Class: IX

SESSION : 2022-2023

SUBJECT: Mathematics

SAMPLE QUESTION PAPER - 4

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. If side of a scalene △ is doubled then area would be increased by **[1]**

a) 200% b) 25 %

c) 50 % d) 300 %

2. Point (0, -8) lies **[1]**

a) on the x-axis b) on the y-axis

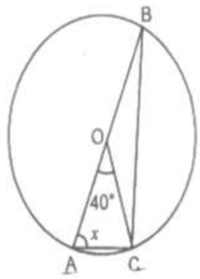
c) in the II quadrant d) in the IV quadrant

3. In a histogram, which of the following is proportional to the frequency of the corresponding class? **[1]**

a) Width of the rectangle b) Length of the rectangle

c) Perimeter of the rectangle d) Area of the rectangle

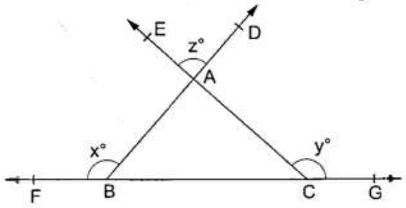
4. In a figure, O is the centre of the circle with AB as diameter. If $\angle AOC = 40^o$, the value of x is equal to **[1]**



a) 80^o b) 50^o

c) 70^o d) 60^o

5. In the given figure, two rays BD and CE intersect at a point A. The side BC of $\triangle$ABC have been produced on both sides to points F and G respectively. If $\angle ABF = x^\circ$, $\angle ACG = y^\circ$ and $\angle DAE = z^\circ$ then z = ? **[1]**



a) x + y - 180 b) x + y + 180

c) 180 - (x + y) d) x + y + 360°

6. If $\sqrt{7} = 2.646$ then $\frac{1}{\sqrt{7}}$ =? **[1]**

a) None of these b) 0.375

c) 0.378 d) 0.441

7. If we multiply both sides of a linear equation with a non-zero number, then the solution of the linear equation: **[1]**

a) Remains the same b) Changes in case of multiplication only

c) Changes in case of division only d) Changes

8. If $\sqrt{2} = 1.414$ then the value of $\sqrt{6} - \sqrt{3}$ upto three places of decimal is **[1]**

a) 1.414 b) 0.717

c) 0.471 d) 0.235

9. The value of $\frac{(0.013)^3+(0.007)^3}{(0.013)^2-0.013\times0.007+(0.007)^2}$, is **[1]**

a) 0.0091 b) 0.02

c) 0.006 d) 0.00185

10. If the diagonals of a quadrilateral bisect each other at right angles then the figure is a **[1]**

a) Trapezium b) Rhombus

c) Parallelogram d) Rectangle

[1]

11. The rationalisation factor of $\frac{1}{2\sqrt{3}-\sqrt{5}}$ is

a) $(\sqrt{3}+\sqrt{5})$

b) $\sqrt{12}+\sqrt{5}$

c) $\sqrt{5}-2\sqrt{3}$

d) $\sqrt{3}+2\sqrt{5}$

12. **The cost of a notebook is twice the cost of a pen.** The equation to represent this statement is **[1]**

a) 2x = 3y

b) x = 3y

c) none of these

d) x - 2y = 0

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

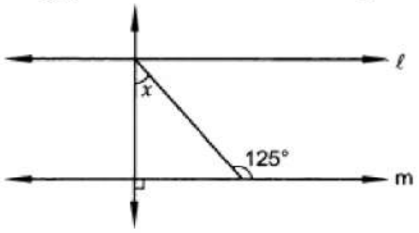
a) 7

b) 3

c) 6

d) 1

14. In Fig., if lines *l* and *m* are parallel, then the value of *x* is **[1]**



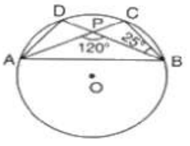
a) 65°

b) 55°

c) 75°

d) 35°

15. O is the centre of the given circle. If $\angle APB = 120^o$ and $\angle DBC = 25^o$, then the measure of $\angle ADB$ is equal to **[1]**



a) 60^o

b) 100^o

c) 95^o

d) 120^o

16. Write the linear equation such that each point on its graph has an ordinate 5 times its abscissa. **[1]**

a) y = 5x

b) none of these

c) 5x + y = 2

d) x = 5y

17. ________ is an algebraic tool for studying geometry. **[1]**

a) Statistics

b) None of these

c) Coordinate Geometry d) Trigonometry

18. If $x^4 + \frac{1}{x^4} = 194$, then $x^3 + \frac{1}{x^3} =$ **[1]**

a) none of these b) 64

c) 76 d) 52

19. **Assertion (A):** $\sqrt{3}$ is an irrational number. **[1]**
Reason (R): Square root of a positive integer which is not a perfect square is an irrational number.

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

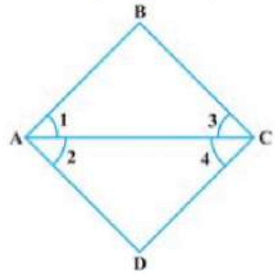
20. **Assertion (A):** A parallelogram consists of two congruent triangles. **[1]**
Reason (R): Diagonal of a parallelogram divides it into two congruent triangles.

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. How would you rewrite Euclid's fifth postulate so that it would be easier to understand ? **[2]**

22. In the given figure, we have $\angle 1 = \angle 3$ and $\angle 2 = \angle 4$. Show that $\angle \mathrm{A} = \angle \mathrm{C}$. **[2]**



23. Find: $125^{1/3}$ **[2]**

OR

Find the value of a : $\frac{6}{3\sqrt{2}-2\sqrt{3}} = 3\sqrt{2} - a\sqrt{3}$

24. A right triangle ABC with slides 5 cm, 12 cm and 13 cm is revolved about the side 12 cm. Find the volume of the solid so obtained. **[2]**

OR

A semi-circular sheet of metal of diameter 28 cm is bent to form an open conical cup. Find the capacity of the cup.

25. Write the quadrant in which it lies: (3, -8) **[2]**

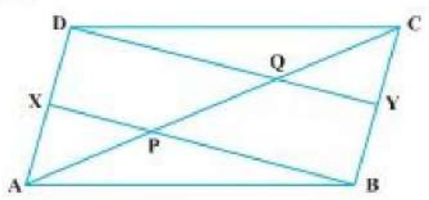
Section C

26. The following table gives the number of vehicles passing through a busy crossing in Delhi in different time intervals on a particular day. **[3]**

Time interval	8 to 9 hrs	9 to 10 hrs	10 to 11 hrs	11 to 12 hrs	12 to 13 hrs	13 to 14 hrs	14 to 15 hrs
Number of vehicles	300	400	350	250	200	150	100

Represent the above data by a bar graph.

27. 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]**



28. Prove that $\sqrt{23}$ is an irrational number. **[3]**

29. For what value of c, the linear equation 2x + cy = 8 has equal values of x and y for its solution? **[3]**

30. The following data gives the production of foodgrains (in thousand tonnes) for some years: **[3]**

Year	1995	1996	1997	1998	1999	2000
Production (in thousand tonnes)	120	150	140	180	170	190

Represent the above data with the help of a bar graph.

OR

The production of oil (in lakh tonnes) in some of the refineries in India during 1982 was given below:

Refinery:	Barauni	Koyali	Mathura	Mumbai	Florida
Production of oil (in lakh tonnes)	30	70	40	45	25

Construct a bar graph to represent the above data so that the bars are drawn horizontally.

[3]

31. If $p(x) = x^3 + 2x^2 - 5x - 6$, find p(2), p(-1), p(-3) and p(0). What do you conclude about the zeros of p(x)? Is 0 a zero of p(x)?

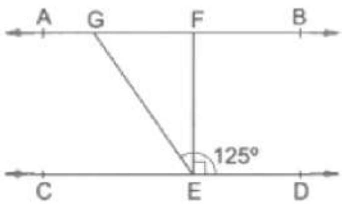
Section D

32. 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 height 1 m. 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 $\pi = 3.14$ and take $\sqrt{1.04} = 1.02$) **[5]**

33. If two parallel lines are intersected by a transversal, then prove that the bisectors of the interior angles form a rectangle. **[5]**

OR

In the given figure, AB || CD $\angle GED = 125^\circ$ and $EF \perp CD$. Find ∠AGE, ∠GEF and FGE.



34. If $(ax^3 + bx^2 - 5x + 2)$ has (x + 2) as a factor and leaves a remainder 12 when divided by (x - 2), find the values of a and b. **[5]**

35. The perimeter of a right triangle is 24 cm. If its hypotenuse is 10 cm, find the other two sides. Find its area by using the formula area of a right triangle. Verify your result by using Heron's formula. **[5]**

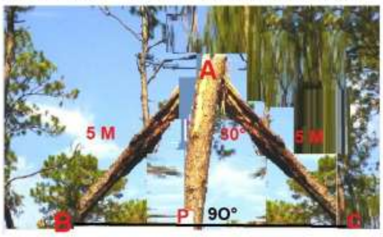
OR

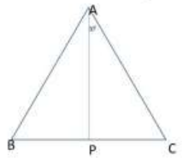
A traffic signal board, indicating SCHOOL AHEAD, is an equilateral triangle with side a. Find the area of the signal board, using Heron’s formula. If its perimeter is 180 cm, what will be the area of the signal board?

Section E

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

In a forest, a big tree got broken due to heavy rain and wind. Due to this rain the big branches AB and AC with lengths 5m fell down on the ground. Branch AC makes an angle of 30° with the main tree AP. The distance of Point B from P is 4 m. You can observe that ΔABP is congruent to ΔACP.





(i) Show that △ACP and △ABP are congruent.

(ii) Find the value of ∠ACP?

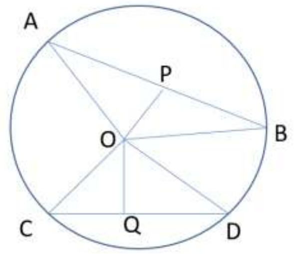
OR

What is the total height of the tree?

(iii) Find the value of ∠BAP?

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

Rohan draws a circle of radius 10 cm with the help of a compass and scale. He also draws two chords, AB and CD in such a way that the perpendicular distance from the center to AB and CD are 6 cm and 8 cm respectively. Now, he has some doubts that are given below.



(i) Show that the perpendicular drawn from the Centre of a circle to a chord bisects the chord.

(ii) What is the length of CD?

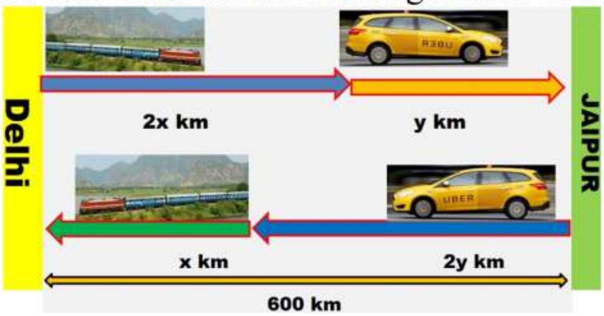
OR

How many circles can be drawn from given three noncollinear points?

(iii) What is the length of AB?

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

Ajay lives in Delhi, The city of Ajay's father in laws residence is at Jaipur is 600 km from Delhi. Ajay used to travel this 600 km partly by train and partly by car. He used to buy cheap items from Delhi and sale at Jaipur and also buying cheap items from Jaipur and sale at Delhi.
Once From **Delhi to Jaipur** in forward journey he covered 2x km by train and the rest y km by taxi.
But, while returning he did not get a reservation from Jaipur in the train. So first 2y km he had to travel by taxi and the rest x km by Train. From Delhi to Jaipur he took 8 hrs but in returning it took 10 hrs.



(i) Write the above information in terms of equation.

(ii) Find the value of x and y?

(iii) Find the speed of Taxi?

OR

Find the speed of Train?

SOLUTION

Section A

1. **(d)** 300 %

   Explanation: Area of triangle with sides a, b, c (A) = $\sqrt{s(s-a)(s-b)(s-c)}$

   New sides are 2a, 2b and 2c

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

   $\Rightarrow$ s' = 2s .....(i)

   New area = $\sqrt{s'(s'-2a)(s'-2b)(s'-2c)}$

   = $\sqrt{2s(2s-2a)(2s-2b)(2s-2c)}$

   = $4\sqrt{s(s-a)(s-b)(s-c)}$

   = 4A

   Increased area = 4A - A = 3A

   % of increased area = $\frac{3A}{A} \times 100 = 300\%$

2. **(b)** on the y-axis

   Explanation: Every point on the y-axis is of the form (0, a)

   Since x-coordinate is 0, so, the point lies on y-axis.

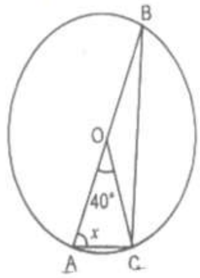
3. **(d)** Area of the rectangle

   Explanation: In, Histogram each rectangle is drawn, where width equivalent to class interval and height equivalent to the frequency of the class.

   Since class interval are same across the distribution table, area of the rectangle is corresponding to frequency or height of the rectangle

4. **(c)** 70^o

   Explanation:



   OA = OC (radii)

   So, ∠OAC = ∠OCA = x

   Again, In △OAC

   $\angle OAC + \angle OCA + \angle AOC = 180^o$

   $x + x + \angle AOC = 180^o$

   $x + x + 40^o = 180^o$

   $2x = 140^o$

   $x = 70^o$

5. **(a)** x + y - 180

   Explanation: In the given figure, $\angle ABF + \angle ABC = 180^\circ$ (Linear pair of angles)

   $\therefore x^\circ + \angle ABC = 180^\circ$

   $\Rightarrow \angle ABC = 180^\circ - x^\circ$ .....(1)

   Also, $\angle ACG + \angle ACB = 180^\circ$ (Linear pair of angles)

$\therefore y' + \angle ACB = 180^\circ$
$\Rightarrow \angle ACB = 180^\circ - y'$ .....(2)
Also, $\angle BAC = \angle DAE = z^\circ$ .....(3) (Vertically opposite angles)
In $\triangle ABC$
$\angle BAC + \angle ABC + \angle ACB = 180^\circ$ (Angle sum property)
$\therefore z^0 + 180^\circ - x^0 + 180^\circ - y^\circ = 180^\circ$ [Using (1),(2) and (3)]
$\Rightarrow$ z = x + y - 180

6. **(c)** 0.378

   Explanation: $\frac{1}{\sqrt{7}} = \frac{1}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}}$
   $= \frac{\sqrt{7}}{7}$
   $= \frac{1}{7} \times \sqrt{7}$
   $= \frac{1}{7} \times 2.646$
   = 0.378

7. **(a)** Remains the same

   Explanation: If for any c. where c is any natural number
   Like addition and subtraction we can multiply and divide both sides of an equation by a number, c, without changing the equation, where c is any natural number.

8. **(b)** 0.717

   Explanation: Given $\sqrt{2} = 1.414$
   $\sqrt{6} - \sqrt{3}$
   $= \sqrt{2 \times 3} - \sqrt{3}$
   $= \sqrt{2} \times \sqrt{3} - \sqrt{3}$
   $= \sqrt{3}(\sqrt{2} - 1)$
   $= \sqrt{3}(1.414 - 1)$
   = 1.732×0.414
   =0.717

9. **(b)** 0.02

   Explanation: Assume a = 0.013 and b = 0.007. Then the given expression can be rewritten as
   $\frac{a^3+b^3}{a^2-ab+b^2}$
   Recall the formula for sum of two cubes
   $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
   Using the above formula, the expression becomes
   $\frac{(a+b)(a^2-ab+b^2)}{a^2-ab+b^2}$
   Note that both a and b are positive. So, neither $a^3 + b^3$ nor any factor of it can be zero.
   Therefore we can cancel the term $(a^2 - ab + b^2)$ from both numerator and denominator.
   Then the expression becomes
   $\frac{(a+b)(a^2-ab+b^2)}{a^2-ab+b^2} = a + b$
   = 0.013 + 0.007
   = 0.02

10. **(b)** Rhombus

    Explanation: Rhombus is the correct answer. As we know that from all the quadrilaterals given in other options the diagonals of rhombus bisect each other at right angles.

11. **(b)** $\sqrt{12}+\sqrt{5}$

Explanation: $\frac{1}{2\sqrt{3}-\sqrt{5}}$

$=(2\sqrt{3}-\sqrt{5})(2\sqrt{3}+\sqrt{5})$

=12-5

= 7

Rational number

$(2\sqrt{3}+\sqrt{5})=(\sqrt{4\times 3}+\sqrt{5})=\sqrt{12}+\sqrt{5}$

12. **(d)** x - 2y = 0

Explanation: Let the cost of the notebook is ₹ x and pen is ₹ y and we have given that the cost of a notebook is twice the cost of a pen.

So we have

x = 2y

or x - 2y = 0

13. **(a)** 7

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

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

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

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

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

$= 3 - \sqrt{7}$

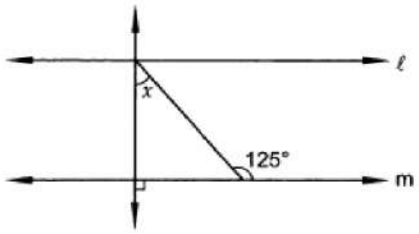
Now $(x - 3)^2 = (3 - \sqrt{7} - 3)^2$

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

=7

14. **(d)** 35°

Explanation:



Given that,

l ∥ m and n cuts them

Let,

$\angle 1 = x$

$\angle 2 = 90^o$

$\angle 3 = 125^o$

$\angle 3 + \angle 5 = 180^o$ (Linear pair)

$125^o + \angle 5 = 180^o$

$\angle 5 = 55^o$ (i)

$\angle 4 = 90^o$ (ii)

Now,

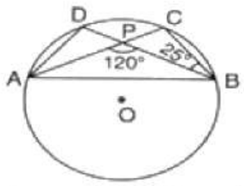
$\angle 1 + \angle 4 + \angle 5 = 180^o$ (Angle sum property)

$x + 90^o + 55^o = 180^o$

$x = 35^o$

15. **(c)** 95^o

Explanation:



Now, $\angle APB + \angle CPB = 180^0$ (Linear Pair)

$120^0 + \angle CPB = 180^0$

$\angle CPB = 60^0$

Now from angle sum property, we can calculate the values of $\angle PCB$ and we find that

$\angle PCB = 95^0$

Since, $\angle PCB = \angle ADB = 95^0$

16. **(a)** y = 5x

Explanation: y = 5x

---

at x = 1

y = 5.1 = 5

y = 5

(1,5)

---

at x = 2

y = 5.2 = 10

y = 10

(2,10)

---

at x = 3

y = 5.3 = 15

y = 15

(3,15)

17. **(c)** Coordinate Geometry

Explanation: Coordinate Geometry is an algebraic tool for studying geometry.

18. **(d)** 52

Explanation: $\left(x^4 + \frac{1}{x^4}\right) = 194$

$\Rightarrow \left(x^2\right)^2 + \left(\frac{1}{x^2}\right) + 2 \times x^2 \times \frac{1}{x^2} = 194 + 2 \times x^2 \times \frac{1}{x^2}$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 = 196$

$\Rightarrow x^2 + \frac{1}{x^2} = \sqrt{196} = 14$

Now,

$\Rightarrow \left(x^2\right) + \left(\frac{1}{x^2}\right) + 2 \times x \times \frac{1}{x} = 14 + 2 \times x \times \frac{1}{x}$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 = 16$

$\Rightarrow x+\frac{1}{x}=\sqrt{16}=4$

Now, $\left(x+\frac{1}{x}\right)^3=(4)^3$

$\Rightarrow (x)^3+\left(\frac{1}{x}\right)^3+3\times x\times\frac{1}{x}\left(x+\frac{1}{x}\right)=64$

$\Rightarrow \left(x^3\right)+\left(\frac{1}{x^3}\right)+3(4)=64$

$\Rightarrow \left(x^3\right)+\left(\frac{1}{x^3}\right)=64-12=52$

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

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

Section B

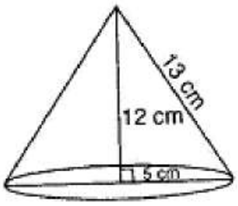
21. We know that Euclid's fifth postulate states that "No intersection of lines will take place when the sum of the measures of the interior angles on the same side of the falling line is exactly 180°".
Two lines are said to be parallel if they are equidistant from one other and they do not have any point of intersection.
e.g.

22. We have $\angle 1=\angle 3$ ...(1) [Given]
And $\angle 2=\angle 4$ ...(2) [Given]
Now, by Euclid's axiom 2, we have if equal are added to equals, the whole are equal.
Adding (1) and (2), we get
$\angle 1+\angle 2=\angle 3+\angle 4$
Hence, $\angle A=\angle C$.

23. $125^{1/3}=(5^3)^{1/3}$
$=5^{3\times 1/3}=5^1=5$

OR

$3\sqrt{2}-a\sqrt{3}$
$=\frac{6}{3\sqrt{2}-2\sqrt{3}}$
$=\frac{6}{3\sqrt{2}-2\sqrt{3}}\times\frac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}}$
$=\frac{6(3\sqrt{2}+2\sqrt{3})}{(3\sqrt{2})^2-(2\sqrt{3})^2}$
$=\frac{6(3\sqrt{2}+2\sqrt{3})}{18-12}$
$=\frac{6(3\sqrt{2}+2\sqrt{3})}{6}$
$=3\sqrt{2}+2\sqrt{3}$
On comparing,
$3\sqrt{2}-a\sqrt{3}=3\sqrt{2}+2\sqrt{3}$
$\Rightarrow a=-2$

24. 

The solid obtained will be a right circular cone whose radius of the base is 5 cm. and height is 12 cm

$\therefore$ r = 5 cm, h = 12 cm

$\therefore$ Volume $=\frac{1}{3}\pi r^2 h$

$\frac{1}{3}\times\pi\times(5)^2\times 12\ cm^3$

= 100π cm^3

The volume of the solid so obtained is 100π cm^3

OR

Diameter of semicircular sheet is 28 cm. It is bent to from an open conical cup. The radius of sheet becomes the slant height of the cup. The circumference of the sheet becomes the circumference of the base of the cone.

$\therefore\ l=$ Slant height of conical cup = 14 cm.

Let r cm be the radius and h cm be the height of the conical cup circumference of conical cup of the semicircular sheet

$\therefore\ 2\pi r=\pi\times 14\Rightarrow r=7cm$

Now, $l^2=r^2+h^2\Rightarrow h=\sqrt{l^2-r^2}$

$=\sqrt{(14)^2-(7)^2}=\sqrt{196-49}=\sqrt{147}=12.12cm$

$\therefore$ Capacity of the cup

$=\frac{1}{3}\pi r^2 h=\frac{1}{3}\times\frac{22}{7}\times 7\times 7\times 12.12$

= 622.16 cm^3

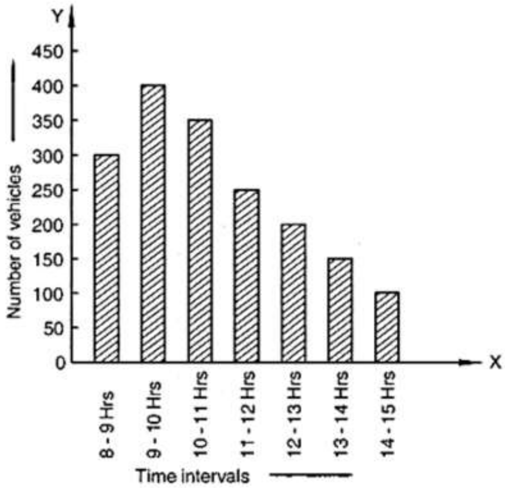
25. Recall that (+, +) lies in I quadrant, (-, +) lies in II quadrant, (-, -) lies in III quadrant, (+, -) lies in IV quadrant.

In (3, -8), x coordinate is positive and y coordinate is negative.

Hence, (3, -8) lies in the 4th Quadrant.

Section C

26. Here 7 values of the data are given. So, mark 7 points on the horizontal axis at equal distances and erect rectangles of the same width whose heights are proportional to the values of the numerical data.Therefore from above data the bar graph is given below.



27. AD = BC (Opposite sides of a parallelogram)

Therefore,DX = 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)]

28. We know that on finding the square root of 23, we will not get an integer.

Therefore, we conclude that $\sqrt{23}$ is an irrational number.

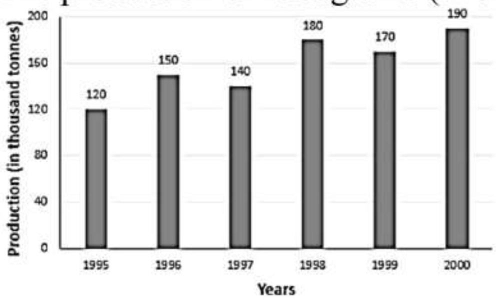
29. The value of c for which the linear equation 2x + cy = 8 has equal values of x and y i.e., x = y for its solution is

2x + cy = 8 $\Rightarrow$ 2x + cx = 8 [$\because$ y = x]

$\Rightarrow$ cx = 8 - 2x

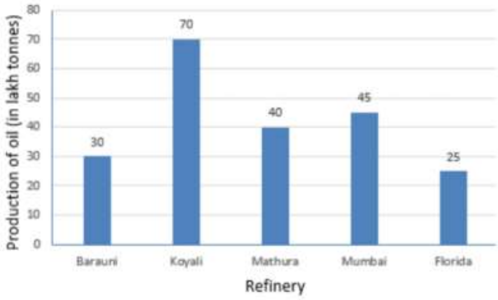
$\therefore\ c = \frac{8-2x}{x}, x \neq 0$

30. The production of foodgrains (in thousand tonnes) for some years:



OR

The production of oil (in lakh tonnes) in some of the refineries in India during 1982



31. Given, p(x) = $x^3 + 2x^2 - 5x - 6$

$\therefore$ p(2) = $2^3 + 2 \times 2^2 - 5 \times 2 - 6 = (8 + 8 - 10 - 6) = 0$

p(-1) = $(-1)^3 + 2 \times (-1)^2 - 5 \times (-1) - 6 = (-1 + 2 + 5 - 6) = 0$

p(-3) = $(-3)^3 + 2 \times (-3)^2 - 5 \times (-3) - 6 = (-27 + 18 + 15 - 6) = 0$

p(0) = $0^3 + 2 \times 0^2 - 5 \times 0 - 6 = (0 + 0 - 0 - 6) = -6 \neq 0$.

Since p(2) = p(-1) = p(-3) = 0, so, 2, -1 and -3 are the zeros of p(x)

But, p(0) = -6 $\neq$ 0.

Therefore, 0 is not a zero of p(x).

Section D

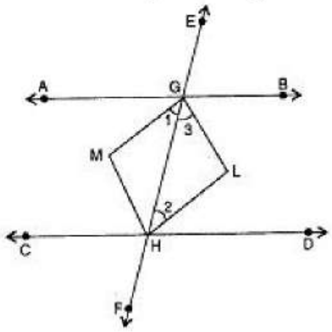
32. Diameter of cone = 40 cm

$\Rightarrow$ 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 = $\pi r l$
$= 3.14 \times 0.2 \times \sqrt{1.04}$
= 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 × 0.64056 = Rs. 7.68672
$\therefore$ Cost of painting of 50 such cones = 50 × 7.68672 = Rs. 384.34 (approx.)

33. 

as, AB || CD and EF cuts them
$\therefore \angle AGH = \angle GHD$ (Alternate Angles)
$\Rightarrow \frac{1}{2}\angle AGH = \frac{1}{2}\angle GHD$
$\Rightarrow \angle 1 = \angle 2$ .... (1)
But these angles form a pair of equal alternate angles for lines GM and HL and transversal GH.
$\therefore$ GM || HL .... (2)
Similarly, we can prove that
HM || GL .... (3)
In view of (2) and (3),
GLHM is a parallelogram
AB || CD and EF cuts them
$\therefore \angle BGH + \angle GHD = 180^\circ$
(The sum of the interior angles on the same side of a transversal is 180°)
$\Rightarrow \frac{1}{2}\angle BGH + \frac{1}{2}\angle GHD = 90^\circ$
$\Rightarrow \angle 3 + \angle 2 = 90^\circ$
In $\triangle GHL$,
$\angle 3 + \angle 2 + \angle GLH = 180^\circ$
(The sum of the three angles of a triangle is 180°)
$\Rightarrow 90^\circ + \angle GLH = 180^\circ$ .... From (4)
$\Rightarrow \angle GLH = 180^\circ - 90^\circ = 90^\circ$
$\Rightarrow$ One angle of parallelogram GLHM is a right angle.
$\Rightarrow$ Parallelogram GLHM is a rectangle.

OR

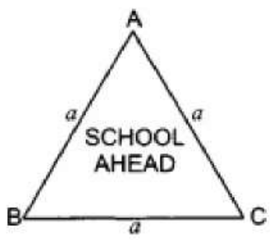
AB || CD and GE is the transversal.
$\therefore \angle AGE = \angle GED = 125^\circ$ [alternate interior ∠]
and $\angle GEF = (\angle GED - \angle FED) = (125^\circ - 90^\circ) = 35^\circ$
Now, AB || CD and EF is the transversal
$\therefore \angle BFE + \angle FED = 180^\circ$ [sum of interior ∠]
$\Rightarrow \angle BFE + 90^\circ = 180^\circ$
$\Rightarrow \angle BFE = 90^\circ$
Now, AB is a straight line and EF stands on it
$\therefore \angle GFE + \angle BFE = 180^\circ$
$\Rightarrow \angle GFE + 90^\circ = 180^\circ$
$\Rightarrow \angle GFE = (180^\circ - 90^\circ) = 90^\circ$
In △GEF, we have
$\angle GEF + \angle EFG + \angle FGE = 180^\circ$ [the sum of the angles of a triangle is 180°]
$\Rightarrow 35^\circ + 90^\circ + \angle FGE = 180^\circ$
$\Rightarrow \angle FGE = (180^\circ - 125^\circ) = 55^\circ$
Hence, $\angle AGE = 125^\circ, \angle GEF = 35^\circ$ and $\angle FGE = 55^\circ$

34. Let $p(x) = ax^3 + bx^2 - 5x + 2$, $g(x) = x + 2$ and $h(x) = x - 2$. Then, $g(x) = 0 \Rightarrow x + 2 = 0$
$\Rightarrow x = -2$
$h(x) = 0 \Rightarrow x - 2 = 0 \Rightarrow x = 2$
$(x + 2)$ is a factor of $p(x) \Rightarrow p(-2) = 0$
Now ,$p(-2) = 0 \Rightarrow a \times (-2)^3 + b \times (-2)^2 - 5 \times (-2) + 2) = 0$
$\Rightarrow -8a + 4b + 12 = 0$
$\Rightarrow 8a - 4b = 12 \Rightarrow 2a - b = 3$ ...(i)
When p(x) is divided by (x - 2), then the remainder is p(2)
$\therefore p(2) = 12 \Rightarrow (a \times 2^3) + (b \times 2^2) - (5 \times 2) + 2) = 12$
$\Rightarrow 8a + 4b = 20 \Rightarrow 2a + b = 5$ ...(ii)
On solving (i) and (ii), we get a = 2 and b = 1

35. Let x and y be the two lines of the right ∠
∴ AB = x cm, BC = y cm and AC = 10 cm
∴ By the given condition,
Perimeter = 24 cm
x + y +10 = 24 cm
Or x + y = 14 ... (I)
By Pythagoras theorem,
$x^2 + y^2 = (10)^2 = 100$ ... (II)
From (1), $(x + y)^2 = (14)^2$
Or $x^2 + y^2 + 2xy = 196$
∴100 + 2xy =196 [From (II)]
$xy = \frac{96}{2} = 48$ sq cm .... (III)
Area of Δ ABC = $\frac{1}{2}xy$ sq cm
$= \frac{1}{2} \times 48$ sq cm
=24 sq cm.... (IV)
Again, we know that
$(x - y)^2 = (x + y)^2 - 4xy$
$= (14)^2 - 4 \times 48$ [From (I) & (III)]
Or x - y = ± 2
(i) When, x-y = 2 and x+y = 14, then 2x = 16

or x = 8, y = 6
(ii) When, X – y = -2 and x + y = 14, then 2x = 12
Or x = 6, y = 8
Verification by using Heron's formula:
Sides are 6 cm, 8 cm and 10 cm
$S = \frac{24}{2} = 12$ cm
Area of Δ ABC = $\sqrt{12\,(12-6)\,(12-8)\,(12-10)}$ sq cm
$= \sqrt{12 \times 6 \times 4 \times 2}$ sq cm
= 24 sq cm
Which is same as found in (IV)
Thus, the result is verified.

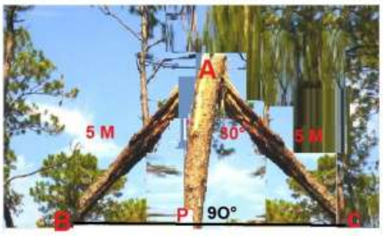
OR

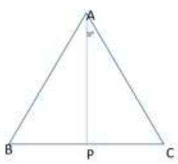


A traffic signal board is an equilateral triangle with side a.
Perimeter of the signal board,
2s = a + a + a
$\Rightarrow s = \frac{3}{2}a$
Area of triangle $= \sqrt{s(s-a)(s-b)(s-c)}$
$= \sqrt{\frac{3a}{2}\left(\frac{3}{2}a-a\right)\left(\frac{3}{2}a-a\right)\left(\frac{3}{2}a-a\right)}$
$= \sqrt{\frac{3a}{2} \times \frac{a}{2} \times \frac{a}{2} \times \frac{a}{2}} = \sqrt{\frac{3a^4}{16}} = \frac{\sqrt{3}}{4}a^2$ sq. units
Now, if perimeter = 180 cm
3a = 180
$\Rightarrow$ a = 60 cm
$\therefore$ Area of signal board $= \frac{\sqrt{3}}{4}a^2 = \frac{\sqrt{3}}{4} \times (60)^2 = 900\sqrt{3}\text{cm}^2$
So, area of the signal board is $900\sqrt{3}\text{cm}^2$.

Section E

36. **Read the text carefully and answer the questions:**
In a forest, a big tree got broken due to heavy rain and wind. Due to this rain the big branches AB and AC with lengths 5m fell down on the ground. Branch AC makes an angle of 30° with the main tree AP. The distance of Point B from P is 4 m. You can observe that ΔABP is congruent to ΔACP.





(i) In $\triangle$ACP and $\triangle$ABP
AB = AC (Given)
AP = AP (common)

$\angle APB = \angle APC = 90^o$
By RHS criteria $\triangle ACP \cong \triangle ABP$

(ii) In $\triangle ACP$

$\angle APC + \angle PAC + \angle ACP = 180^o$

$\Rightarrow 90^o + 30^o + \angle ACP = 180^o$ (angle sum property of $\triangle$)

$\Rightarrow \angle ACP = 180^o - 120^o = 60^o$

$\angle ACP = 60^o$

OR

$\triangle ACP$

$AC^2 = AP^2 + PC^2$

$\Rightarrow 25 = AP^2 + 16$

$\Rightarrow AP^2 = 25 - 16 = 9$

$\Rightarrow AP = 3$

Total height of the tree = AP + 5 = 3 + 5 = 8 m

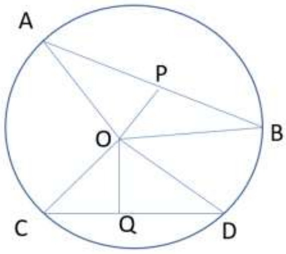
(iii) $\triangle ACP \cong \triangle ABP$

Corresponding part of congruent triangle

$\angle BAP = \angle CAP$

$\angle BAP = 30^o$ (given $\angle CAP = 30^o$)

37. **Read the text carefully and answer the questions:**
Rohan draws a circle of radius 10 cm with the help of a compass and scale. He also draws two chords, AB and CD in such a way that the perpendicular distance from the center to AB and CD are 6 cm and 8 cm respectively. Now, he has some doubts that are given below.



(i) In ΔAOP and ΔBOP

$\angle APO = \angle BPO$ (Given)

OP = OP (Common)

AO = OB (radius of circle)

$\Delta AOP \cong \Delta BOP$

AP = BP (CPCT)

(ii) In right ΔCOQ

$CO^2 = OQ^2 + CQ^2$

$\Rightarrow 10^2 = 8^2 + CQ^2$

$\Rightarrow CQ^2 = 100 - 64 = 36$

$\Rightarrow CQ = 6$

CD = 2CQ

$\Rightarrow CD = 12$ cm

OR

There is one and only one circle passing through three given non-collinear points.

(iii)In right ΔAOB

$AO^2 = OP^2 + AP^2$

$\Rightarrow 10^2 = 6^2 + AP^2$

$\Rightarrow AP^2 = 100 - 36 = 64$

$\Rightarrow AP = 8$

$AB = 2AP$

$\Rightarrow AB = 16$ cm

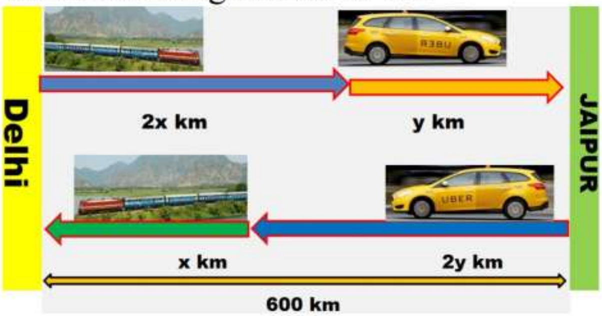
38. **Read the text carefully and answer the questions:**

Ajay lives in Delhi, The city of Ajay's father in laws residence is at Jaipur is 600 km from Delhi. Ajay used to travel this 600 km partly by train and partly by car.

He used to buy cheap items from Delhi and sale at Jaipur and also buying cheap items from Jaipur and sale at Delhi.

Once From **Delhi to Jaipur** in forward journey he covered 2x km by train and the rest y km by taxi.

But, while returning he did not get a reservation from Jaipur in the train. So first 2y km he had to travel by taxi and the rest x km by Train. From Delhi to Jaipur he took 8 hrs but in returning it took 10 hrs.



(i) Delhi to Jaipur: $2x + y = 600$

Jaipur to Delhi: $2y + x = 600$

Let S_1 and S_2 be the speeds of Train and Taxi respectively, then

Dehli to Jaipur: $\frac{2x}{S_1} + \frac{y}{S_2} = 8$ ...(i)

Jaipur to Delhi: $\frac{x}{S_1} + \frac{2y}{S_2} = 10$ ...(ii)

(ii) $2x + y = 600$ ...(1)

$x + 2y = 600$ ...(2)

Solving (1) and (2) $\times$ 2

$2x + y - 2x - 4y = 600 - 1200$

$\Rightarrow -3y = -600$

$\Rightarrow y = 200$

Put $y = 200$ in (1)

$2x + 200 = 600$

$\Rightarrow x = \frac{400}{2} = 200$

(iii)We know that speed $= \frac{Distance}{Time} \Rightarrow$ Time $= \frac{Distance}{Speed}$

Let S_1 and S_2 are speeds of train and taxi respectively.

Delhi to Jaipur: $\frac{2x}{S_1} + \frac{y}{S_2} = 8$ ...(i)

Jaipur to Delhi: $\frac{x}{S_1} + \frac{2y}{S_2}$ = 10 ...(ii)

Solving (i) and (ii) $\times$ 2

$\Rightarrow \frac{2x}{S_1} + \frac{y}{S_2} - \frac{2x}{S_1} - \frac{4y}{S_2}$ = 8 - 20 = -12

$\Rightarrow \frac{-3y}{S_2}$ = -12

We know that y = 200 km

$\Rightarrow S_2 = \frac{3\times200}{12}$ = 50 km/hr

Hence speed of Taxi = 50 km/hr

OR

We know that x = 200 km

Put S_2 = 50 km/hr ...(i)

$\frac{400}{S_1} + \frac{200}{50} = 8$

$\Rightarrow \frac{400}{S_1}$ = 8 - 4 = 4

$\Rightarrow S_1 = \frac{400}{4}$ = 100 km/hr

Hence speed of Train = 100 km/hr