Class IX Session 2025-26
Subject - Mathematics
Sample Question Paper - 9

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 point (0, -4) lies **[1]**

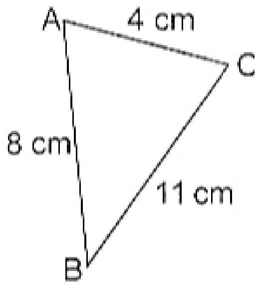
   a) in quadrant III

   b) in quadrant IV

   c) on the negative direction of x-axis

   d) on the negative direction of y-axis

2. In the given figure, the area of the $\triangle$ABC is **[1]**



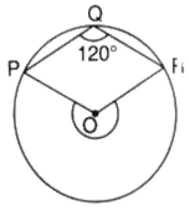
   a) $12.29\ cm^2$

   b) $13.24\ cm^2$

c) $11.32\ cm^2$

d) $15.37\ cm^2$

3. What fraction of the whole circle is minor arc RP in the given figure? **[1]**



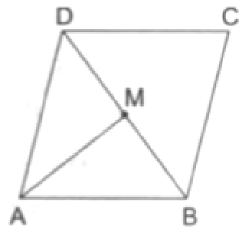
a) $\frac{1}{3}$ of the circle

b) $\frac{1}{2}$ of the circle

c) $\frac{1}{5}$ of the circle

d) $\frac{1}{4}$ of the circle

4. In given figure, ABCD is a parallelogram, M is the mid-point of BD and BM bisects $\angle$B. Then, $\angle$AMB = **[1]**



a) 100°

b) 10°

c) 90°

d) 80°

5. If x = $\frac{\sqrt{7}}{5}$and $\frac{5}{x} = p\sqrt{7}$ then the value of p is **[1]**

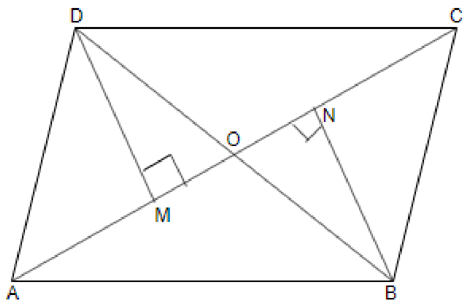
a) $\frac{25}{7}$

b) $\frac{7}{15}$

c) $\frac{15}{7}$

d) $\frac{7}{25}$

6. In the adjoining figure, ABCD is a quadrilateral in which BN and DM are drawn perpendiculars to AC such that BN = DM. If OB = 4 cm. then BD is **[1]**



a) 6 cm

b) 12 cm

c) 10 cm

d) 8 cm

7. If the graph of the equation 4x + 3y = 12 cuts the coordinate axes at A and B, then hypotenuse of right triangle AOB is of length **[1]**

a) 3 units

b) 6 units

c) 4 units

d) 5 units

8. The value of $x^3 - 8y^3 - 36xy - 216$, when $x = 2y + 6$ is **[1]**

a) 3

b) 2

c) 0

d) 1

9. $\sqrt{10} \times \sqrt{15}$ is equal to **[1]**

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

c) $10\sqrt{5}$ d) $\sqrt{25}$

10. ABCD is a Rhombus such that $\angle ACB$= 40°, then $\angle ADB$ is **[1]**

a) 40° b) 50°

c) 60° d) 100°

11. $\sqrt[5]{6} \times \sqrt[5]{6}$ is equal to **[1]**

a) $\sqrt[5]{6 \times 0}$ b) $\sqrt[5]{12}$

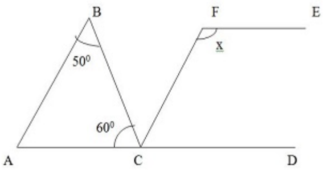
c) $\sqrt[5]{6}$ d) $\sqrt[5]{36}$

12. The equation x = 7 in two variables can be written as **[1]**

a) 1.x + 0.y = 7 b) 0.x + 0.y = 7

c) 1.x + 1.y = 7 d) 0.x + 1.y = 7

13. In figure, if AB || CF, CD || EF, then the value of x is : **[1]**



a) 120° b) 110°

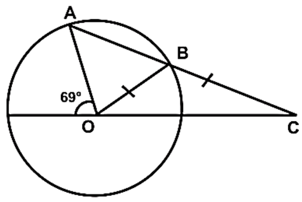
c) 140° d) 100°

14. If $(2^3)^2 = 4^x$, then 3^x = **[1]**

a) 27 b) 3

c) 6 d) 9

15. In the following figure, BC = radius OB. Then find the value of ∠OCB **[1]**



a) 69° b) 23°

c) 92° d) 46°

16. The point of intersect of the coordinate axes is **[1]**

a) abscissa b) ordinate

c) quadrant d) origin

17. The graph of the linear equation 4x + 2y = 12, cuts the x-axis at the point **[1]**

a) (0, -2) b) (3, 0)

c) (-2, 0) d) (0, 3)

18. $(x + y)^3 - (x - y)^3$ can be factorized as **[1]**

a) $2x(3x^2 + y^2)$ b) $2y(3x^2 + y^2)$

c) $2x(x^2 + 3y^2)$ d) $2y(3y^2 + x^2)$

19. **Assertion (A):** ABCD is a square. AC and BD intersect at O. The measure of $\angle AOB = 90^o$. **[1]**

Reason (R): Diagonals of a square bisect each other at right angles.

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.

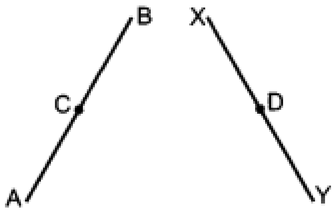
20. **Assertion (A):** $17^2 \cdot 17^6 = 17^3$ **[1]**

Reason (R): If a > 0 be a real number and p and q be rational numbers. Then $a^p \cdot a^q = a^{p+q}$.

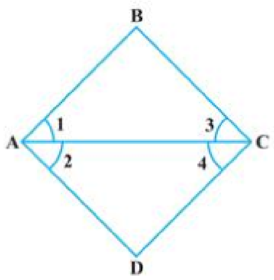
a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

Section B

21. In fig. AC = XD, C is the mid-point of AB and D is the mid-point of XY. Using a Euclid's axiom, show that AB = XY. **[2]**



22. In the given figure, we have $\angle 1 = \angle 2, \angle 2 = \angle 3$. Show that $\angle 1 = \angle 3$. **[2]**



23. Name the quadrant in which the following points lie :(i) (2, 3)(ii) (–3, 4)(iii) (–3, –10) **[2]**

24. Express $0.\overline{4}$ in the form $\frac{p}{q}$ **[2]**

OR

Find the decimal expansion of $\frac{1}{7}$.

25. A cubical box has each edge 10 cm and another cuboidal box is 12.5 cm long, 10 cm wide and 8 cm high. Which box has the greater lateral surface area and by how much? **[2]**

OR

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

Section C

26. Find the values of a and b in each of $\frac{\sqrt{2}+\sqrt{3}}{3\sqrt{2}-2\sqrt{3}} = a - b\sqrt{6}$ **[3]**

27. The following data on the number of girls (to the nearest ten) per thousand boys in different sections of Indian society is given below. **[3]**

Section	**Number of girls per thousand boys**

Scheduled Caste (SC)	940
Scheduled Tribe (ST)	970
Non SC/ST	920
Backward districts	950
Non-backward districts	920
Rural	930
Urban	910

i. Represent the information above by a bar graph.

ii. In the classroom discuss what conclusion can be arrived at from the graph.

28. In figure diagonal AC of parallelogram ABCD bisects $\angle A$ show that **[3]**

if AC bisects $\angle C$ then ABCD is a rhombus.

29. Draw the graph of the equation $2x + 3y = 12$. From the graph, find the coordinates of the point **[3]**

i. whose y coordinates is 3

ii. whose x coordinate -3.

30. Following table shows a frequency distribution for the speed of cars passing through at a particular spot on a high way: **[3]**

Class interval (km/h)	Frequency
30 - 40	3
40 - 50	6
50 - 60	25
60 - 70	65
70 - 80	50
80 - 90	28
90 - 100	14

Draw histogram and frequency polygon representing the data above.

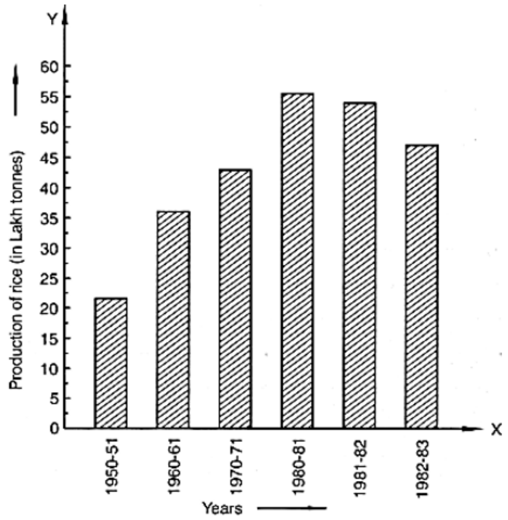
OR

Read the bar graph given in Figure and answer the following questions:

i. What information is given by the bar graph?

ii. What was the crop-production of rice in 1970-71?

iii. What is the difference between the maximum and minimum production of rice?

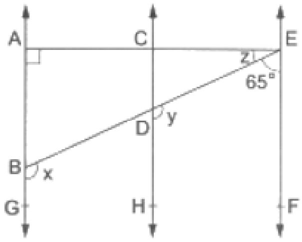


Bar graph of the production of rice crop in India in different years

31. Find whether polynomial g(x) is a factor of polynomial f(x) or not: $f(x) = x^3 - 6x^2 + 11x - 6$, $g(x) = x^2 - 3x + 2$ **[3]**

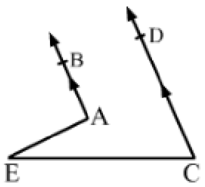
Section D

32. In the given figure, AB || CD || EF, $\angle DBG = x, \angle EDH = y$, $\angle AEB = z$, $\angle EAB = 90^\circ$ and $\angle BEF = 65^\circ$. Find the values of x, y and z. **[5]**



OR

In the given figure, AB || CD. Prove that $\angle BAE - \angle DCE = \angle AEC$.

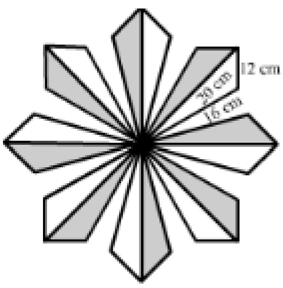


33. A cloth having an area of 165 m^2 is shaped into the form of a conical tent of radius 5 m. **[5]**

i. How many students can sit in the tent if a student on an average, occupies $\frac{5}{7}$ m^2 on the ground?

ii. Find the volume of the cone.

34. A floral design on a floor is made up of 16 tiles, each triangular in shape having sides 16 cm, 12 cm and 20 cm. Find the cost of polishing the tiles at Rs.1 per sq cm. **[5]**



OR

The perimeter of a triangular field is 420 m and its sides are in the ratio 6 : 7 : 8. Find the area of the triangular field.

35. If $(x^3 + ax^2 + bx + 6)$ has (x - 2) as a factor and leaves a remainder 3 when divided by (x - 3), find the values of a **[5]**

and b.

Section E

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

Rainwater harvesting system is a technology that collects and stores rainwater for human use.

Anup decided to do rainwater harvesting. He collected rainwater in the underground tank at the rate of 30 cm^3/sec.

i. What will be the equation formed if the volume of water collected in x seconds is taken as y cm^3? and also find amount of water collected in 2 hours? (1)

ii. Write the equation in standard form. (1)

iii. How much water will be collected in 60 sec? (2)

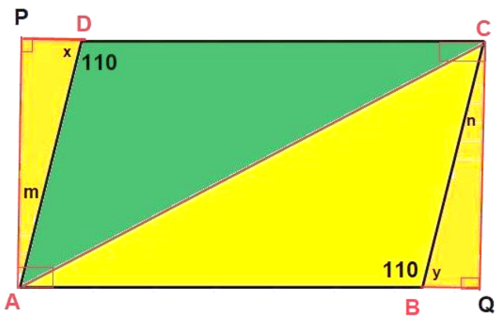
OR

How much time will it take to collect water in 900 cm^3? (2)

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

In the middle of the city, there was a park ABCD in the form of a parallelogram form so that AB = CD, AB||CD and AD = BC, AD || BC.

Municipality converted this park into a rectangular form by adding land in the form of ΔAPD and Δ BCQ. Both the triangular shape of land were covered by planting flower plants.



i. Show that ΔAPD and ΔBQC are congruent. (1)

ii. PD is equal to which side? (1)

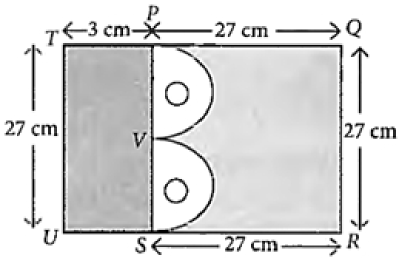
iii. Show that ΔABC and ΔCDA are congruent. (2)

OR

What is the value of $\angle$m? (2)

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

Mr. Vivekananda purchased a plot QRUT to build his house. He leaves space of two congruent semicircles for gardening and a rectangular area of breadth 3 cm for car parking.



i. Find the total area of Garden. (1)

ii. Find the area of rectangle left for car parking. (1)

iii. Find the radius of semi-circle. (2)

OR

Find the area of a semi-circle. (2)

Solution

Section A

1.

(d) on the negative direction of y-axis

Explanation:

Since x = 0 so point lies on y-axis, but value of y is -ve.

So, point lies on -ve direction of y-axis.

2. **(a)** 12.29 cm^2

Explanation:

Here a = 11 cm, b = 4 cm, c = 8 cm

$\therefore s = \frac{11+4+8}{2} = \frac{23}{2} = 11.5$ cm

Area

$= \sqrt{11.5 \times (11.5 - 11) \times (11.5 - 4) \times (11.5 - 8)}$

$= \sqrt{11.5 \times 0.5 \times 7.5 \times 3.5} = \sqrt{150.94}$ = 12.29 cm^2

3. **(a)** $\frac{1}{3}$ of the circle

Explanation:

Complete the cyclic quadrilateral PQRS, with S being a point on a point on the major arc. Then $\angle S = 60^0$ (Opposite angles of a cyclic quadrilateral)

Then Major $\angle POR = 120^0$

Thus fraction the minor arc $= \frac{120^0}{360^0} = \frac{1}{3}$

4.

(c) 90°

Explanation:

ABCD is a parallelogram. BD is the diagonal and M is the mid point of BD. BD is a bisector of ∠B.

We know that, diagonals of the parallelogram bisect each other.

∴ M is the mid point of AC.

AB || CD and BD is the transversal,

∴ ∠ABD = ∠BDC ...(1) (Alternate interior angles)

∠ABD = ∠DBC ...(2) (Given)

From (1) and (2), we get

∠BDC = ∠DBC

In Δ BCD,

∠BDC = ∠DBC

⇒ BC = CD ...(3) (In a triangle, equal angles have equal sides opposite to them)

AB = CD and BC = AD ...(4) (Opposite sides of the parallelogram are equal)

From (3) and (4), we get

AB = BC = CD = DA

∴ ABCD is a rhombus.

⇒ ∠AMB = 90° (Diagonals of rhombus are perpendicular to each other)

5. **(a)** $\frac{25}{7}$

Explanation:

x $= \frac{\sqrt{7}}{5}$ and

$\frac{5}{\frac{\sqrt{7}}{5}} = p\sqrt{7}$

$\frac{5\times5}{\sqrt{7}} = p\sqrt{7}$

$\frac{5\times5}{\sqrt{7}\sqrt{7}} = p$
p = $\frac{25}{7}$

6.
(d) 8 cm
Explanation:
In Triangle DMO and traingle BNO,
BN = DM and ∠DMO = ∠BNO (90^o)
∠DOM = ∠BON
Therefore, Triangle DMO and traingle BNO are congruent by AAS criteria
Therefore,OB = OD (by CPCT)
So OD = 4 cm, BD = OD+OB = 4+4 = 8cm

7.
(d) 5 units
Explanation:
5 units
According to the given question, triangle so formed has sides of unit 3 and 4 , using pythagoras theorem , the largest side is of 5 units.

8.
(c) 0
Explanation:
$x^3 - 8y^3 - 36xy - 216$
Putting x = 2y + 6,
$(2y+6)^3 - 8y^3 - 36\,(2y+6)\,y - 216$
= $8y^3 + 216 + 3 \times 2y \times 6\,(2y+6) - 8y^3 - 36\,(2y+6)\,y - 216$
= $8y^3 + 216 + 72y^2 + 216y - 8y^3 - 72y^2 - 216y - 216$
= 0

9. **(a)** $5\sqrt{6}$
Explanation:
$\sqrt{10} \times \sqrt{15}$
= $\sqrt{5 \times 2 \times 5 \times 3}$
= $5\sqrt{6}$

10.
(b) 50°
Explanation:
In Rhombus, digonals bisect each other right angle. By using angle sum property in any of the four triangles formed by intersection of diagonals, we get ∠CBD = 50 and ∠CBD = ∠ADC (alternate angles).
So, ∠ADC = 50

11.
(d) $\sqrt[5]{36}$
Explanation:
$\sqrt[5]{6} \times \sqrt[5]{6}$
= $\sqrt[5]{6 \times 6}$
=$\sqrt[5]{36}$

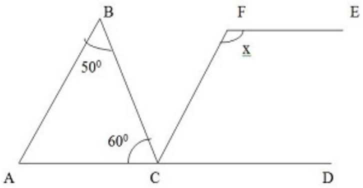
12. **(a)** 1.x + 0.y = 7
Explanation:
The equation x = 7 in two variables can be written as exactly 1.x + 0.y = 7

because it contain two variable x and y and coefficient of y is zero as there is no term containing y in equation x = 7

13.

(b) 110°

Explanation:



In the above figure, ∠B = ∠BCF (Alternate Interior angles)

Now ∠FCA = ∠BCA + ∠FCB

= 60° + 50° = 110°

Now ∠FCA = ∠x (Alternate interior angles)

Therefore ∠x = 110°

14. **(a)** 27

Explanation:

$(2^3)^2 = 4^x$

$\Rightarrow 2^{3\times 2} = (2^2)^x$

$\Rightarrow 2^6 = 2^{2x}$

Comparing,

$\Rightarrow 2x = 6$

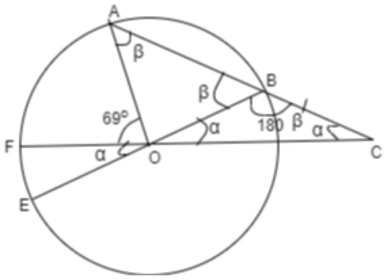
$\Rightarrow x = \frac{6}{2} = 3$

Now $3^x = (3)^3 = 3 \times 3 \times 3 = 27$

15.

(b) 23^o

Explanation:



Exterior angle of triangle $\angle AOE = 69^\circ + \alpha$

Exterior angle = Sum of opp. interior angle

$69^\circ + \alpha = 2\beta$ .... (i) in $\triangle AOB$

$\angle FOE = \angle BOC$

In ΔBOC, OB = BC

$180^\circ - \beta + 2\alpha = 150^o$

$\beta = 2\alpha$

$69^\circ + \alpha = 2\beta$

$69^\circ + \alpha = 4^\alpha$

$69 = 3x$

$\alpha = 23^o$

$\Rightarrow \angle BCO = 23^\circ$

16.

(d) origin

Explanation:

The point where coordinate axes intersect is known as origin O(0,0).

17.

(b) (3, 0)

Explanation:

The graph of the linear equation 4x + 2y = 12, cuts the x-axis at the point

when line cut x axis the co-ordinate of y becomes zero.

so we put y = 0 in given equation to find the co-ordinate

$4x + 2y = 12$

$4x + 2(0) = 12$

$4x = 12$

$x = \frac{12}{4}$

$x = 3$

so the required cordinate is (3,0)

18.

(b) $2y(3x^2 + y^2)$

Explanation:

put a=x+y and b=x-y,then

$(x+y)^3 - (x-y)^3 = a^3 - b^3$

$= (a-b)(a^2 + b^2 + ab)$

$= (x+y-x+y)[(x+y)^2 + (x-y)^2 + (x-y)(x+y)]$

$= 2y[2(x^2+y^2) + (x^2-y^2)]$

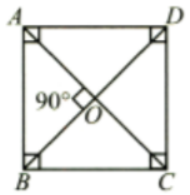
$= 2y[3x^2 + y^2]$

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

Explanation:

Since, diagonals of a square bisect each other at right angles.

$\angle AOB = 90^o$



20.

(d) A is false but R is true.

Explanation:

$17^2 \cdot 17^5 = 17^{2+5} = 17^7$

Section B

21. In the above figure, we have

AB = AC + BC = AC + AC = 2AC (Since, C is the mid-point of AB) ..(1)

XY = XD + DY = XD + XD = 2XD (Since, D is the mid-point of XY) ..(2)

Also, AC = XD (Given) ..(3)

From (1),(2)and(3), we get

AB = XY, According to Euclid, things which are double of the same things are equal to one another.

22. We have

$\angle 1 = \angle 2$ [Given]

$\angle 2 = \angle 3$ [Given]

Now, by Euclid's axiom 1, things which are equal to the same thing are equal to one other.

Hence, $\angle 1 = \angle 3$.

23. (i) I quadrant

(ii) II quadrant

(iii) III quadrant

24. Let x = $0.\overline{4}$

i.e. x = 0.444... ----- (i)

Multiply eq. (i) by 10, we get,

$\Rightarrow$ 10x = 4.444....---- (ii)

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

10 x - x = 4.444... - 0.444...

9x = 4

$\Rightarrow$ x = $\frac{4}{9}$

$\Rightarrow 0.\overline{4} = \frac{4}{9}$

OR

The given number is $\frac{1}{7}$

Now let us divide 1 by 7 using long division method.

```
7)1.000000(0.142857
  0
  --
  10
   7
  --
   30
   28
   --
   20
   14
   --
   60
   56
   --
    40
    35
    --
    50
    49
    --
     1
```

Now we see that remainder 1 is returned so same pattern will repeat in the quotient, so we can say that

$\frac{1}{7}$ = 0.142857142857...........

Hence $\frac{1}{7}$ = $0.\overline{142857}$

25. We are given that, Each edge of the cubical box (a) = 10 cm

Therefore Lateral surface area of the cubical box = $4a^2$

= $4(10)^2$ = 400 cm^2

For cuboidal box

l = 12.5 cm, b = 10 cm, h = 8 cm

Lateral surface area of the cuboidal box = 2(l + b)h

= 2(12.5 + 10) (8) = 360 cm^2

Cubical box has the greater lateral surface area than the cuboidal box by (400 – 360) cm^2 i.e. 40 cm^2

OR

Inner radius of bowl (r) = 5 cm

Thickness of steel (t) = 0.25 cm

$\therefore$ Outer radius of bowl (R) = $r + t$ = 5 +0.25 = 5.25 cm

$\therefore$ Outer curved surface area of bowl = $2\pi R^2 = 2 \times \frac{22}{7} \times 5.25 \times 5.25$

= $2 \times \frac{22}{7} \times \frac{21}{4} \times \frac{21}{4}$

= $\frac{693}{4}$

$= 173.25\ cm^2$

Section C

26. LHS $= \frac{\sqrt{2}+\sqrt{3}}{3\sqrt{2}-2\sqrt{3}} = \frac{\sqrt{2}+\sqrt{3}}{3\sqrt{2}-2\sqrt{3}} \times \frac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}}$

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

$= \frac{6+2\sqrt{6}+3\sqrt{6}+6}{18-12}$

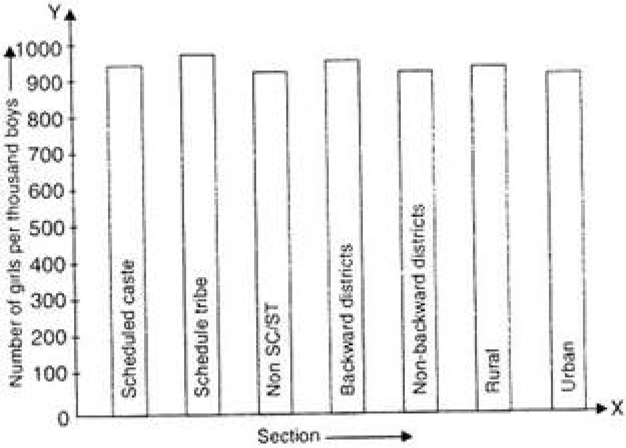
$= \frac{12+5\sqrt{6}}{6} = 2 + \frac{5\sqrt{6}}{6}$

Now, $a - b\sqrt{6} = 2 + \frac{5}{6}\sqrt{6}$

a = 2

b = $-\frac{5}{6}$

27. i.



ii. The two conclusions we can arrive at from the graph are as follows:

iii. The numbers of girls to the nearest ten per thousand boys is maximum in Scheduled Tribe section of the society and minimum in Urban section of the society.

iv. The number of girls to the nearest ten per thousand boys is the same for 'Non SC/ST' and 'Non-backward Districts' sections of the society.

28. i. Since, AB $\|$DC and AC is transversal

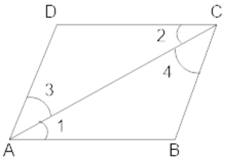
$\therefore \angle 1 = \angle 2$ (Alternate angles)

And $\angle 3 = \angle 4$ (Alternate angles)

But, $\angle 1 = \angle 3$

$\therefore \angle 2 = \angle 4$

$\therefore AC\ bi\sec sts\ \angle C$



ii. In $\triangle$ABC and $\triangle$ADC

AC = AC [common]

$\angle$1 = $\angle$3 [given]

$\angle$2 = $\angle$4 [proved]

$\therefore$ $\triangle$ABC $\cong$ $\triangle$ADC

$\therefore$ AB = AD [By CPCT]

$\therefore$ ABCD is a rhombus

29. Graph of the equation 2x + 3y = 12

We have

2x + 3y = 12

2x = 12 - 3y

x = $\frac{(12-3y)}{2}$

Putting y = 2 we get x = $\frac{(12-3\times 2)}{2}$ = 3

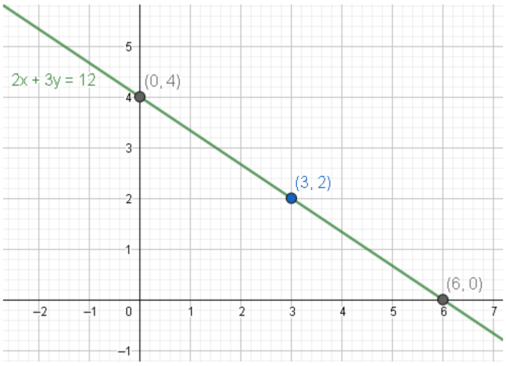
Putting y = 4 we get x = $\frac{(12-3\times 4)}{2}$ = 0

Thus, (3, 2) and (0, 4) are two points on the line 2x + 3y = 12

The graph of line represents by the equation 2x + 3y = 12

x	0	3	6
y	4	2	0

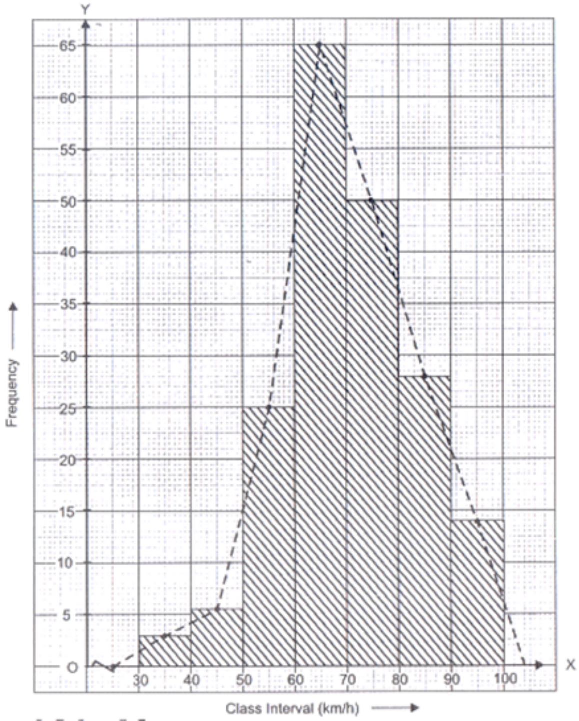
Graph of the equation 2x + 3y = 12



i) To find coordinates of the points when y = 3, we draw a line parallel to x-axis and passing through (0, 3) this lines meets the graph of 2x + 3y = 12 at a point p from which we draw a line parallel to y-axis which crosses x-axis at x = $\frac{3}{2}$, so the coordinates of the required points are ($\frac{3}{2}$, 3).

ii) To find the coordinates of the points when x = -3 we draw a line parallel to y-axis and passing through (-3, 0). This lines meets the graph of 2x + 3y = 12 at a point p from which we draw a line parallel to x-axis crosses y axis at y = 6, so, the coordinates of the required point are (-3, 6).

30. In the figure given below, a histogram and a frequency polygon (in dotted lines) are drawn on the same scale.



OR

i. It gives information regarding the production of rice crops(in lakh tonnes) in India in different years.
ii. The crop production of rice in 1970-71 = 42.5 lakh tonnes.
iii. The difference between the maximum and minimum production of rice = 55 – 22 = 33 lakh tonnes

31. The given polynomials are,

f(x) = $x^3 - 6x^2 + 11x - 6$

g(x) = $x^2 - 3x + 2$

First we need to find the factors of $x^2 - 3x + 2$

$\Rightarrow x^2 - 2x - x + 2$

$\Rightarrow x(x - 2) -1(x - 2)$

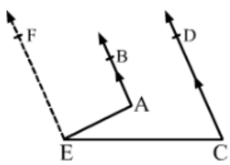
⇒ (x - 1) and (x - 2) are the factors
To prove that g(x) is the factor of f(x),
The results of f(1) and f(2) should be zero
Let, x – 1 = 0
x = 1
substitute the value of x in f(x),then,we have,
$f(1) = 1^3 - 6(1)^2 + 11(1) - 6$
= 1 – 6 + 11 – 6
= 12 – 12
= 0
Let, x – 2 = 0
x = 2
substitute the value of x in f(x),then,we have,
$f(2) = 2^3 - 6(2)^2 + 11(2) - 6$
= 8 – (6 × 4) + 22 – 6
= 8 – 24 + 22 - 6
= 30 – 30
= 0
Since, the results are 0 g(x) is the factor of f(x)

Section D

32. EF || CD and ED is the transversal.
$\therefore \quad \angle FED + \angle EDH = 180^\circ$ [co-interior angles]
⇒ 65° + y = 180°
⇒ y = (180° - 65°) = 115°.
Now CH || AG and DB is the transversal
∴ x = y = 115° [corresponding angles]
Now, ABG is a straight line.
$\therefore \angle ABE + \angle EBG = 180^\circ$ [sum of linear pair of angles is 180°]
$\Rightarrow \angle ABE + x = 180^\circ$
$\Rightarrow \angle ABE + 115^\circ = 180^\circ$
$\Rightarrow \angle ABE = (180^\circ - 115^\circ) = 65^\circ$
We know that the sum of the angles of a triangle is 180°.
From △EAB, we get
$\angle EAB + \angle ABE + \angle BEA = 180^\circ$
⇒ 90° + 65° + z = 180°
⇒ z = (180° - 155°) = 25°
∴ x = 115°, y = 115° and z = 25°

OR

To Prove : ∠BAE - ∠DCE = ∠ACE



Draw EF || AB || CD through E.
Now, EF || AB and AE is the transversal.
Then, $\angle BAE + \angle AEF = 180^\circ$
[Angles on the same side of a transversal line are supplementary
Again, EF || CD and CE is the transversal
Then,
$\angle DCE + \angle CEF = 180^\circ$
[Angles on the same side of a transversal line are supplementary
$\Rightarrow \angle DCE + (\angle AEC + \angle AEF) = 180^\circ$

$\Rightarrow \angle DCE + \angle AEC + 180^\circ - \angle BAE = 180^\circ$

$\Rightarrow \angle BAE - \angle DCE = \angle AEC$

33. Suppose l be the slant height of the conical tent.

Radius of the base of conical tent $(r) = 5m$

i. Area of the circular base of the cone = πr^2 = $\frac{22}{7} \times 5^2 m^2$

Number of student = $\frac{\textit{Area of the base}}{\textit{Area occupied by one student}}$

$= \frac{\frac{22}{7} \times 5 \times 5m^2}{\frac{5}{7}m^2}$ = $\frac{22}{7} \times 5 \times 5 \times \frac{7}{5} = 110$

ii. Also, curved surface area of cone = πrl

$\Rightarrow 165 = \frac{22}{7} \times 5 \times l$

$\Rightarrow l = \frac{165 \times 7}{22 \times 5}$

$\Rightarrow l = \frac{21}{2} m = 10.5m$

Also, $h^2 = l^2 - r^2$

$\Rightarrow h = \sqrt{(10.5)^2 - 5^2} = \sqrt{15.5 \times 5.5}$ ≈<p

Volume of conical tent = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 5^2 \times 9.23m^3 = 241.74m^3$.

34. Area of one triangular-shaped tile can be found by using Heros formula in the following manner:

Let:

a = 16 cm, b = 12 cm and c = 20 cm

$s = \frac{a+b+c}{2} = \frac{16+12+20}{2} = 24cm$

By Heron's formula, we have:

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

$= \sqrt{24(24-16)(24-12)(24-20)}$

$= \sqrt{24 \times 8 \times 12 \times 4}$

$= \sqrt{6 \times 4 \times 4 \times 4 \times 4 \times 6}$

$= 6 \times 4 \times 4$

= 96 cm^2

Now,

Area of 16 triangular-shaped tiles $= 16 \times 96$ = 1536 cm^2

Cost of polishing tiles of area 1 cm^2 = Rs 1

Cost of polishing tiles of area 1536 $cm^2 = 1 \times 1536$ = Rs.1536

OR

Suppose that the sides in metres are 6x, 7x and 8x.

Now, 6x + 7x + 8x = perimeter = 420

$\Rightarrow$ 21x = 420

$\Rightarrow x = \frac{420}{21}$

$\Rightarrow$ x = 20

$\therefore$ The sides of the triangular field are $6 \times 20m, 7 \times 20m, 8 \times 20m$, i.e., 120 m, 140 m and 160 m.

Now, s = Half the perimeter of triangular field.

$= \frac{1}{2} \times 420m = 210m$

Using Heron's formula,

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

$= \sqrt{210(210-120)(210-140)(210-160)}$

$= \sqrt{210 \times 90 \times 70 \times 50}$

$= \sqrt{66150000} = 8133.265m^2$

Hence, the area of the triangular field = 8133.265 m^2.

35. Let: f(x) = $x^3 + ax^2 + bx + 6$

f(x) is divisible by x – 2

Then f(2) = 0

$2^3 + a \times 2^2 + b \times 2 + 6 = 0$

$8 + 4a + 2b + 6 = 0$

$4a + 2b = -14$

$2a + b = -7$ ...(i)

If f(x) is divided by x - 3 remainder is 3

$\therefore f(3) = 3$

$3^3 + a \times 3^2 + b \times 3 + 6 = 3$

$9a + 3b = -30$

$3a + b = -10$ ...(ii)

Subtracting (i) from (ii)

$-a = 3$ and $a = -3$

Put a = -3 in eq (i)

$2 \times -3 + b = -7$

$-6 + b = -7$

$b = -7 + 6$

$b = -1$

Section E

36. i. Let 'x be time taken and y be amount of water collected as per given statement.

    Equation is $30x = y$

    Now when x = 2 hours = 120 sec

    $y = 30 \times 120 = 3600\ cm^3$

    ii. $30x - y + 0 = 0$

    Standard form of a linear equation in two variables is $ax + by + c = 0$

    iii. Since, $y = 30x$

    If x = 60, then, $y = 30 \times 60$

    $= 1800$

    Required volume is $1800\ cm^3$.

    OR

    Since, $y = 30x$

    If y = 900, then, $900 = 30x$

    $x = \frac{900}{30} = 30$

    Required time is 30 sec.

37. i. In $\triangle APD$ and $\triangle BQC$

    AD = BC (given)

    AP = CQ (opposite sides of rectangle)

    $\angle APD = \angle BQC = 90^o$

    By RHS criteria $\triangle APD \cong \triangle CQB$

    ii. $\triangle APD \cong \triangle CQB$

    Corresponding part of congruent triangle

    side PD = side BQ

    iii. In $\triangle ABC$ and $\triangle CDA$

    AB = CD (given)

    BC = AD (given)

    AC = AC (common)

    By SSS criteria $\triangle ABC \cong \triangle CDA$

    OR

    In $\triangle APD$

    $\angle APD + \angle PAD + \angle ADP = 180^o$

    $\Rightarrow 90^o + (180^o - 110^o) + \angle ADP = 180^o$ (angle sum property of $\triangle$)

    $\Rightarrow \angle ADP = m = 180^o - 90^o - 70^o = 20^o$

    $\angle ADP = m = 20^o$

38. i. Area of Garden is = 2 $\times$ semicircles

Area of a semi-circle = 2 $\times$ $\frac{1}{2}\pi r^2$

= $\frac{22}{7}$ $\times$ 6.75×6.75 = 144.43 cm^2

ii. Area of rectangle left for car parking is area of region PSUT = 27 $\times$ 3 = 81 cm^2

iii. Diameter of semi-circle = PV = $\frac{PS}{2} = \frac{27}{2}$ = 13.5 cm

$\therefore$ Radius of semi-circle = $\frac{13.5}{2}$ = 6.75 cm

OR

Diameter of semi-circle = PV = $\frac{PS}{2} = \frac{27}{2}$ = 13.5 cm

$\therefore$ Radius of semi-circle = $\frac{13.5}{2}$ = 6.75 cm

Area of a semi-circle = $\frac{1}{2}\pi r^2$

= $\frac{1}{2} \times \frac{22}{7} \times 6.75 \times$ 6.75 = 71.59 cm^2