Class: IX
SESSION : 2022-2023
SUBJECT: Mathematics
SAMPLE QUESTION PAPER - 10
with SOLUTION

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 (04 marks each) with subparts of the values of 1, 1 and 2 marks each respectively.
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 2marks questions of Section E.
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

Section A

1. The value of k if x = 3 and y = -2 is a solution of the equation 2x - 13y = k is **[1]**

a) 31 b) 23

c) 32 d) 30

2. If $\sqrt{2} = 1.41$ then $\frac{1}{\sqrt{2}}$ =? **[1]**

a) 0.709 b) 7.05

c) 0.75 d) 0.075

3. The co-ordinates of a point below the x-axis lying on y-axis at a distance of 4 units are **[1]**

a) (-4, 0) b) (0, 4)

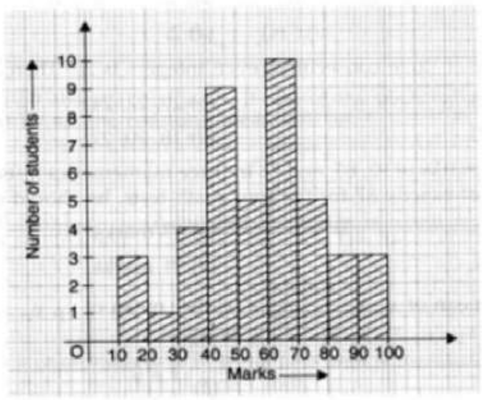
c) (0, -4) d) (4, 0)

4. Express y in terms of x in the equation 5y - 3x - 10 = 0. **[1]**

a) $y = \frac{3-10x}{5}$ b) $y = \frac{3+10x}{5}$

c) $y = \frac{3x-10}{5}$ d) $y = \frac{3x+10}{5}$

5. In the given graph, the number of students who scored 60 or more marks is **[1]**



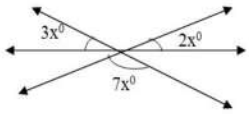
a) 22

b) 20

c) 21

d) 19

6. In the adjoining figure, the value of x is: **[1]**



a) 15°

b) 10°

c) 12°

d) 18°

7. If a straight line falling on two straight lines makes the interior angles on the same side of it taken together less than 180°, then the two straight lines, if produced indefinitely, meet on that side on which the angles taken together are **[1]**

a) $< 180^o$

b) $= 180^o$

c) $> 180^o$

d) None of these

8. In △ABC, E is the mid-point of median AD such that BE produced meets AC at F. If AC = 10.5 cm, then AF = **[1]**

a) 2.5 cm

b) 5 cm

c) 3 cm

d) 3.5 cm

9. How many lines pass through one point? **[1]**

a) one

b) three

c) two

d) many

10. When $p(x) = x^3 + ax^2 + 2x + a$ is divided by $x + a$, the remainder is **[1]**

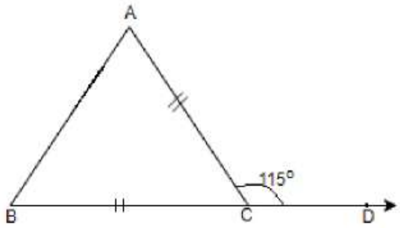
a) a

b) 0

c) 1

d) -a

11. In the adjoining figure, BC = AC. If ∠ACD = 115°, the ∠A is **[1]**



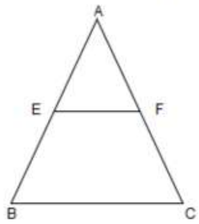
a) 50°

b) 65°

c) 57.5°

d) 70°

12. E and F are the mid-points of the sides AB and AC of a $\triangle$ABC. If AB = 6cm, BC = 5cm and AC = 6cm, Then EF is equal to **[1]**



a) 4 cm

b) 3 cm

c) 2.5 cm

d) None of these

13. If x = 3 + $2\sqrt{2}$, then the value of $x + \frac{1}{x}$ is **[1]**

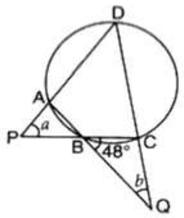
a) 0

b) 3

c) 1

d) 6

14. In the given figure, ABCD is a cyclic quadrilateral, $\angle CBQ = 48^o$ and a = 2b. Then, b is equal to **[1]**



a) 48^o

b) 18^o

c) 38^o

d) 28^o

15. The factors of $x^3 - 1 + y^3 + 3xy$ are **[1]**

a) $3(x + y - 1)(x^2 + y^2 - 1)$

b) $(x - 1 + y)(x^2 - 1 - y^2 + x + y + xy)$

c) $(x + y + 1)(x^2 + y^2 + 1 - xy - x - y)$

d) $(x - 1 + y)(x^2 + 1 + y^2 + x + y - xy)$

16. The cost of turfing a triangular field at the rate of Rs. 45 per 100 m^2 is Rs. 900. If **[1]**

the double the base of the triangle is 5 times its height, then its height is

a) 40 m
b) 42 m
c) 32 m
d) 44 m

17. Which of the following is a binomial? **[1]**

a) $x + 3 + \frac{1}{x}$
b) $x^2 + 4$
c) $2x^2$
d) $x^2 + x + 3$

18. **Assertion (A):** The perimeter of a right angled triangle is 60 cm and its hypotenuse is 26 cm. The other sides of the triangle are 10 cm and 24 cm. Also, area of the triangle is 120 cm^2. **[1]**
Reason (R): $(\text{Base})^2 + (\text{Perpendicular})^2 = (\text{Hypotenuse})^2$

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.

19. A right triangle with sides 3 cm, 4 cm and 5 cm is rotated about the side of 3 cm to form a cone. The volume of the cone so formed is **[1]**

a) $12\pi \text{ cm}^3$
b) $20\pi \text{ cm}^3$
c) $16\pi \text{ cm}^3$
d) $15\pi \text{ cm}^3$

20. **Assertion (A):** There are infinite number of lines which passes through (2, 14). **[1]**
Reason (R): A linear equation in two variables has infinitely many solutions.

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. Factorize: $6ab - b^2 + 12ac - 2bc$ **[2]**

22. An isosceles triangle has perimeter 30 cm and each of the equal sides is 12 cm. Find the area of the triangle. **[2]**

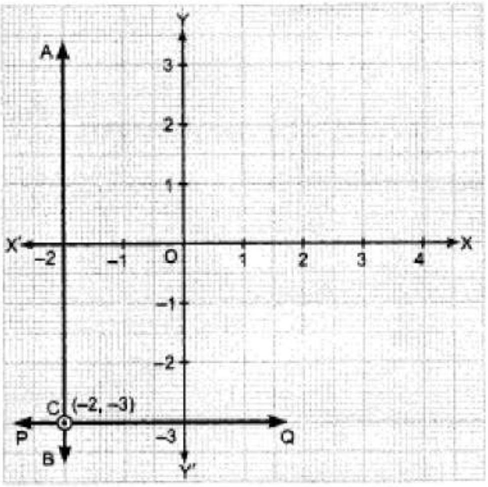
23. What must be added to $2x^2 - 5x + 6$ to get $x^3 - 3x^2 + 3x - 5$? **[2]**

OR

Find whether polynomial g(x) is a factor of polynomial f(x) or not: $f(x) = x^3 - 6x^2 - 19x + 84$, $g(x) = x - 7$

24. The height of a cone is 15 cm. If its volume is 1570 cm^3. Find the radius of the base. **[2]**

25. Write the linear equation represented by line AB and PQ. Also find the co-ordinate of intersection of line AB and PQ. **[2]**



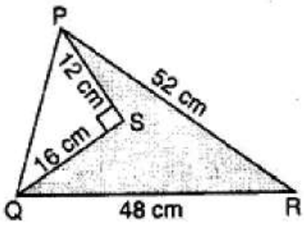
OR

Express x in terms of y for the linear equation $\frac{2}{3}x + 4y = -7$.

Section C

26. Locate $\sqrt{3}$ on the number line. **[3]**

27. Find the area of the shaded region in figure. **[3]**



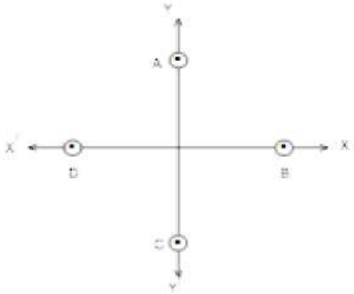
OR

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?

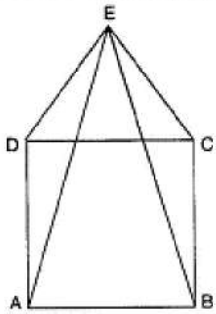
28. Find at least 3 solutions for the linear equation $2x - 3y + 7 = 0$. **[3]**

29. Without actually calculating the cubes, find the value of $(-12)^3 + (7)^3 + (5)^3$ **[3]**

30. In fig. write the Co-ordinates of the points and if we join the points write the name of fig. formed. Also write Co-ordinate of intersection point of AC and BD. **[3]**



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



OR

In $\triangle ABC$, if $\angle A + \angle B = 125^\circ$ and $\angle A + \angle C = 113^\circ$, find $\angle A$, $\angle B$, $\angle C$.

Section D

32. Visualize the representation of $5.\overline{37}$ on the number line upto 5 decimal places, that is, up to 5.37777. **[5]**

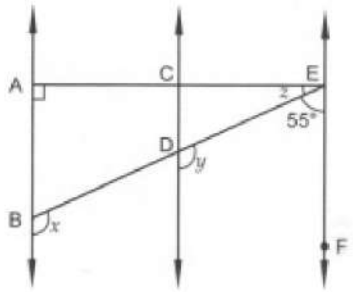
OR

If x = 2 - $\sqrt{3}$, find the value of $\left(x - \frac{1}{x}\right)^3$.

33. If two lines intersect, prove that the vertically opposite angles are equal. **[5]**

OR

Fig., AB || CD and CD || EF. Also, EA ⊥ AB. If ∠BEF = 55°, find the values of x, y, and z.



34. In the adjoining figure, name: **[5]**

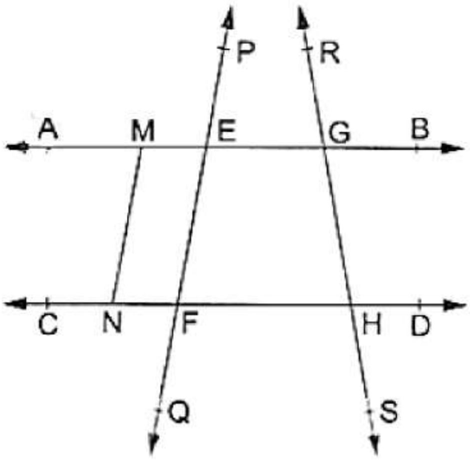
i. Six points

ii. Five line segments

iii. Four rays

iv. Four lines

v. Four collinear points



35. In a study of diabetic patients in a village, the following observations were noted: **[5]**

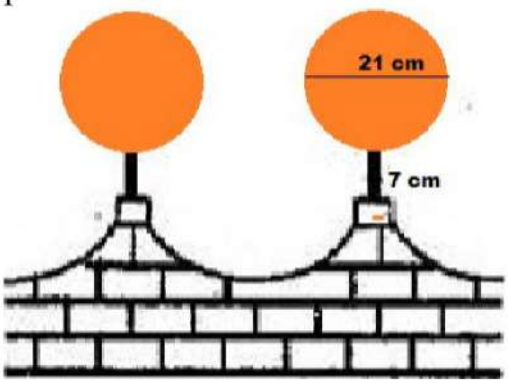
Age in years	10-20	20-30	30-40	40-50	50-60	60-70
Number of patients	2	5	12	19	9	4

Represent the above data by a frequency polygon.

Section E

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

The front compound wall of a house is decorated by wooden spheres of diameter 21 cm, placed on small supports as shown in figure. 25 such spheres are used for this purpose and are to be painted silver. Each support is a cylinder and is to be painted black.



(i) what will be the total surface area of the spheres all around the wall?

(ii) Find the cost of orange paint required if this paint costs 20 paise per cm^2.

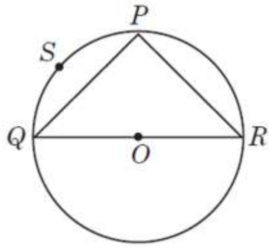
OR

What will be the volume of total spheres all around the wall?

(iii) How much orange paint in liters is required for painting the supports if the paint required is 3 ml per cm^2?

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

Sanjay and his mother visited in a mall. He observes that three shops are situated at P, Q, R as shown in the figure from where they have to purchase things according to their need. Distance between shop P and Q is 8 m and between shop P and R is 6 m.
Considering O as the center of the circles.



(i) Find the Measure of $\angle QPR$.

(ii) Find the radius of the circle.

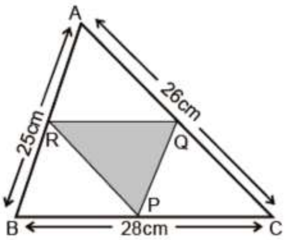
(iii) Find the Measure of $\angle QSR$.

OR

Find the area of ΔPQR.

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

There is a Diwali celebration in the DPS school Janakpuri New Delhi. Girls are asked to prepare Rangoli in a triangular shape. They made a rangoli in the shape of triangle ABC. Dimensions of $\triangle ABC$ are 26 cm, 28 cm, 25 cm.

(i) In fig R and Q are mid-points of AB and AC respectively. Find the length of RQ.

(ii) Find the length of Garland which is to be placed along the side of $\triangle QPR$.

OR

R, P, Q are the mid-points of corresponding sides AB, BC, CA in ΔABC, then name the figure so obtained BPQR.

(iii) R, P and Q are the mid-points of AB, BC, and AC respectively. Then find the relation between area of $\triangle PQR$ and area of $\triangle ABC$.

SOLUTION

Section A

1. **(c)** 32

   Explanation: We have to find the value of 'k' if x = 3 and y = -2 is a solution of the equation 2x – 13y = k

   2x - 13y = k

   2(3) - 13(-2) = k

   6 + 26 = k

   k = 32
2. **(a)** 0.709

   Explanation: $\frac{1}{\sqrt{2}} = \frac{1}{1.41} = 0.709$
3. **(c)** (0, -4)

   Explanation: Since, it lies on the y-axis so abscissa = 0

   And since it lies 4 unit below x-axis so the value of ordinate = -4.

   Thus, point will be (0, -4).
4. **(d)** $y = \frac{3x+10}{5}$

   Explanation: 5y - 3x - 10 = 0

   5y - 3x = 10

   5y = 10 + 3x

   y = $\frac{10+3x}{5}$
5. **(c)** 21

   Explanation: Add the values corresponding to the height of the bar from 60 to 100

   10 + 5 + 3 + 3 = 21
6. **(a)** 15°

   Explanation: 7x + 2x + 3x = 180°

   12x = 180°

   x = 15°
7. **(a)** < 180^{o}

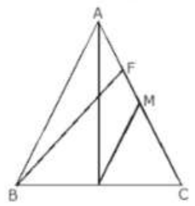
   Explanation: According to Euclid's fifth postulate, if a straight line crossing two straight lines makes the interior angles on the same side less than two right angles, the two straight lines, if extended indefinitely, meet on that side on which are the angles less than the two right angles.
8. **(d)** 3.5 cm

   Explanation:

   Given,

   In △ABC

   E is mid point of median AD

   AC = 10.5 cm

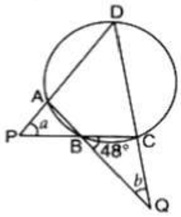
   Draw DM || EF

$\because$ E is mid point of AD so F is mid point of AM
AF = FM ...(i)
In $\triangle$BFC
EF || DM
So, FM = MC ...(ii)
From (i) & (ii)
AF = MC ...(iii)
AC = AF + MC + FM
$\Rightarrow$ AC = AF + AF + AF From (i) (ii) &(iii)
AC = 3AF
AF = $\frac{1}{3}$ AC
AF = $\frac{1}{3}$ $\times$ 10.5 = 3.5 cm

9. **(d)** many
Explanation: Because one point can be solution of many equations. So many equations can be pass from one point.
10. **(d)** -a
Explanation: x + a = 0 $\Rightarrow$ x = -a
By the remainder theorem, we know that when p(x) is divided by (x + a), the remainder is p (−a).
Thus, we have: p(-a) = $(-a)^3 + a \times (-a)^2 + 2 \times (-a) + a$
$= -a^3 + a^3 - 2a + a$
= -a
11. **(c)** 57.5°
Explanation: As BC = AC, therefore triangle ABC is an isoscelestriangle.
Given $\angle$ACD = 115°, $\angle$ACB = 180 - 115 = 65° (Linear Pair)
As AC = BC, therefore $\angle$A =$\angle$B
As sum of all the three angles of atriangle is 180°
Therefore,$\angle$A +$\angle$B +$\angle$ACB = 180°
$\angle$A =$\angle$B = 57.5
12. **(c)** 2.5 cm
Explanation: since E and F are the mid points of sides AB and AC respectively.
according to mid point theorem of triangle;
EF = $\frac{1}{2} \times BC$
EF = $\frac{1}{2} \times 5$
13. **(d)** 6
Explanation: $x + \frac{1}{x}$
$\Rightarrow \frac{x^2+1}{x}$
Put the value of x,
$\Rightarrow \frac{(3+2\sqrt{2})^2+1}{3+2\sqrt{2}}$
$\Rightarrow \frac{9+8+12\sqrt{2}+1}{3+2\sqrt{2}}$
$\Rightarrow \frac{18+12\sqrt{2}}{3+2\sqrt{2}}$
$\Rightarrow \frac{6(3+2\sqrt{2})}{3+2\sqrt{2}}$
$\Rightarrow 6$

14. **(d)** 28^o

Explanation:



Here, $\angle ABC$ is supplementary to $\angle CBQ$

So, $\angle ABC$ = 180 - 48 = 132°

Since, ABCD is cyclic quadrilateral, $\angle B + \angle D = 180^\circ$ {opposite angles are supplementery}

So, $\angle D$ = 180 - 132 = 48°

Now, in triangle PDC, $\angle P + \angle D + \angle C$ = 180°

= a + 48° + (48°+ b) =180° {since, $\angle C$ is external angle to B and b, and sum of two opposite interior angles is equal to external angle}

= 3b + 96 = 180°

= 3b = 180 - 96 = 84

b = 28°

15. **(d)** $(x- 1 + y)(x^2 + 1 + y^2 + x + y - xy)$

Explanation: The given expression to be factorized is $x^3 - 1 + y^3 + 3xy$

This can be written in the form

$x^3 - 1 + y^3 + 3xy = (x)^2 + (-1)^3 + (y)^3 - 3(x).(-1).(y)$

Recall the formula $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$

Using the above formula, we have,

$x^3 - 1 + y^3 + 3xy$

$= (x + (-1) + y) \{(x)^2 + (-1)^2 + (y)^2 - (x).(-1) - (-1).(y) - (y).(x)\}$

$= (x - 1 + y)(x^2 + 1 + y^2 + x + y - xy)$

16. **(a)** 40 m

Explanation: Cost of turfing a triangular field at the rate of Rs.45 per 100 = Rs.900

$\frac{\text{Area} \times 45}{100} = 900$

$\Rightarrow$ Area = 2000 sq. m

According to question,

$2 \times$ Base = $5 \times$ Height

$\Rightarrow$ Base = $\frac{\text{Height} \times 5}{2}$

Area of triangle = 2000 sq. m

$\Rightarrow \frac{1}{2} \times$ Base $\times$ Height = 2000

$\Rightarrow \frac{1}{2} \times \frac{\text{Height} \times 5}{2} \times$ Height = 2000

$\Rightarrow (\text{Height})^2 = 1600$

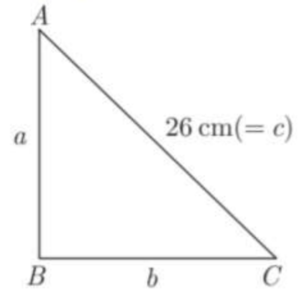
$\Rightarrow$ Height = 40 m

17. **(b)** $x^2 + 4$

Explanation: Clearly, $x^2 + 4$ is an expression having two non-zero terms. So, it is a binomial.

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

Explanation:



a + b + c = 60

a + b + 26 = 60

a + b = 34 ...(i)

Now, $26^2 = a^2 + b^2$ ...(ii)

Squaring (1) both sides, we get

$(a + b)^2 = (34)^2$

$a^2 + b^2 + 2ab = 34 \times 34$

$(26)^2 + 2ab = 1156$ [From (ii)]

2ab = 1156 - 676

2ab = 480

ab = 240 ...(iii)

Now, $a + \frac{240}{a} = 34$ [From (i) and (iii)]

$a^2 - 24a - 10a + 240 = 0$

a(a - 24) - 10(a - 24) = 0

a = 10, 24

Now, other sides are 10 cm and 24 cm

$s = \frac{26+10+24}{2} = 30$ cm

Area of triangle = $\sqrt{30(30-26)(30-10)(30-24)}$

$= \sqrt{30 \times 4 \times 20 \times 6} = 120 \text{ cm}^2$

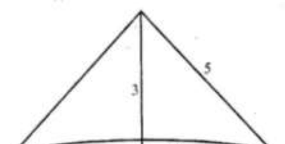
19. **(c)** $16\pi \text{ cm}^3$

Explanation:

A cone is formed be rotating the right angled triangle above the side 3 cm

Height of cone = (h) = 3 cm

and radius (r) = 4 cm



$\therefore$ Volume = $\frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times (4)^2 \times 3\text{cm}^3$

$= \frac{1}{3}\pi \times 16 \times 3 = 16\pi\text{cm}^3$

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

Explanation: Through a point infinite lines can be drawn. Through (2, 14) infinite number of lines can be drawn. Also a line has infinite points on it hence a linear equation representing a line has infinite solutions.

Section B

21. The given expression is

$6ab - b^2 + 12ac - 2bc$

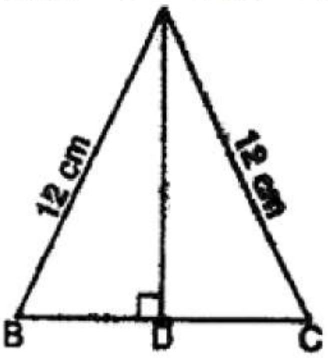
Taking b common in $(6ab - b^2)$ and 2c in (12ac - 2bc)

= b(6a - b) + 2c (6a - b)

Taking (6a - b) common in the terms

= (6a - b)(b + 2c)

$\therefore 6ab - b^2 + 12ac - 2bc = (6a - b)(b + 2c)$

22. 

a = 12 cm, b = 12 cm

Perimeter = 30 cm

a + b + c = 30

⇒ 12 + 12 + c = 30

⇒ 24 + c = 30

⇒ c = 30 – 24

⇒ c = 6 cm

$s = \frac{30}{2}$ cm = 15 cm

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

$= \sqrt{15(15-12)(15-12)(15-6)}$

$= \sqrt{15(3)(3)(9)} = 9\sqrt{15}$ cm^2

23. Let p(x) be added.

Then, $2x^2 - 5x + 6 + p(x) = x^3 - 3x^2 + 3x - 5$

So, $p(x) = x^3 - 3x^2 + 3x - 5 - 2x^2 + 5x - 6$

$= x^3 - 5x^2 + 8x - 11$

OR

We are given that,

$f(x) = x^3 - 6x^2 - 19x + 84$

g(x) = x - 7

g(x)=0

⇒x-7=0

x=7

To prove that g(x) is the factor of f(x),we must have,

f(7)=0

Substitute the value of x in f(x)

$f(7) = 7^3 - 6(7)^2 - 19(7) + 84$

= 343 - (6 × 49) - (19 × 7) + 84

= 342 - 294 - 133 + 84

= 427 - 427

= 0

Since, the result is 0 g(x) is the factor of f(x)

24. Let the radius of the base of the cone be r cm.

h = 15 cm, Volume = 1570 cm^3

$\Rightarrow \frac{1}{3}\pi r^2 h$= 1570

$\Rightarrow \frac{1}{3} \times 3.14 \times r^2 \times 15 = 1570$

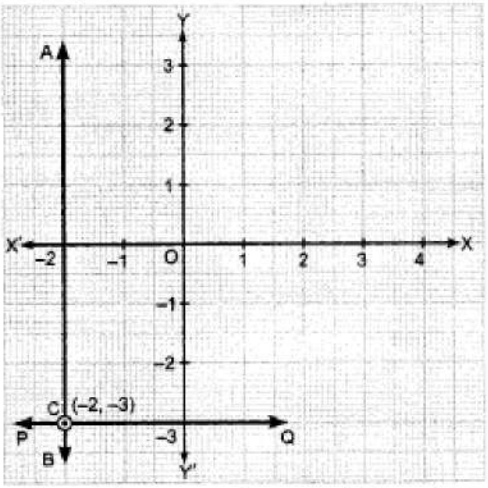
$\Rightarrow r^2 = \frac{1570\times3}{3.14\times15} \Rightarrow r^2 = 100$

$\Rightarrow r = \sqrt{100} \Rightarrow$ r = 10 cm.

∴ the radius of the base of the cone is 10 cm.

25. AB⇒x=-2

PQ⇒y=-3



Point of intersection of AB and PQ is $C(-2,-3)$.

OR

According to the question, given equation is $\frac{2}{3}x + 4y = -7$

$\Rightarrow \frac{2}{3}x = -7 - 4y$

$\Rightarrow 2x = 3(-7 - 4y)$

$\Rightarrow x = \frac{-21-12y}{2}$

Section C

26. Let point A represents 1 as shown in Figure.

Clearly, $OA = 1\ unit.$

Now, draw a right triangle OAB in which $AB = OA = 1\ unit.$

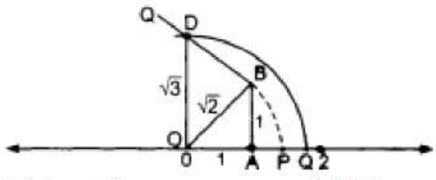
By Using Pythagoras theorem, we have

$OB^2 = OA^2 + AB^2$

$= 1^2 + 1^2$

$= 2$

$\Rightarrow OB = \sqrt{2}$



Taking O as centre and OB as a radius draw an arc intersecting the number line at point P.

Then p corresponds to $\sqrt{2}$ on the number line. Now draw DB of unit length perpendicular to OB.

By using Pythagoras theorem, we have

$OD^2 = OB^2 + DB^2$

$OD^2 = (\sqrt{2})^2 + 12$

$= 2 + 1 = 3$

$OD = \sqrt{3}$

Taking O as centre and OD as a radius draw an arc which intersects the number line at the point Q.

Clearly, Q corresponds to $\sqrt{3}$.

27. In right triangle PSQ,

$PQ^2 = PS^2 + QS^2$ ...[By Pythagoras theorem]

$= (12)^2 + (16)^2$

$= 144 + 256 = 400$

$\Rightarrow PQ = \sqrt{400} = 20$ cm

Now, for ΔPQR

a = 20 cm, b = 48 cm, c = 52 cm

$\therefore s = \frac{a+b+c}{2}$

$= \frac{20+48+52}{2} = 60$ cm

$\therefore$ Area of ΔPQR

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

$= \sqrt{60(60-20)(60-48)(60-52)}$

$= \sqrt{60(40)(12)(8)}$

$= \sqrt{(6 \times 10)(4 \times 10)(6 \times 2)(8)}$

$= 6 \times 10 \times 8 = 480\ cm^2$

Area of Δ PSQ $= \frac{1}{2} \times$ Base $\times$ Altitude

$= \frac{1}{2} \times 16 \times 12 = 96\ cm^2$

$\therefore$ Area of the shaded portion

= Area of ΔPQR - Area of ΔPSQ

$= 480 - 96 = 384\ cm^2$

OR

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.

28. $2x - 3y + 7 = 0$

$\Rightarrow 3y = 2x + 7$

$\Rightarrow y = \frac{2x+7}{3}$

Put x = 0, then $y = \frac{2(0)+7}{3} = \frac{7}{3}$

Put x = 1, then $y = \frac{2(1)+7}{3} = 3$

Put x = 2, then $y = \frac{2(2)+7}{3} = \frac{11}{3}$

Put x = 3, then $y = \frac{2(3)+7}{3} = \frac{13}{3}$

$\therefore (0, \frac{7}{3}), (1, 3), (2, \frac{11}{3})\ and\ (3, \frac{13}{3})$ are the solutions of the equation 2x – 3y + 7 = 0.

29. $(-12)^3 + (7)^3 + (5)^3$

Let a = −12, b = 7 and c = 5

We know that, if $a + b + c = 0, then, a^3 + b^3 + c^3 = 3abc$

Here, a+b+c=−12+7+5=0

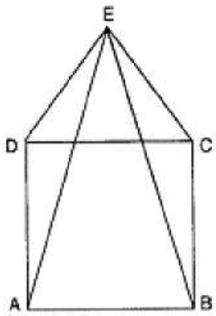
$\therefore\ (-12)^3 + (7)^3 + (5)^3 = 3(-12)(7)(5)$

= - 1260

30. i. The Co-ordinate of point A is (0, 2), B is (2, 0), C is (0, -2) and D is (-2, 0).

ii. If we joined them we get square.

iii. Co-ordinate of intersection point of AC and BD is (0, 0).

31. 

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

Let $\angle A + \angle B = 125^\circ$ and $\angle A + \angle C = 113^\circ$

Then,

$\angle A + \angle B + \angle A + \angle C = (125 + 113)^\circ$

$\Rightarrow (\angle A + \angle B + \angle C) + \angle A = 238^\circ$

$\Rightarrow 180^\circ + \angle A = 238^\circ$

$\Rightarrow \angle A = 58^\circ$

$\therefore \angle B = 125^\circ - \angle A$

$(125 - 58)^o = 67^o$

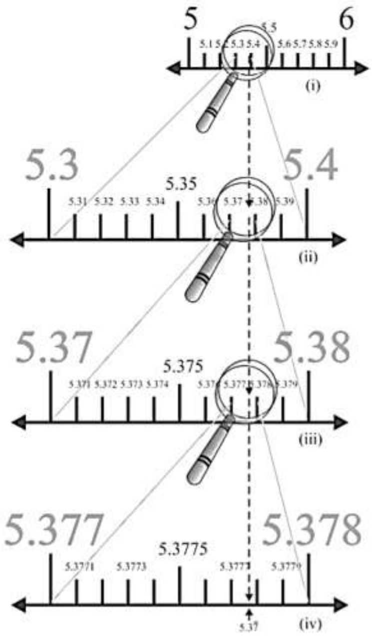
$\therefore \angle C = 113^\circ - \angle A$

$(113 - 58)^o = 55^o$

Section D

32. We proceed by successive magnification. First, we see that $5.\overline{37}$ is located between 5 and 6. In the next step, we locate $5.\overline{37}$ between 5.3 and 5.4. To get a more accurate visualization of the representation, we divide this portion of the number line into 10

equal parts and use a magnifying glass to visualize that $5.\overline{37}$ lies between 5.37 and 5.38. To visualize $5.\overline{37}$ more accurately, we again divide the portion between 5.37 and 5.38 into ten equal parts and use a magnifying glass to visualize that $5.\overline{37}$ lies between 5.377 and 5.378. Now to visualize $5.\overline{37}$ still more accurately, we divide the portion between 5.377 an 5.378 into 10 equal parts, and visualize the representation of $5.\overline{37}$ as in Fig. Notice that $5.\overline{37}$ is located closer to 5.3778 than to 5.3777 [see Fig. (iv)].



OR

Here $x = 2 - \sqrt{3}$

$\therefore\ \frac{1}{x} = \frac{1}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}} = \frac{2+\sqrt{3}}{2^2-\sqrt{3}^2} = \frac{2+\sqrt{3}}{4-3} = 2+\sqrt{3}$

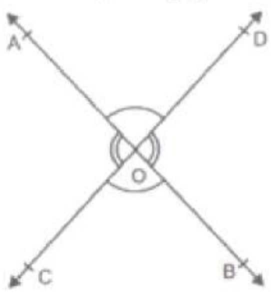
$\Rightarrow\ x - \frac{1}{x}$

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

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

$= -2\sqrt{3}$

Hence, $\left(x - \frac{1}{x}\right)^3 = (-2\sqrt{3})^3 = -24\sqrt{3}$

33. 

Let two lines AB and CD intersect at point O.

To prove: $\angle AOC = \angle BOD$ (vertically opposite angles)

$\angle AOD = \angle BOC$ (vertically opposite angles)

Proof: (i) Since, ray OA stands on the line CD.

$\Rightarrow \angle AOC + \angle AOD = 180°$…(1)[Linear pair axiom]

Also, ray OD stands on the line AB.

$\angle AOD + \angle BOD = 180°$ …(2) [Linear pair axiom]

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

$\angle AOC + \angle AOD = \angle AOD + \angle BOD$

$\Rightarrow \angle AOC = \angle BOD$
Hence, proved.
(ii) Since, ray OD stands on the line AB.
$\therefore \angle AOD + \angle BOD = 180^\circ$ ...(3) [Linear pair axiom]
Also, ray OB stands on the line CD.
$\therefore \angle DOB + \angle BOC = 180^\circ$ ...(4) [linear pair axiom]
From equations (3) and (4), we get
$\angle AOD + \angle BOD = \angle BOD + \angle BOC$
$\Rightarrow \angle AOD = \angle BOC$
Hence, proved.

OR

Since corresponding angles are equal.
$\therefore x = y$ ... (i)
We know that the interior angles on the same side of the transversal are supplementary.
$\therefore y + 55^o = 180^o$
$\Rightarrow y = 180^o - 55^o = 125^o$
So, $x = y = 125^o$
Since AB || CD and CD || EF.
$\therefore$ AB || EF
$\Rightarrow \angle EAB + \angle FEA = 180^o$ [$\because$ Interior angles on the same side of the transversal EA are supplementary]
$\Rightarrow 90^o + z + 55^o = 180^o$
$\Rightarrow z = 35^o$

34.
- Six points: A,B,C,D,E,F
- Five line segments: $\overline{EG}, \overline{FH}, \overline{EF}, \overline{GH}, \overline{MN}$
- Four rays: $\overrightarrow{EP}, \overrightarrow{GR}, \overrightarrow{GB}, \overrightarrow{HD}$
- Four lines: = $\overleftrightarrow{AB}, \overleftrightarrow{CD}, \overleftrightarrow{PQ}, \overleftrightarrow{RS}$
- Four collinear points: M,E,G,B

35. The given frequency distribution is below:

Age in years	10-20	20-30	30-40	40-50	50-60	60-70
Number of patients	2	5	12	19	9	4

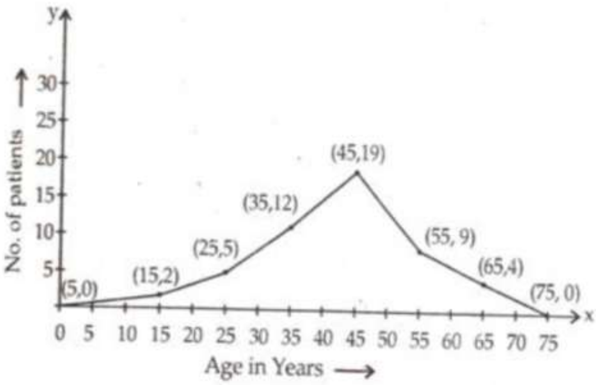
In order to draw, frequency polygon, we require class marks.
The class mark of a class interval is: $\frac{\text{lower limit} + \text{upper limit}}{2}$
The frequency distribution table with class marks is given below:

Class-intervals	Class marks	Frequency
0-10	5	0
10-20	15	2
20-30	25	5
30-40	35	12
40-50	45	19

50-60	55	9
60-70	65	4
70-80	75	0

In the above table, we have taken imaginary class intervals 0-10 at beginning and 70-80 at the end, each with frequency zero . Now

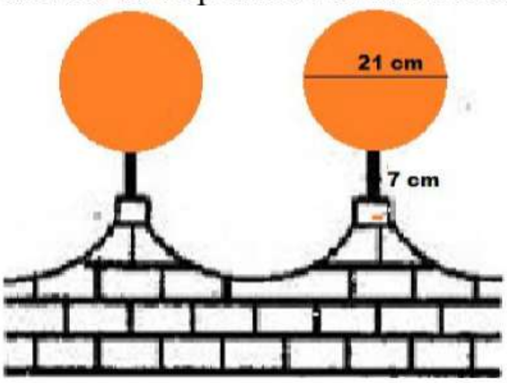
Plot points (5, 0), (15, 2), (25, 5), (35, 12), (45, 19), (55, 9), (65, 4) and (75, 0) and draw line segments.



Section E

36. **Read the text carefully and answer the questions:**

The front compound wall of a house is decorated by wooden spheres of diameter 21 cm, placed on small supports as shown in figure. 25 such spheres are used for this purpose and are to be painted silver. Each support is a cylinder and is to be painted black.



(i) Diameter of a wooden sphere = 21 cm.

therefore Radius of wooden sphere (R) $= \frac{21}{2}$cm

The surface area of 25 wooden spares

$= = 25 \times 4\pi R^2$

$= 25 \times 4 \times \frac{22}{7} \times (\frac{21}{2})^2$

$=138,600 \text{ cm}^2$

(ii) Diameter of a wooden sphere = 21 cm.

therefore Radius of wooden sphere (R) $= \frac{21}{2}$cm

The surface area of 25 wooden spares

$= 25 \times 4\pi R^2$

$= 25 \times 4 \times \frac{22}{7} \times (\frac{21}{2})^2$

$= 138,600 \text{ cm}^2$

The cost of orange paint= 20 paise per cm^2

Thus total cost

$= \frac{138600 \times 20}{100} = ₹\ 27720$

OR

$V = \frac{4}{3}\pi r^3 \times 25$

$V = 25 \times \frac{4}{3} \times \frac{22}{7} \times \left(\frac{21}{6}\right)^?$

$25 \times \frac{4}{3} \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times \frac{21}{2}$

$= 25 \times 11 \times 21 \times 21$

$= 121275\ cm^3$

(iii) Radius of a wooden sphere r = 4 cm.

Height of support (h) = 7 cm

The surface area of 25 supports

$= 25 \times \pi r^2 h$

$= 25 \times \frac{22}{7} \times 4^2 \times 7$

$= 8800\ cm^2$

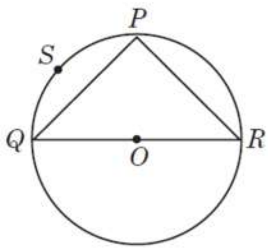
The cost of orange paint = 10 paise per cm^2

Thus total cost

$= 0.1 \times 8800 = ₹\ 880$

37. **Read the text carefully and answer the questions:**

Sanjay and his mother visited in a mall. He observes that three shops are situated at P, Q, R as shown in the figure from where they have to purchase things according to their need. Distance between shop P and Q is 8 m and between shop P and R is 6 m. Considering O as the center of the circles.



(i) We know that angle in the semicircle = 90^o

Here QR is a diameter of circle and ∠QPR is angle in semicircle.

Hence ∠QPR = 90^o

(ii) ∠QPR = 90^o

$\Rightarrow QR^2 = PQ^2 + PR^2$

$\Rightarrow QR^2 = 8^2 + 6^2$

$\Rightarrow QR = \sqrt{64 + 36}$

$\Rightarrow QR = 10$ m

(iii) Measure of ∠QSR = 90^o

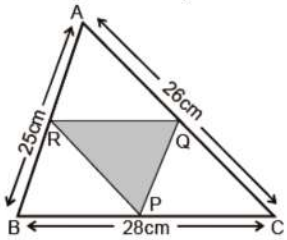
Angles in the same segment are equal. ∠QSR and ∠QPR are in the same segment.

OR

Area ΔPQR = $\frac{1}{2} \times PQ \times PR$

$\Rightarrow$ Area ΔPQR = $\frac{1}{2} \times 8 \times 6$ = 24 sqm

38. **Read the text carefully and answer the questions:**
There is a Diwali celebration in the DPS school Janakpuri New Delhi. Girls are asked to prepare Rangoli in a triangular shape. They made a rangoli in the shape of triangle ABC. Dimensions of $\triangle$ABC are 26 cm, 28 cm, 25 cm.



(i) We know that line joining mid points of two sides of triangle is half and parallel to third side.
Hence RQ is parallel to BC and half of BC.
RQ = $\frac{28}{2}$ = 14 cm
Length of RQ = 14 cm

(ii) By mid-point theorem we know that line joining mid points of two sides of triangle is half and parallel to third side.
PQ = $\frac{AB}{2} = \frac{25}{2}$ = 12.5 cm
QR = $\frac{BC}{2} = \frac{28}{2}$ = 14 cm
RP = $\frac{AC}{2} = \frac{26}{2}$ = 13 cm
Length of garland = PQ + QR + RP = 12.5 + 14 + 13 = 39.5 cm
Length of garland = 39.5 cm..

OR

As R and Q are mid-points of sides AB and AC of the triangle ABC. Similarly, P and Q are mid points of sides BC and AC by mid-point theorem, RQ || BC and PQ || AB. Therefore BRQP is parallelogram

(iii) As R and P are mid-points of sides AB and BC of the triangle ABC, by mid point theorem, RP || AC Similarly, RQ || BC and PQ || AB. Therefore ARPQ, BRQP and RQCP are all parallelograms. Now RQ is a diagonal of the parallelogram ARPQ, therefore, $\triangle$ARQ $\cong$ $\triangle$PQR Similarly $\triangle$CPQ $\cong$ $\triangle$RQP and $\triangle$BPR $\cong$ $\triangle$QRP So, all the four triangles are congruent.
Therefore Area of $\triangle$ARQ = Area of $\triangle$CPQ = Area of $\triangle$BPR = Area of $\triangle$PQR
Area $\triangle$ABC = Area of $\triangle$ARQ + Area of $\triangle$CPQ + Area of $\triangle$BPR + Area of $\triangle$PQR
Area of $\triangle$ ABC = 4 Area of $\triangle$PQR
$\triangle$PQR = $\frac{1}{4}$ar(ABC)