Class IX Session 2025-26
Subject - Mathematics
Sample Question Paper - 7

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

General Instructions:

Read the following instructions carefully and follow them:

1. This question paper contains 38 questions.
2. This Question Paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Questions no. 1-18 are multiple choice questions (MCQs) and questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.
4. In Section B, Questions no. 21-25 are very short answer (VSA) type questions, carrying 02 marks each.
5. In Section C, Questions no. 26-31 are short answer (SA) type questions, carrying 03 marks each.
6. In Section D, Questions no. 32-35 are long answer (LA) type questions, carrying 05 marks each.
7. In Section E, Questions no. 36-38 are case study-based questions carrying 4 marks each with sub-parts of the values of 1,1 and 2 marks each respectively.
8. All Questions are compulsory. However, an internal choice in 2 Questions of Section B, 2 Questions of Section C and 2 Questions of Section D has been provided. An internal choice has been provided in all the 2 marks questions of Section E.
9. Draw neat and clean figures wherever required.
10. Take $\pi = 22/7$ wherever required if not stated.
11. Use of calculators is not allowed.

Section A

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

2. The point of the form (a, a), where a lies on **[1]**

a) y-axis b) x-axis

c) On the line x + y = 0 d) On the line y = x

3. The abscissa of any point on the y-axis is **[1]**

a) 0 b) 1

c) y d) -1

4. In a histogram the class intervals or the groups are taken along **[1]**

a) Y-axis
b) in between X and Y axis
c) X-axis
d) both of X-axis and Y-axis

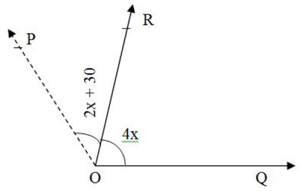
5. The equation y = 2x - 7 has **[1]**

a) many solutions
b) no solution
c) one solution
d) two solutions

6. Three or more lines intersecting at the same point are said to be **[1]**

a) Non-Collinear
b) Concurrent
c) Intersecting
d) Collinear

7. In the given figure, the value of x which makes POQ a straight line is: **[1]**



a) 35°
b) 25°
c) 30°
d) 40°

8. A diagonal of a Rectangle is inclined to one side of the rectangle at an angle of 25°. The Acute Angle between the diagonals is : **[1]**

a) 115°
b) 25°
c) 40°
d) 50°

9. If $x + y = 8$ and $xy = 15$, then $x^2 + y^2$ **[1]**

a) 34
b) 36
c) 1
d) 32

10. The equation x - 2 = 0 on number line is represented by **[1]**

a) a point
b) two lines
c) infinitely many lines
d) a line

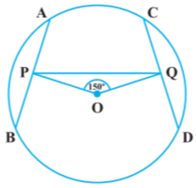
11. The Diagonals AC and BD of a Parallelogram ABCD intersect each other at point O. If $\angle DAC = 32^\circ$ and $\angle AOB = 70^\circ$, then $\angle DBC$ is equal to **[1]**

a) 38°
b) 86°
c) 24°
d) 32°

12. The Quadrilateral forms by joining the mid-points of the sides of a Quadrilateral PQRS, taken in order, is a Rhombus if **[1]**

a) PQRS is a Parallelogram
b) Diagonals of PQRS are perpendicular
c) Diagonals of PQRS are equal
d) PQRS is a Rhombus

13. In Fig., AB and CD are two equal chords of a circle with centre O. OP and OQ are perpendiculars on chords AB and CD, respectively. If ∠POQ = 150°, then ∠APQ is equal to **[1]**



a) 30º
b) 15º
c) 75º
d) 60º

14. Two rational numbers between $\frac{2}{3}$ and $\frac{5}{3}$ are **[1]**

a) $\frac{1}{6}$ and $\frac{2}{6}$
b) $\frac{1}{2}$ and $\frac{2}{1}$
c) $\frac{2}{3}$ and $\frac{4}{3}$
d) $\frac{5}{6}$ and $\frac{7}{6}$

15. The graph of the linear equation 4x + y = 12 is a line which meets the y-axis at the point ________. **[1]**

a) (0, 4)
b) (12, 0)
c) (0, 12)
d) (4, 0)

16. It is given that $\triangle ABC \cong \triangle FDE$ and AB = 5 cm, $\angle B = 40°$ and $\angle A = 80°$. Then which of the following is true? **[1]**

a) DE = 5 cm, $\angle E = 60°$
b) DF = 5 cm, $\angle E = 60°$
c) DF = 5 cm, $\angle F = 60°$
d) DE = 5 cm, $\angle D = 40°$

17. In a histogram the area of each rectangle is proportional to **[1]**

a) the class mark of the corresponding class interval
b) cumulative frequency of the corresponding class interval
c) the class size of the corresponding class interval
d) frequency of the corresponding class interval

18. The number of spherical bullets each 5 dm in diameter which can be cast from a rectangular block of lead 11 m long, 10 m broad and 5 high is **[1]**

a) 6300.
b) 8400.
c) 5600.
d) 4200.

19. **Assertion (A):** The height of the triangle is 18 cm and its area is 72 cm^2. Its base is 8 cm. **[1]**
Reason (R): Area of a triangle = $\frac{1}{2} \times$ base $\times$ height

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.

20. **Assertion (A):** The equation of 2x + 5 = 0 and 3x + y = 5 both have degree 1. **[1]**
Reason (R): The degree of a linear equation in two variables is 2.

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. Find the area of an isosceles triangle each of whose equal sides measures 13 cm and whose base measures 20 cm. **[2]**

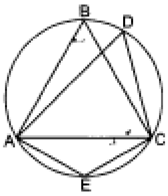
22. In figure, $\angle PQR = 100^\circ$, where P, Q, R are points on a circle with centre O. Find $\angle OPR$. **[2]**

23. A dome of a building is in the form of a hemisphere. From inside, it was whitewashed at the cost of ₹ 498.96. If the cost of white-washing is ₹ 2.00 per square metre, find the inside surface area of the dome and volume of the air inside the dome. **[2]**

24. In the given figure, $\triangle ABC$ is an equilateral. Find **[2]**

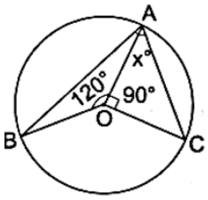
i. $\angle ADC$

ii. $\angle AEC$



OR

If O is the centre of the circle, find the value of x in given figure:



25. How many solution(s) of the equation 3x + 2 = 2x - 3 are there on the : **[2]**

i. Number line?

ii. Cartesian plane?

OR

Draw a graph of the equation y = -3

Section C

26. Find the values of a and b $\frac{7+\sqrt{5}}{7-\sqrt{5}} - \frac{7-\sqrt{5}}{7+\sqrt{5}} = a + \frac{7}{11}\sqrt{5}b$ **[3]**

27. Factorise: $2x^2 + y^2 + 8z^2 - 2\sqrt{2}xy + 4\sqrt{2}yz - 8xz$ **[3]**

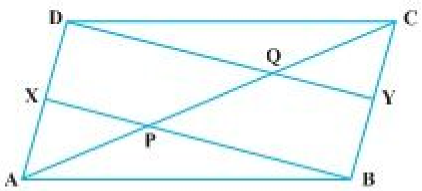
28. The perimeter of a triangle is 480 meters and its sides are in the ratio of 1:2:3. Find the area of the triangle? **[3]**

OR

A traffic signal board indicating 'school ahead' is an equilateral triangle with side 'a' find the area of the signal board using heron's formula. Its perimeter is 180 cm, what will be Its area?

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. In Fig. X and Y are respectively the mid-points of the opposite sides AD and BC of a parallelogram ABCD. Also, BX and DY intersect AC at P and Q, respectively. Show that AP = PQ = QC. **[3]**



OR

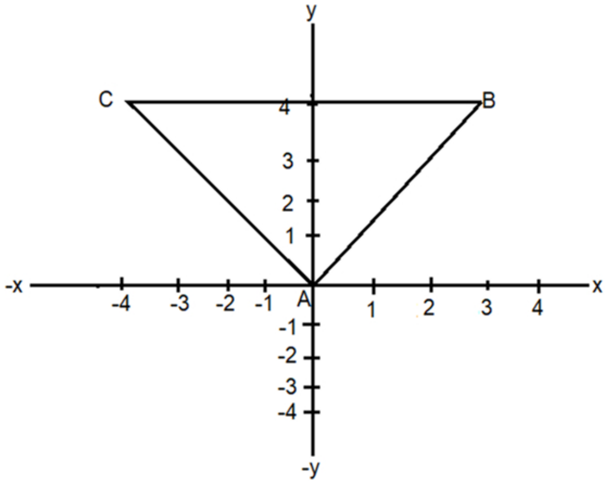
ABC is a triangle right angled at C. A line through the mid-point M of hypotenuse AB and parallel to BC intersects AC at D. Then prove that,

i. D is the midpoint AC

ii. MD is perpendicular to AC

iii. CM = AM = $\frac{1}{2}$ AB

31. In fig find the vertices' co-ordinates of $\triangle$ABC **[3]**



Section D

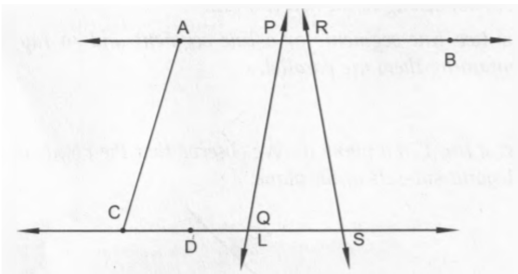
32. If x is a positive real number and exponents are rational numbers, simplify **[5]**

$\left(\frac{x^b}{x^c}\right)^{b+c-a} \cdot \left(\frac{x^c}{x^a}\right)^{c+a-b} \cdot \left(\frac{x^a}{x^b}\right)^{a+b-c}$.

OR

Represent each of the numbers $\sqrt{2}$, $\sqrt{3}$ and $\sqrt{5}$ on the real line.

33. In Fig, name the following: **[5]**



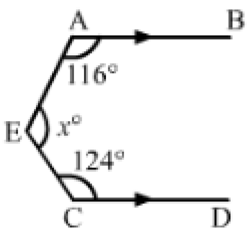
i. Five line segments

ii. Five rays

iii. Four collinear points

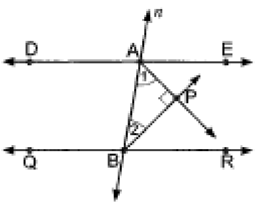
iv. Two pairs of non-intersecting line segments

34. In each of the figures given below, AB || CD. Find the value of x° in each other case. **[5]**



OR

In given figure, DE || QR and AP and BP are bisectors of $\angle$EAB and $\angle$RBA respectively. Find $\angle$APB.



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

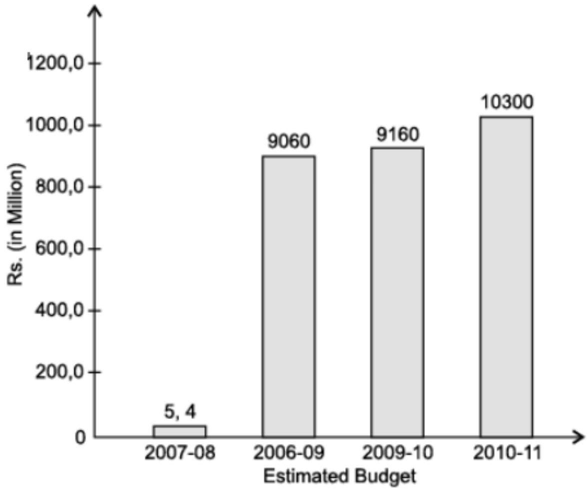
remainder when p(x) is divided by x + 2.

Section E

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

Ladli Scheme was launched by the Delhi Government in the year 2008. This scheme helps to make women strong and will empower a girl child. This scheme was started in 2008.

The expenses for the scheme are plotted in the following bar chart.



i. What are the total expenses from 2009 to 2011? (1)

ii. What is the percentage of no of expenses in 2009-10 over the expenses in 2010-11? (1)

iii. What is the percentage of minimum expenses over the maximum expenses in the period 2007-2011? (2)

OR

What is the difference of expenses in 2010-11 and the expenses in 2006-09? (2)

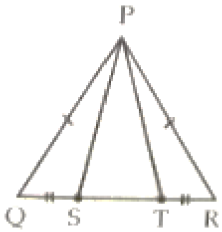
37. A bus stop is barricaded from the remaining part of the road, by using 50 hollow cones made of recycled cardboard. Each cone has a base diameter of 40 cm and a height of 1 m. **[4]**

i. Find the curved surface area of the cone.

ii. 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? (Use π = 3.14 and take $\sqrt{1.04}$ = 1.02)

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

A children's park is in the shape of isosceles triangle said PQR with PQ = PR, S and T are points on QR such that QT = RS.



i. Which rule is applied to prove that congruency of △PQS and △PRT. (1)

ii. Name the type of △PST. (1)

iii. If PQ = 6 cm and QR = 7 cm, then find perimeter of △PQR. (2)

OR

If ∠QPR = 80^o find ∠PQR? (2)

Solution

Section A

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

Explanation:

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

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

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

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

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

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

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

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

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

$= \frac{1}{2}$

2.

(d) On the line y = x

Explanation:

The point (a ,a) lies on line x = y or x - y = 0

Here is the verification

Put x = a in equation

x - y = 0

a - y = 0

-y = -a

y = a

Hence it is prove that (a,a) is a solution of x- y = 0 or x = y

3. **(a)** 0

Explanation:

Since coordinates of any point on y-axis is (0, y)

Therefore, the abscissa is 0.

4.

(c) X-axis

Explanation:

Histogram states that a two dimensional frequency density diagram is called as a histogram. The histograms are diagrams which represent the class interval and the frequency in the form of a rectangle. There will be as many adjoining rectangles as there are class intervals.

5. **(a)** many solutions

Explanation:

y = 2x - 7

Has many solution because for different value of x we have different value of y for example.

At x = 1

y = 2 (1) - 7

y = 2 - 7

y = -5

at x = 2

y = 2(2) - 7

y = 4 - 7

y = -3

So we can say for many value of x there is many value of y.

6.

(b) Concurrent

Explanation:

When three or more lines intersect in one point, they are concurrent. The point at which they intersect is the point of concurrency.

7.

(b) 25°

Explanation:

We know that he measure of a straight angle is 180°

(2x + 30°) + 4x = 180°

2x + 30° + 4x = 180°

6x = 180° - 30°

6x = 150°

x = $\frac{150^0}{6}$ = 25°

8.

(d) 50°

Explanation:

Two diagonals of a rectangle divides it into four triangles. Out of these four triangles a pair of opposite triangles are congruent by SSS in which a pair of triangles have two equal angles of 25 each and in another pair of opposite triangles have two equal angles of 65 each. By angle sum property we have two options of angle fromed between diagonals. Either it is of 130 or 50. 50 is an acute angle. So, it is a correct option.

9. **(a)** 34

Explanation:

$x^2 + y^2 = (x + y)^2 - 2xy$

=> $x^2 + y^2 = (8)^2 - 2 \times 15$

=> $x^2 + y^2 = 64 - 30$

=> $x^2 + y^2 = 34$

10. **(a)** a point

Explanation:

x – 2 = 0

x = 2 is a point on the number line

11. **(a)** 38°

Explanation:

∠DAC = ∠ACB = 32^o (alternate angles)

∠AOB + ∠COB = 180^o (linear pair)

$\angle COB = 180 - 70^o = 110^o$

In triangle BOC,

$\angle BOC + \angle OCB + \angle CBO = 180^o$ (angle sum property)

$110^o + 32^o + \angle CBO = 180^o$

$\angle CBO = 180^o - 142^o = 38^o$

12.

(c) Diagonals of PQRS are equal

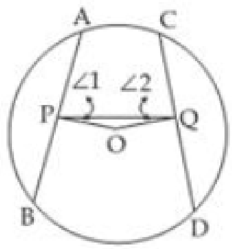
Explanation:

A quadrilateral formed by joining the mid points of the sides of the Rectangle is a rhombus. In rectangle , diagonals are equal.

13.

(c) 75°

Explanation:



As AB = CD

So, OP = OQ (equal chords are equidistant from the centre)

$\angle 1 = \angle 2$ (angles opposite to equal sides are equal)

$\angle 1 + \angle 2 + \angle POQ = 180^\circ$

$\angle 1 + \angle 1 + 150^\circ = 180^\circ$

$\therefore \angle 1 = 15^\circ$

Since APB is a line segement

$\therefore \angle BPO + \angle 1 + \angle APQ = 180^\circ$

$90^\circ + 15^\circ + \angle APQ = 180^\circ$

$\therefore \angle APQ = 75^\circ$

14.

(d) $\frac{5}{6}$ and $\frac{7}{6}$

Explanation:

$\frac{2}{3}$ and $\frac{5}{3}$

$\frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6}$

$\frac{5}{3} = \frac{5 \times 2}{3 \times 2} = \frac{10}{6}$

$\frac{4}{6} < \frac{5}{6} < \frac{6}{6} < \frac{7}{6} < \frac{10}{6}$

$\frac{5}{6}$ and $\frac{7}{6}$

15.

(c) (0, 12)

Explanation:

We have, 4x + y = 12

Since, the line meets y-axis i.e., x = 0

Now, $4 \times 0 + y = 12 \Rightarrow y = 12$

$\therefore$ Required point is (0, 12).

16.

(b) DF = 5 cm, ∠E = 60°

Explanation:

Given that: In $\triangle ABC$, AB = 5 cm, $\angle B = 40°$ and $\angle A = 80°$

Using angles sum property of triangle, we have

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

$\Rightarrow 80° + 40° + \angle C = 180$

$\Rightarrow 120° + \angle C = 180°$ [$\because \angle B = 40°$ and $\angle A = 80°$]

$\Rightarrow \angle C = 180° - 120°$

$\Rightarrow \angle C = 60°$

It is given that $\triangle ABC \cong \triangle FDE$, so we have

AB = FD, BC = DE and AC = FE & $\angle A = \angle F$, $\angle B = \angle D$ and $\angle C = \angle E$

$\Rightarrow$ AB = FD = 5cm and $\angle C = \angle E = 60°$.

17.

(d) frequency of the corresponding class interval

Explanation:

A histogram is a display of statistical information that uses rectangles to show the frequency of data items in successive numerical intervals of equal size. In the most common form of histogram, the independent variable is plotted along the horizontal axis and the dependent variable is plotted along the vertical axis.

18.

(b) 8400.

Explanation:

Here, radius of spherical bullets = 2.5 dm or 0.25m(1 dm = 0.1 m)

Let the number of bullets be n

Now, volume of n number of bullets = volume of rectangular block

$n \times \frac{4}{3} \pi r^3 = l \times b \times h$

$n \times \frac{4}{3} \times \frac{22}{7} \times 0.25 \times 0.25 \times 0.25 = 11 \times 10 \times 5$

$n = \frac{11 \times 10 \times 5 \times 21}{88 \times 0.25 \times 0.25 \times 0.25}$

n = 8400

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

Explanation:

Assertion: Area of $\triangle = \frac{1}{2} \times$ base $\times$ height

$72 = \frac{1}{2} \times 18 \times b$

$b = \frac{72 \times 2}{18} = 8$ cm

20.

(c) A is true but R is false.

Explanation:

Every linear equation has degree 1.

2x + 5 = 0 and 3x + y = 5 are linear equations. So, both have degree 1.

Section B

21. We have:

a = 13 cm and b = 20 cm

$\therefore$ Area of an isosceles triangle $= \frac{b}{4}\sqrt{4a^2 - b^2}$

$= \frac{20}{4} \times \sqrt{4(13)^2 - 20^2}$

$= 5 \times \sqrt{676 - 400}$

$= 5 \times \sqrt{276}$

$= 5 \times 16.6$

Area of an isosceles triangle = 83.6 cm^2

22. Since the angle subtented by an arc of a circle at its centre is twice the angle subtented by the same arc at a point on the circumference.

Therefore, $\angle ROP = 2\angle PQR$

$\Rightarrow \angle ROP = 2 \times 100^\circ = 200^\circ$

Now $m\widehat{PR} + m\widehat{RP} = 360^o \Rightarrow \angle POR + \angle ROP = 360^\circ \Rightarrow \angle POR + 200^\circ = 360^\circ \Rightarrow \angle POR = 360^\circ - 200^\circ = 160^\circ$ .....(i)

Now $\triangle OPR$ is an isosceles triangle.

$\therefore$ OP = OR [Radii of the circle]

$\Rightarrow \angle OPR = \angle ORP$ [Angles opposite to equal sides are equal] .....(ii)

Now in isosceles triangle OPR,

$\angle OPR + \angle ORP + \angle POR = 180^\circ$ [The sum of the all angles of a traingle is 180°]

$\Rightarrow \angle OPR + \angle ORP + 160^\circ = 180^\circ$

$\Rightarrow 2\angle OPR = 180^\circ - 160^\circ$[Using (i) & (ii)]

$\Rightarrow 2\angle OPR = 20^\circ$

$\Rightarrow \angle OPR = 10^\circ$

23. Inside surface area hemisphere = $2\pi r^2$

$\therefore$ Cost of white-washing at the rate of ₹ 2 per m^2 = ₹ ($2\pi r^2$ x 2) = ₹ $4\pi r^2$

It is given that the cost of white-washing is ₹ 498.96.

$\therefore 4\pi r^2 = 498.96$

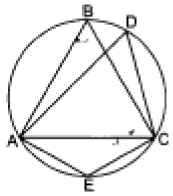
$\Rightarrow 4 \times \frac{22}{7} \times r^2 = 498.96$

$\Rightarrow r^2 = \frac{498.96 \times 7}{22 \times 4} \Rightarrow r^2 = 39.69 \Rightarrow r = 6.3$

$\therefore$ Inside surface area of the dome = $2\pi r^2 = 2 \times \frac{22}{7}$ x $(6.3)^2$ cm^2 = 249.48 cm^2

Volume of the dome = $\frac{2}{3}\pi r^3 = \frac{2}{3} \times \frac{22}{7} \times (6.3)^3$ = 523.908 cm^3

24. Here it is given that $\triangle ABC$ is an equilateral triangle,



i. As ABC is equilateral, we have

$\angle ABC = 60^o$

$\angle ADC = \angle ABC$ ....(Angles in the same segment)

$\therefore \angle ADC = 60^o$

ii. $\angle ABC + \angle AEC = 180°$ ....(Opposite angles of cyclic quadrilateral)

$60° + \angle AEC = 180°$

$\Rightarrow \angle AEC = 180° - 60° = 120°$

OR

We know that the sum of all angles at a point is 360°

$\therefore 90^\circ + 120^\circ + \angle BOC = 360^\circ \Rightarrow \angle BOC = 150^\circ$

$\angle BOC = 2\angle BAC$

$\Rightarrow 2x^o = 150^o$

=> $x^o = 75^o$

25. According to the question, given equation is 3x + 2 = 2x -3

i. 3x + 2 = 2x -3

$\Rightarrow$ 3x - 2x = - 3 - 2

$\Rightarrow$ x = -5

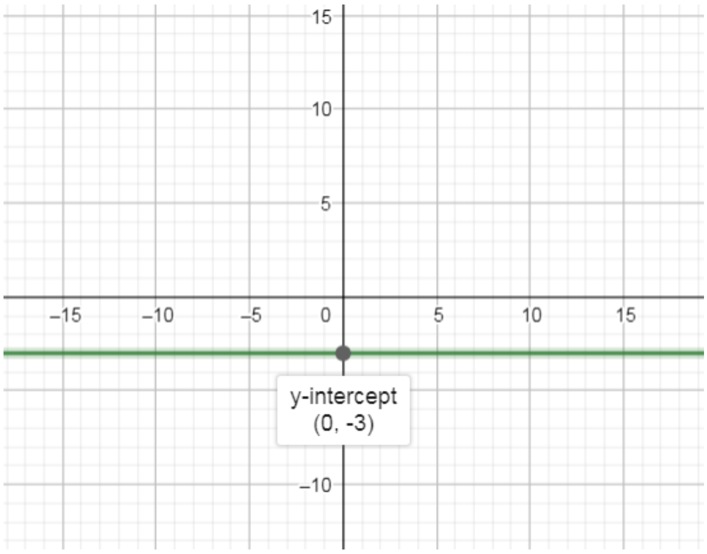
So, on a number line there is only one solution which is x = -5.

ii. In a Cartesian plane there are infinitely many solutions.

OR

The equation y = - 3 means that for all values of abscissa x, the ordinate y is -3.

So, graph of the equation y = - 3 is a line parallel to x-axis passing through the point (0, - 3) as shown in the figure



Section C

26. $\frac{7+\sqrt{5}}{7-\sqrt{5}}-\frac{7-\sqrt{5}}{7+\sqrt{5}}=a+\frac{7}{11}\sqrt{5}b$

$\frac{7+\sqrt{5}}{7-\sqrt{5}}\times\frac{7+\sqrt{5}}{7+\sqrt{5}}-\frac{7-\sqrt{5}}{7+\sqrt{5}}\times\frac{7-\sqrt{5}}{7-\sqrt{5}}=a+\frac{7}{11}\sqrt{5}b$

$\frac{(7+\sqrt{5})^2}{(7)^2-(\sqrt{5})^2}-\frac{(7-\sqrt{5})^2}{(7)^2-(\sqrt{5})^2}=a+\frac{7}{11}\sqrt{5}b$

$\frac{49+5+14\sqrt{5}}{49-5}-\frac{49+5-14\sqrt{5}}{49-5}=a+\frac{7}{11}\sqrt{5}b$

$=\frac{54+14\sqrt{5}}{44}-\frac{54-14\sqrt{5}}{44}=a+\frac{7}{11}\sqrt{5}b$

$=\frac{54+14\sqrt{5}-54+14\sqrt{5}}{44}$

$=a+\frac{7}{11}\sqrt{5}b=\frac{28\sqrt{5}}{44}$

$\Rightarrow\frac{7\sqrt{5}}{11}=a+\frac{7}{11}\sqrt{5}b$

$\Rightarrow 0+\frac{7\sqrt{5}}{11}=a+\frac{7}{11}\sqrt{5}b$

Thus, a = 0 and b = 1.

27. $2x^2+y^2+8z^2-2\sqrt{2}xy+4\sqrt{2}yz-8xz$

The expression can be re written as

$(-\sqrt{2}x)^2+(y)^2+(2\sqrt{2}z)^2+2\times(-\sqrt{2}x)\times y+2\times y\times(2\sqrt{2}z)+2\times(2\sqrt{2}z)\times(-\sqrt{2}x)$

As we know $(a+b+c)^2=a^2+b^2+c^2+2ab+2bc+2ca$

$=(-\sqrt{2}x)^2+(y)^2+(2\sqrt{2}z)^2+2\times(-\sqrt{2}x)\times y+2\times y\times(2\sqrt{2}z)+2\times(2\sqrt{2}z)\times(-\sqrt{2}x)$

=$(-\sqrt{2}x+y+2\sqrt{2}z)^2$

Therefore, we conclude that after factorizing the expression

$2x^2+y^2+8z^2-2\sqrt{2}xy+4\sqrt{2}yz-8xz,$

we get $(-\sqrt{2}x+y+2\sqrt{2}z)(-\sqrt{2}x+y+2\sqrt{2}z)$

28. Let the sides of the triangle be x,2x,3x

Perimeter of the triangle = 480 m

$\therefore x+2x+3x=480m$

$6x=480m$

$x=80m$

$\therefore$ The sides are 80m, 160m, 240m

so,

$S=\frac{80+160+240}{2}=\frac{480}{2}$

= 240 m

And,

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

$=\sqrt{240(240-80)(240-160)(240-240)}$sqm

= 0 sq m

$\therefore$ Triangle doesn't exit with the ratio 1:2:3 whose perimeter is 480 m.

OR

$S=\frac{a+a+a}{2}$ units $=\frac{3a}{2} units$

$\therefore$Area of triangle = $\sqrt{\frac{3a}{2}\times(\frac{3a}{2}-a)(\frac{3a}{2}-a)(\frac{3a}{2}-a)}$

= $\sqrt{\frac{3a}{2}\times\frac{a}{2}\times\frac{a}{2}\times\frac{a}{2}}$

=$\frac{a^2}{4}\sqrt{3}$ sq units

Now, perimeter = 180 cm

$\therefore$ each side =$\frac{180}{3}=60cm$

Using above derived formula

$\therefore$ Area of signal board = $\frac{\sqrt{3}}{4}$ $(60)^2$ sq cm

= 900 $\sqrt{3}$ sq cm

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

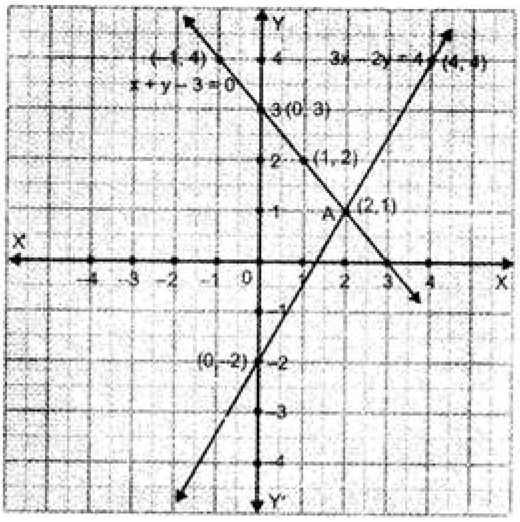
Let x = 2 : y = $\frac{3}{2}$(2) - 2 = 3 - 2 = 1

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

$\Rightarrow$ 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. AD = BC (Opposite sides of a parallelogram)

Therefore,$\text{DX}=\text{BY}\left(\frac{1}{2}\text{AD}=\frac{1}{2}BC\right)$

Also, DX || BY (As AD || BC)

So, XBYD is a parallelogram (A pair of opposite sides equal and parallel)

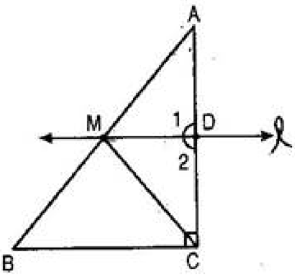
i.e., PX || QD

Therefore, AP = PQ (From $\triangle$AQD where X is mid-point of AD) ...(1)

Similarly, from $\triangle CPB$, CQ = PQ ...(2)
Thus, AP = PQ = CQ [From (1) and (2)]

OR

i. In $\triangle ABC$, M is the mid-point of AB[Given]
MD $\|$ BC
$\therefore$ AD = DC[Converse of mid-point theorem]
Thus D is the mid-point of AC.



ii. $l \| BC$ (given) consider AC as a transversal.
$\therefore \angle 1 = \angle C$ [Corresponding angles]
$\Rightarrow \angle 1 = 90^\circ$ [$\angle C = 90^\circ$]
Thus MD $\perp$ AC.

iii. In $\triangle AMD$ and $\triangle CMD$,
AD = DC[proved above]
$\angle 1 = \angle 2 = 90^\circ$ [proved above]
MD = MD[common]
$\therefore \triangle AMD \cong \triangle CMD$ [By SAS congruency]
$\Rightarrow$ AM = CM[By C.P.C.T.]……….(i)
Given that M is the mid-point of AB.
$\therefore AM = \frac{1}{2}$ AB……….(ii)
From eq. (i) and (ii),
CM = AM = $\frac{1}{2}$ AB

31. (A) (0, 0) (B) (3, 4) (c) (-4, 4)

Section D

32. Given.

$$\left(\frac{x^b}{x^c}\right)^{b+c-a} \cdot \left(\frac{x^c}{x^a}\right)^{c+a-b} \cdot \left(\frac{x^a}{x^b}\right)^{a+b-c}$$

$$= \left(\frac{x^{b^2+bc-ab}}{x^{bc+c^2-ac}}\right) \cdot \left(\frac{x^{c^2+ac-bc}}{x^{ac+a^2-ab}}\right) \cdot \left(\frac{x^{a^2+ab-ac}}{x^{ab+b^2-bc}}\right)$$

$$= \left(x^{b^2+bc-ab-bc-c^2+ac}\right)\left(x^{c^2+ac-bc-ac-a^2+ab}\right)\left(x^{a^2+ab-ac-ab-b^2+bc}\right)$$

$$= \left(x^{b^2-ab-c^2+ac}\right)\left(x^{c^2-bc-a^2+ab}\right)\left(x^{a^2-ac-b^2+bc}\right)$$

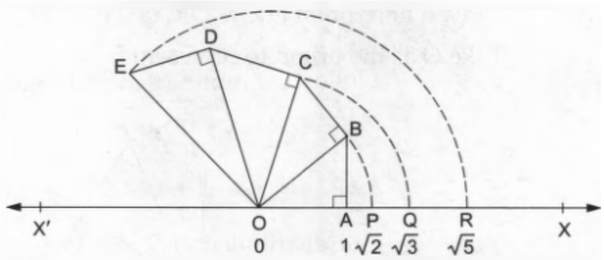
$$= x^{b^2-ab-c^2+ac+c^2-bc-a^2+ab+a^2-ac-b^2+bc}$$

$= x^0$

= 1

OR

Let X'OX be a horizontal line, taken as the x-axis and let O be the origin. Let O represent 0.



Take OA = 1 unit and draw AB $\perp$ OA such that AB = 1 unit.
Join OB. Then,by Pythagoras Theorem
$OB = \sqrt{OA^2 + AB^2} = \sqrt{1^2 + 1^2} = \sqrt{2}$ units

With O as centre and OB as radius, draw an arc, meeting OX at P.
Then, OP = OB=$\sqrt{2}$ units
Thus, the point P represents $\sqrt{2}$ on the real line.
Now, draw BC $\perp$OB such that BC = 1 unit.
Join OC. Then by Pythagoras Theorem

$$OC = \sqrt{OB^2 + BC^2} = \sqrt{(\sqrt{2})^2 + 1^2} = \sqrt{3} \text{ units}$$

With O as centre and OC as radius, draw an arc, meeting OX at Q. Then,
OQ = OC =$\sqrt{3}$ units
Thus, the point Q represents $\sqrt{3}$ on the real line
Now, draw CD $\perp$ OC such that CD = 1 unit.
Join OD. Then,by Pythagoras Theorem

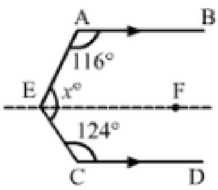
$$OD = \sqrt{OC^2 + CD^2} = \sqrt{(\sqrt{3})^2 + 1^2} = \sqrt{4} = 2 \text{ units}$$

Now, draw DE $\perp$ OD such that DE = 1 unit.
Join OE. Then,

$$OE = \sqrt{OD^2 + DE^2} = \sqrt{2^2 + 1^2} = \sqrt{5} \text{ units.}$$

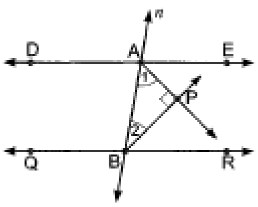
With O as centre and OE as radius, draw an arc, meeting OX
at R. Then, OR = OE = $\sqrt{5}$ units.
Thus, the point R represents $\sqrt{5}$ on the real line.
Hence, the points P, Q, R represent the numbers $\sqrt{2}$, $\sqrt{3}$ and $\sqrt{5}$respectively.

33. i. Five line segments are: $\overline{PQ}, \overline{PN}, \overline{RS}, \overline{ND}, \overline{TL}$
ii. Five rays are: $\underset{QC}{\longrightarrow}, \underset{PM}{\longrightarrow}, \underset{RB}{\longrightarrow}, \underset{DF}{\longrightarrow}, \underset{LH}{\longrightarrow}$
iii. Four Collinear points are: A, P, R, B
iv. Two pairs of non-intersecting line segments are: PN, RS and PQ, TL

34. 

Draw EF || AB || CD
Then, $\angle AEF + \angle CEF = x°$
Now, EF || AB and AE is the transversal
$\therefore \angle AEF + \angle BAE = 180°$ [Consecutive Interior Angles]
$\Rightarrow \angle AEF + 116 = 180$
$\Rightarrow \angle AEF = 64°$
Again, EF || CD and CE is the transversal.
$\angle CEF + \angle ECD = 180°$ [Consecutive Interior Angles]
$\Rightarrow \angle CEF + 124 = 180$
$\Rightarrow \angle CEF = 56°$
Therefore,
$x° = \angle AEF + \angle CEF$
x° = (64 + 56)°
x° = 120°

OR



Given ED ||RQ & AB is transversal.
Since interior angles on the same side of transversal are supplementary.

$\therefore \angle EAB + \angle RBA = 180°$ (see figure)

$\Rightarrow \frac{1}{2}\angle EAB + \frac{1}{2}\angle RBA = \frac{1}{2} \times 180° = 90°$ ....(1)

As AP and BP are bisectors of $\angle EAB$ and $\angle RBA$, respectively

$\therefore \angle 1 = \frac{1}{2}\angle EAB$ and $\angle 2 = \frac{1}{2}\angle RBA$ ....(2) (from figure)

From (1) and (2), we get

$\angle 1 + \angle 2 = 90°$ ....(3)

In $\triangle APB$, we have

$\angle 1 + \angle 2 + \angle APB = 180°$ (Angle sum property of triangle)

$\Rightarrow 90° + \angle APB = 180°$ [Using (3)]

$\Rightarrow \angle APB = 180° - 90°$

$\therefore \angle APB = 90°$. Ans.

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

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

$\therefore -1 + 4a = 49$

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

Again, 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. Expenses in 2009-10 = 9160 Million

Expenses in 2010-11 = 10300 Million

Total expenses from 2009 to 2011

= 9160 + 10300

= 19460 Million

ii. Expenses in 2009-10 = 9160 Million

Expenses in 2010-11 = 10300 Million

Thus percentage of no of expenses in 2009-10 over the expenses in 2010-11

$= \frac{9160}{10300} \times 100$

= 88.93%

iii. The minimum expenses (in 2007-08) = 5.4 Million

The maximum expenses (in 2010-11) = 10300 Million

Thus percentage of no of minimum expenses over the maximum expenses

$= \frac{5.4}{10300} \times 100$

= 0.052%

OR

The expenses in 2010-11 = 10300 Million

The expenses in 2006-09 = 9060 Million

The difference = 10300 - 9060 Million

= 1240 Million

37. 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

$\because$ Cost of painting 1m^2 of a cone = Rs.12

$\therefore$ Cost of painting 0.64056m^2 of a cone = 12 $\times$ 0.64056 = Rs. 7.68672

$\therefore$ Cost of painting of 50 such cones = 50 $\times$ 7.68672 = Rs. 384.34 (approx.)

38. i. In $\triangle$PQS and $\triangle$PRT

PQ = PR (Given)

QS = TR (Given)

$\angle$PQR =$\angle$ PRQ (corresponding angles of an isosceles $\triangle$)

By SAS commence

$\triangle$PQS $\cong$ $\triangle$PRT

ii. $\triangle PQS \cong \triangle PRT$

$\Rightarrow$ PS = PT (CPCT)

So in $\triangle$PST

PS = PT

It is an isosceles triangle.

iii. Perimeter = sum of all 3 sides

PQ = PR = 6 cm

QR = 7 cm

So, P = (6 + 6 + 7) cm

= 19 cm

OR

Let $\angle$Q = $\angle$R = x and $\angle$P = 80^o

In $\triangle$PQR, $\angle$P + $\angle$Q + $\angle$R = 180^o (Angle sum property of $\triangle$)

$80^o + x + x = 180^o$

$2x = 180^o - 80$

$2x = 100^o$

$x = \frac{100^\circ}{2}$

$= 50^o$