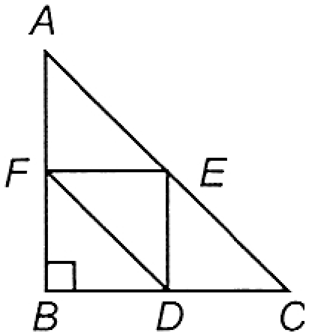
$= (-\sqrt{7})^2$

=7

10.

(b) Right angled

Explanation:



Let ABC be right angled triangle and $\angle ABC = 90°$.

Let D, E, F are mid-points of sides BC,

AC and AB respectively.

$\therefore$ EF || BD and BF || DE (By mid-point theorem)

$\Rightarrow$ BDEF is a parallelogram.

$\therefore \angle FED = \angle FBD = 90°$ ($\because$ Opposite angles of a parallelogram are equal)

$\therefore$ DEF is right angled triangle.

11. **(a)** 0

Explanation:

0, [Since 0 is in between -3 and 3 (ie -3<0<3)]

12.

(c) (1, -2)

Explanation:

Solution of the equation 3x – 2y = 7 is (1, -2) as it satisfy the given equation

3x – 2y = 7

⇒ 3(1) - 2(-2) = 7

⇒ 3 + 4 = 7

LHS = RHS

13.

(b) 65°

Explanation:

∠EAC + ∠BAC = 180° (Linear Pair)

∠EAC = 135°

135° + ∠BAC = 180°

∠BAC = 180° - 135°

∠BAC = 45°

∠ABD + ∠ABC = 180° (Linear Pair)

∠ABD = 110°

110° + ∠ABC = 180°

∠ABC = 180° - 110°

∠ABC = 70°

In ABC

∠BAC + ∠ABC + ∠ACB = 180°

45° + 70° + ∠ACB = 180°

115° + ∠ACB = 180°

∠ACB = 180° - 115°

∠ACB = 65°

14. **(a)** $\frac{1}{2}$

Explanation:

$$\left\{8^{\frac{-4}{3}} \div 2^{-2}\right\}^{\frac{1}{2}}$$

$$= \left[\left(2^3\right)^{\frac{-4}{3}} \div 2^{-2}\right]^{\frac{1}{2}}$$

$$= \left[2^{3\times\frac{-4}{3}} \div 2^{-2}\right]^{\frac{1}{2}}$$

$$= \left[2^{-4} \div 2^{-2}\right]^{\frac{1}{2}}$$

$$= \left[2^{-4-(-2)}\right]^{\frac{1}{2}}$$

$$= \left[2^{-4+2}\right]^{\frac{1}{2}}$$

$$= \left[2^{-2}\right]^{\frac{1}{2}}$$

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

$= \left(\frac{1}{2}\right)^{2 \times \frac{1}{2}}$

$= \frac{1}{2}$

15.

(d) 80^{o}

Explanation:

Angle subtended by a chord BC on the periphery of the circle is $\angle BAC = 30^{\circ}$

Same chord BC subtends another angle $\angle BDC$ on the periphery. Therefore, $\angle BDC = \angle BAC = 30^{\circ}$

Now, in $\triangle BDC$

$\angle DBC + \angle BDC + \angle BCD = 180^{\circ}$

$70^{0} + 30^{0} + \angle BCD = 180^{0}$

$\angle BCD = 180^{\circ} - 100^{\circ} = 80^{\circ}$

16.

(d) Do not lie in the same quadrant

Explanation:

In points (1, -1), (2, -2) and (4, -5) x-coordinate is positive and y-coordinate is negative, So, they all lie in IV quadrant.

In point (-3, -4) x-coordinate is negative and y-coordinate is negative. So, it lies in III quadrant.

So, given points do not lie in the same quadrant.

17. **(a)** (2, 3)

Explanation:

Since, the graph of the line y = 3 is parallel to x-axis at a distance of 3 units from the x-axis.

Or, the y-coordinate of every point on the line is always equal to 3.

So, the graph of the line y = 3 passes through the point (2, 3)

18.

(b) 6

Explanation:

p(x) = x + 3

And p(-x) = -x + 3

Then, p(x) + p(-x)

= x + 3 - x + 3

= 6

19.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

In ΔABC, E and F are midpoint of the sides AC and AB respectively.

FE || BC [By mid-point theorem]

Now, in ΔABP, F is mid-point of AB and FQ || BP. Q is mid-point of AP

AQ = QP

20. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Both A and R are true and R is the correct explanation of A.

Section B

21. From the given figure, we have

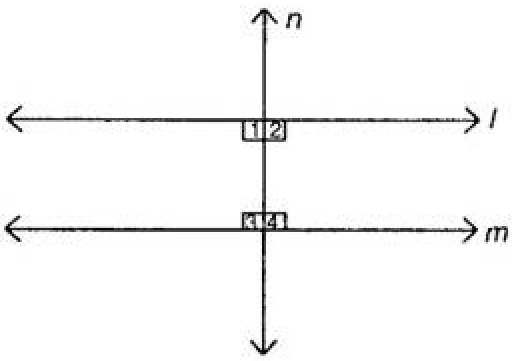
AB + BC + CD = AD [AB, SC and CD are the parts of AD] Here, AD is also the parts of AH.

By Euclid's axiom, the whole is greater than the part. i.e., AH > AD.

Therefore, length AH > sum of lengths of AB + BC + CD.

22. Yes, According to Euclid's 5th postulate when n line falls on l and m if $\angle 1 + \angle 3 < 180^{o}$ and $\angle 2 + \angle 4 > 180^{o}$ then producing the l and m further will meet in the side of $\angle 1$ and $\angle 3$ which is less than 180^{o}.

Which gave the clue about the condition that $\angle 1 + \angle 2 = 180^{o}$ and the line l and m will not meet at any point.



23. (i) II

(ii) III

(iii) I

(iv) II

24. $\left(\frac{x^a}{x^b}\right)^{\frac{1}{ab}}\left(\frac{x^b}{x^c}\right)^{\frac{1}{bc}}\left(\frac{x^c}{x^a}\right)^{\frac{1}{ac}}$

= $\left(x^{a-b}\right)^{\frac{1}{ab}}\left(x^{b-c}\right)^{\frac{1}{bc}}\left(x^{c-a}\right)^{\frac{1}{ac}}$ [using $\frac{a^m}{a^n}$= a^{m-n}]

= $x^{\frac{(a-b)}{ab}} \times x^{\frac{(b-c)}{bc}} \times x^{\frac{(c-a)}{ac}}$

= $x^{\frac{1}{b}-\frac{1}{a}} \times x^{\frac{1}{c}-\frac{1}{b}} \times x^{\frac{1}{a}-\frac{1}{c}}$

= $x^{\frac{1}{b}-\frac{1}{a}+\frac{1}{c}-\frac{1}{b}+\frac{1}{a}-\frac{1}{c}}$ [using $a^m \times a^n = a^{m+n}$]

= $x^0 = 1$

OR

$\left[(16)^{\frac{1}{2}}\right]^{\frac{1}{2}}$

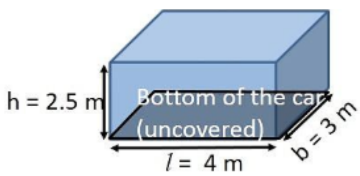
$= \left[(4^2)^{\frac{1}{2}}\right]^{\frac{1}{2}}$

$= \left[4^{2\times\frac{1}{2}}\right]^{\frac{1}{2}}$

$= 4^{\frac{1}{2}}$

$= 2^{2\times\frac{1}{2}}$

= 2

25. 

For shelter : l = 4 m, b = 3 m, h = 2.5 m.

∴ Total surface area of the shelter = lb + 2(bh + hl)

= $4 \times 3 + 2[(3)(2.5) + (2.5)(4)]$

= $12 + 2[7.5 + 10]$

= $12 + 2[17.5]$

= 47 m^2

∴ 47 m^2 of tarpaulin will be required.

OR

Area of 4 walls of the room = [2 (l+ b) × h] sq units

= [2(16 + 9) × 3] m^2 = 150 m^2

Area of 2, doors = $\left[2 \times \left(2 \times \frac{3}{2}\right)\right] \mathrm{m}^2 = 6\mathrm{m}^2$

Area of 3 windows = $\left[3 \times \left(1.6 \times \frac{75}{100}\right)\right] \mathrm{m}^2 = \frac{18}{5}\mathrm{m}^2$ = 3.6m^2

Area not to be distempered = (6 + 3.6) m^2 = 9.6 m^2

Area to be distempered = (150 - 9.6) m^2 = 140.4 m^2

Cost of distempering the walls = Rs. (140.4 × 50) = Rs. 7020

Section C

26. Let x =$0.\overline{38}$

i.e. x = 0.3838…. ….(i)

Multiply eq. (i) by 100 we get,

⇒ 100x = 38.3838…. ….(ii)

On subtracting eq. (i) from (ii), we get

100x - x = 38.3838... - 0.3838...

99x = 38

$\Rightarrow x = \frac{38}{99}$

Let y = $1.\overline{27}$

i.e. y = 1.2727….(iii)

Multiply eq. (i) by 100 we get,

⇒ 100y = 127.2727…(iv)

On subtracting (iii) from (iv), we get

100y-y = 127.2727.... - 1.2727....

99y = 126

$\Rightarrow y = \frac{126}{99}$

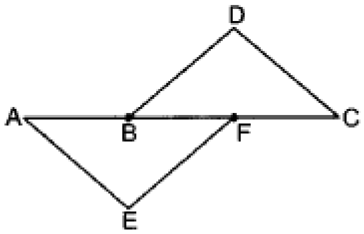
$\therefore x + y = 0.\overline{38} + 1.\overline{27}$

$= \frac{38}{99} + \frac{126}{99}$

$= \frac{38+126}{99}$

$= \frac{164}{99}$

27.



In triangles AFE and CBD (in above shown figure) , we have

AB = CF (Given)

Adding BF on both the sides, we get:-

AB + BF = CF + BF

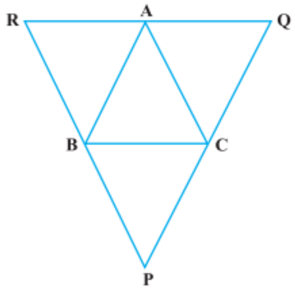
or, AF = BC

Now in triangles AFE and CBD, we have AF= CB (Proved above)

∠AFE = ∠CBD (Given)

and EF = BD (Given) .So, according to SAS congruency criteria of triangles;

△AFE ≅ △CBD Hence, proved.

28. 

Given,

PQ||AB, PR||AC and RQ||BC.

In quadrilateral BCAR,

BR||CA and BC||RA

∴ BCAR is a parallelogram

∴BC = AR …(i)

Now, in quadrilateral BCQA,

BC||AQ and AB||QC

∴BCQA is a parallelogram

∴BC = AQ …(ii)

Adding Eqn. (i) and (ii), we get

2BC = AR + AQ

2BC = RQ

$BC = \frac{QR}{2}$

Hence proved.

29. Graph of equation 3x - 2y = 4,

We have, 3x - 2y = 4, 3x - 4 = 2y

$\Rightarrow y = \frac{3}{2}x - 2$

Let x = 0 : $y = \frac{3}{2}(0) - 2 = 0 - 2 = -2$

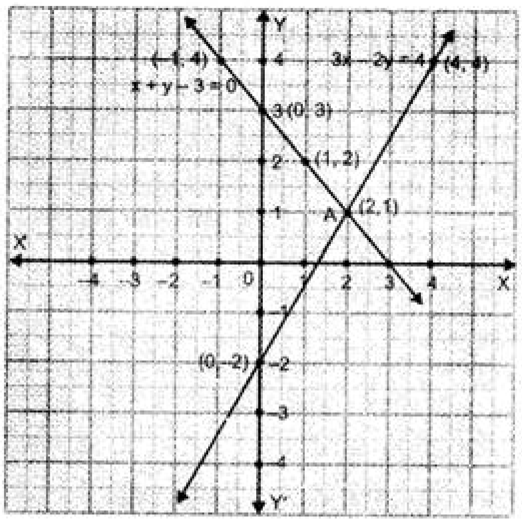
Let x = 2 : $y = \frac{3}{2}(2) - 2 = 3 - 2 = 1$

Let x = 4 : $y = \frac{3}{2}(4) - 2 = 6 - 2 = 4$

Thus, we have the following table :

x	0	2	4
y	-2	1	4

Now, plot the points (0, -2), (2, 1) and (4, 4) on a graph paper and join them by a line.



Graph of the equation x + y - 3 = 0

x + y - 3 = 0

⇒ y = -x + 3

Let x = 0 : y = -0 + 3 = 3

Let x = 1 : y = -1 + 3 = 2

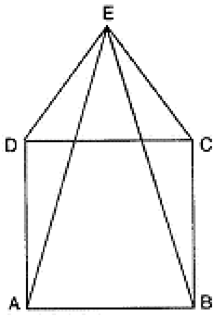
Let x = -1 : y = - (-1) + 3 = 1 + 3 = 4

Thus, we have the following table :

x	0	1	-1
y	3	2	4

By plotting the points (0, 3), (1, 2) and (-1, 4) on the graph paper and joining them by a line, we obtain the graph of x + y - 3 = 0

The lines represented by the equations 3x - 2y = 4 and x + y - 3 = 0 intersect at point A whose co-ordinates are (2, 1).

30. 

In DEDA and DECB,

DE = CE . . . . [Sides of an equilateral triangle]

AD = BC . . . . [Sides of a square]

∠EDA = ∠ECB . . . .[As ∠EDC = ∠ECD and ∠ADC = ∠BCD]

∠EDC + ∠ADC = ∠ECD + ∠BCD . . . .[By addition]

⇒ ∠EDA = ∠ECB

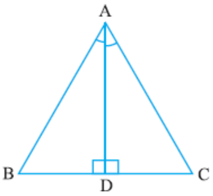
∴ DEDA ≅DECB . . . [By SAS property]

∴ AE = BE . . . [c.p.c.t.]

OR

In △ABD and △ACD, AB = AC [Given]

∠ADB = ∠ADC = 90° [AD ⊥ BC]



AD = AD [Common]

∴ $\triangle ABD \cong \triangle ACD$ [RHS rule of congruency]

⇒ BD = DC [By C.P.C.T.]

⇒ AD bisects BC

Also $\angle BAD$∠BAD = $\angle CAD$∠CAD [By C.P.C.T.]

⇒AD bisects ∠A

31. Let p(x) = $x^3 - 23x^2 + 142x - 120$

We shall now look for all the factors of –120. Some of these are ±1, ±2, ±3, ±4, ±5, ±6, ±8, ±10, ±12, ±15, ±20, ±24, ±30, ±60.

By trial, we find that p(1) = 0. Therefore, x – 1 is a factor of p(x).

Now we see that $x^3 - 23x^2 + 142x - 120 = x^3 - x^2 - 22x^2 + 22x + 120x - 120$

$= x^2 (x - 1) - 22x(x - 1) + 120(x - 1)$

$= (x - 1) (x^2 - 22x + 120)$ [Taking (x – 1) common]

Now $x^2 - 22x + 120$ can be factorised either by splitting the middle term or by using the Factor theorem. By splitting the middle term, we have: $x^2 - 22x + 120 = x^2 - 12x - 10x + 120$

= x(x – 12) – 10(x – 12)

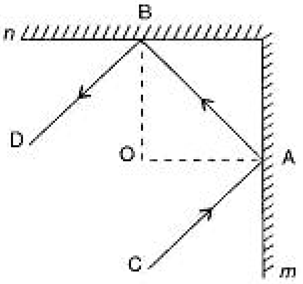
= (x – 12) (x – 10)

Therefore, $x^3 - 23x^2 - 142x - 120 = (x - 1)(x - 10)(x - 12)$

Section D

32. At B, draw BO $\perp$ n and at A. draw AO $\perp$ m.

Let BO and AO meet at O.



as, Perpendiculars to two perpendicular lines are also perpendicular.

$\therefore \angle AOB = 90^o$

In $\triangle AOB$, $\angle AOB + \angle OAB + \angle OBA = 180^o$

(as,The sum of the three angles of a triangle is 180^o)

$\Rightarrow 90^o + \frac{1}{2}\angle CAB + \frac{1}{2}\angle ABD = 180^o$

(as, By law of reflection, Angle of incidence = Angle of reflection

$\therefore \angle CAO = \angle OAB = \frac{1}{2}\angle CAB$ and $\angle ABO = \angle OBD = \frac{1}{2}\angle ABD$)

$\Rightarrow \frac{1}{2}(\angle CAB + \angle ABD) = 90^o$

$\Rightarrow \angle CAB + \angle ABD = 180^o$

But these angles from a pair of supplementary consecutive interior angles.

$\therefore$ Ray CA || Ray BD.

OR

We are given that $AB \parallel CD, CD \parallel EF$ and $y : z = 3 : 7$

We need to find the value of x in the figure given below.

We know that lines parallel to the same line are also parallel to each other.

We can conclude that $AB \parallel EF$

Let $y = 3a$ and $z = 7a$

We know that angles on the same side of a transversal are supplementary.

$\therefore x + y = 180^\circ$

$x = z$ Alternate interior angles

$z + y = 180^\circ$

or $7a + 3a = 180^\circ$

$\Rightarrow 10a = 180^\circ$

$a = 18^\circ$.

$z = 7a = 126^\circ$

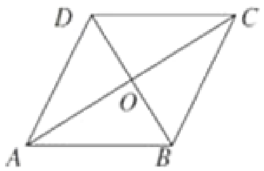
$y = 3a = 54^\circ$.

Now, as $x = z$

=> $x = 126^\circ$.

Therefore, we can conclude that $x = 126^\circ$

33. Let ABCD be rhombus.



We know that rhombus is type of parallelogram whose all sides are equal.

$\therefore$ AB = BC = CD = DA = 10 cm

Let the diagonals AC and BD intersect each other at O, where AC = 16 cm and let BD = x

We know that the diagonals of a rhombus are perpendicular bisectors of each other.

$\therefore \triangle AOB$ is a right angle triangle, in which

OB = BD $\div$ 2 = x $\div$ 2 and

OA = AC $\div$ 2 = 16 $\div$ 2 = 8 cm.

Now, AB= $OA^2 + OB^2$...by pythagoras theorem

$\therefore 10^2 = (\frac{x}{2})^2 + 8^2$

ie. $100 - 64 = \frac{x^2}{4}$

$36 \times 4 = x^2$

$\therefore x^2 = 144$

$\therefore x = 12$ cm

We know that area of rhombus is,

Area of rhombus = $\frac{1}{2}$ × (Diagonal1) × (Diagonal2)

Area of ABCD = $\frac{1}{2} \times AC \times BD$

$= \frac{1}{2} \times 16 \times 12$

$= 96\ cm^2$

Hence, the area of rhombus is 96 cm^2

34. For ΔBCD:

Let $a = 17\ cm, b = 12\ cm, c = 25\ cm$

So its semi-perimeter, $s = \frac{a+b+c}{2}$

$= \frac{17+12+25}{2} = 27\text{cm}$

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

$= \sqrt{27(27-17)(27-12)(27-25)}$

$= \sqrt{27 \times 10 \times 15 \times 2} = 90\text{cm}^2$

Now, area of parallelogram ABCD = 2 × Area of ΔBCD

$= 2 \times 90 = 180\ cm^2$

Also, area of parallelogram ABCD = base × height = DC × AE

$\therefore 180 = 12 \times AE$

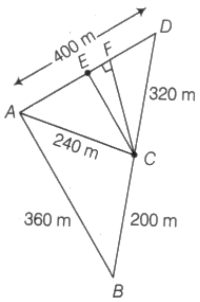
$\Rightarrow AE = \frac{180}{12}$ = 15 cm

Hence the length of altitude is 15 cm.

OR

Let ABC be the field, where wheat is grown. Also, let ACD be the field which has been divided into two parts by joining C to the mid-point E of AD. For the area of $\triangle$ABC, we have

a = 200m, b = 240 m, c = 360m



Therefore, s = $\frac{200+240+360}{2}$ = 400 m

So, area of growing wheat = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{400(400-200)(400-240)(400-360)}$

$= 1.6 \times \sqrt{2}$ hec = 1.6×1.41 [$\because$ 1.6 hec = 16000 m^2]

= 2.26 hec(approx.)

Now, we calculate the area of $\triangle$ACD.

Here, s = $\frac{240+320+400}{2}$ = 480 m

So, area of $\triangle$ACD

$= \sqrt{480(480-240)(480-320)(480-400)}$

$= \sqrt{480 \times 240 \times 160 \times 80}$ = 38400 m^2

= 3.84 hec [$\because$ 1 m^2 = $\frac{1}{10000}$hec]

Now, let CF $\perp$ AD. Then,

ar($\triangle$AEC) = $\frac{1}{2}$ × AE × CF = $\frac{1}{2}$ × ED × CF [$\because$ AE = ED, as E is mid-point of AD]

= ar($\triangle$EDC) [$\because$ CF is also a height of $\because$EDC corresponding to base ED]

$\therefore$ Area for growing potatoes = Area for growing onions

= (3.84 ÷ 2) = 1.92 hec

Hence, area has been used for growing wheat, potatoes and onion are 2.26 hec, 1.92 hec and 19.2 hec, respectively.

35. We know that when $p(x)$ is divided by x + a , then the $remainder = p(-a)$.

Now, $p(x) = x^4 - 2x^3 + 3x^3 - ax + 3a - 7$ is divided by $x + 1$, then the $remainder = p(-1)$

Now, $p(-1) = (-1)^4 - 2(-1)^3 + 3(-1)^2 - a(-1) + 3a - 7$

$= 1 - 2(-1) + 3(1) + a + 3a - 7$

$= 1 + 2 + 3 + 4a - 7$

$= -1 + 4a$

Also, remainder = 19

$\therefore -1 + 4a = 19$

$\Rightarrow 4a = 20, a = 20 \div 4 = 5$

When $p(x)$ is divided by $x + 2$, then

Remainder $= p(-2) = (-2)^4 - 2(-2)^3 + 3(-2)^2 - a(-2) + 3a - 7$

$= 16 + 16 + 12 + 2a + 3a - 7$

$= 37 + 5a$

$= 37 + 5(5) = 37 + 25 = 62$

Section E

36. i. Diameter of cone = 40 cm

$\Rightarrow$ Radius of cone (r) = $\frac{40}{2}$

= 20 cm

= $\frac{20}{100}$ m

= 0.2 m

Height of cone (h) = 1 m

Slant height of cone (l) = $\sqrt{r^2 + h^2}$

=$\sqrt{(0.2)^2 + (1)^2}$

= $\sqrt{1.04}$ m

Curved surface area of cone = πrl

= $3.14 \times 0.2 \times \sqrt{1.04}$

= 0.64056 m^2

ii. Radius of base of cone = 20 cm = 0.2 m

Height of cone = 1 m

Volume of each cone = $\frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 0.2 \times 0.2 \times 1$

= 0.042 m^3

iii. $\therefore$ Cost of painting 1m^2 of a cone = ₹12

$\therefore$ Cost of painting 0.64056 m^2 of a cone = 12 × 0.64056 = ₹ 7.68672

$\therefore$ Cost of painting of 50 such cones = 50 × 7.68672 = ₹ 384.336

OR

Cost of 1 m^2 cardboard = ₹ 100

Curved surface area of 50 cones = 0.640 × 50 = 32 m^2

Cost of card board of these 50 cones = 50 × 32 = ₹ 1600

37. i. No of teachers in the age-group 15-20 years = 10

No of teachers in the age-group 20-25 years = 30

No of teachers in the age-group 25-30 years = 50

No of teachers in the age-group 30-35 years = 50

No of teachers in the age-group 35-40 years = 30

No of teachers in the age-group 40-45 years = 5

No of teachers in the age-group 45-50 years = 2

Thus the total no of teachers

= 10 + 30 + 50 + 50 + 30 + 5 + 2

=177

ii. Class Mark of class 15 - 20 =

$= \frac{15+20}{2}$ = 17.5

Class Mark of class 25 - 30 =

$= \frac{25+30}{2}$ = 27.5

Class Mark of class 45 - 50 =

$= \frac{45+50}{2}$ = 47.5

iii. No of teachers in the age-group 25 - 30 years = 50

No of teachers in the age-group 30 - 35 years = 50

No of teachers in the age-group 35 - 40 years = 30

Thus the no of teachers in the age range 25 - 40 years

= 50 + 50 + 30 = 130

OR

From the observation of the bar chart we find that :

No of teachers in the age-group 25-30 years = 50

No of teachers in the age-group 30-35 years = 50

Thus the no of teacher in the class 25-30 and 30-35 is equal.

38. i. (c) There is unique circle passing through three non-collinear points.

ii. (b) Centre

iii. (d) Road B and Road D subtend equal angles at society 1.

iv. Angad is correct.