# Class IX Session 2023-24
# Subject - Mathematics
# Sample Question Paper - 8

**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 $\sqrt{5^n}$ = 125, then $5^{\sqrt[n]{64}}$ = **[1]**

   a) $\frac{1}{5}$ b) 25

   c) $\frac{1}{125}$ d) 625

2. The graph of y = 6 is a line **[1]**

   a) Parallel to x-axis at a distance 6 units from the origin b) Making an intercept 6 on the x- axis.

   c) Making an intercept 6 on both the axes. d) Parallel to y-axis at a distance 6 units from the origin

3. If the x co-ordinate of a point is zero, then this point always lies: **[1]**

   a) in quadrant IV b) in quadrant III

   c) on y-axis d) on x-axis

4. In a bar graph, 0.25 cm length of a bar represents 100 people. Then, the length of bar which represents 2000 people is **[1]**

   a) 4.5 cm b) 4 cm

   c) 5 cm d) 3.5 cm

5. Which of the following is a linear equation in two variables? **[1]**

a) $2x - 5y = 0$

b) $x + 5 = 8$

c) $x^2 = 5x + 3$

d) $5x = y^2 + 3$

6. Euclid stated that if equals are added to equals, the wholes are equal in the form of **[1]**

a) A definition

b) An axiom

c) A theorem

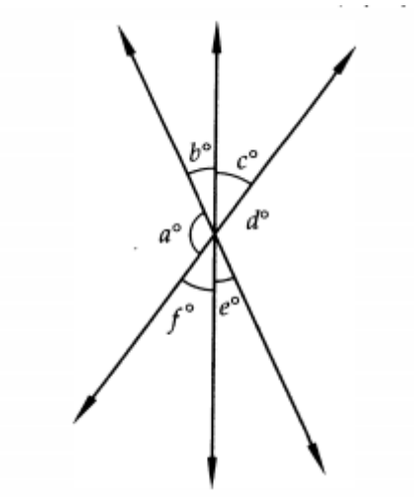
d) None of these

7. In Fig., which of the following statements must be true? **[1]**

i. a + b = d + c

ii. a + c + e = 180°

iii. b + f = c + e




a) (ii) only

b) (i) only

c) (ii) and (iii) only

d) (iii) only

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

a) $115^\circ$

b) $40^\circ$

c) $50^\circ$

d) $25^\circ$

9. The degree of a biquadratic polynomial is **[1]**

a) 2

b) 4

c) 3

d) 1

10. For what value of 'k', x = 2 and y = -1 is a solution of x + 3y – k = 0? **[1]**

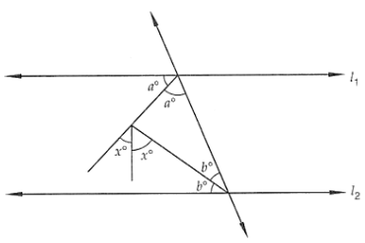
a) 2

b) -2

c) -1

d) 1

11. In Figure, if $l_1 \| l_2$, the value of x is **[1]**



a) 60 b) 45

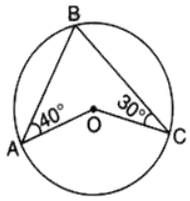
c) $22\frac{1}{2}$ d) 30

12. If the diagonals of a rhombus are 18 cm and 24 cm respectively, then its side is equal to **[1]**

a) 20 cm b) 15 cm

c) 16 cm d) 17 cm

13. In the given figure, O is the centre of the circle. $\angle OAB$ and $\angle OCB$ are $40^o$ and $30^o$ respectively. Then, the measure of $\angle AOC$ is **[1]**




a) $110^o$ b) $140^o$

c) $120^o$ d) $170^o$

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

a) None of these b) 0.375

c) 0.378 d) 0.441

15. x = 5 and y = -2 is the solution of the linear equation. **[1]**

a) x + 3y = 1 b) 2x + y = 9

c) 3x + y = 0 d) 2x – y = 12

16. $\triangle ABC \cong \triangle PQR$, then which of the following is true? **[1]**

a) CA = RP b) CB = QP

c) AB = RP d) AC = RQ

17. The factors of $x^4 + x^2 + 25$, are **[1]**

a) $(x^2 + 3x + 5)(x^2 + 3x - 5)$ b) $(x^2 + 3x + 5)(x^2 - 3x + 5)$

c) none of these d) $(x^2 + x + 5)(x^2 - x + 5)$

18. A cylindrical pencil sharpened at one edge is the combination of **[1]**

a) a cone and a cylinder b) a cone and a hemisphere

c) a frustum of a cone and a cylinder d) a hemisphere and a cylinder

19. **Assertion (A):** The side of an equilateral triangle is 6 cm then the height of the triangle is 9 cm. **[1]**

**Reason (R):** The height of an equilateral triangle is $\frac{\sqrt{3}}{2}$a.

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

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

20. **Assertion (A):** The graph of the linear equation x - 2y = 1 passes through the point (3, 1). **[1]**

**Reason (R):** Every point lying on graph is not a solution of x - 2y = 1.

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.

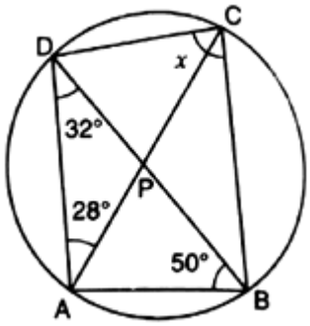
c) A is true but R is false.

d) A is false but R is true.

**Section B**

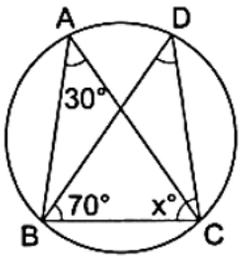
21. The base of an isosceles triangle measures 80 cm and its area is 360 $cm^2$. Find the perimeter of the triangle. **[2]**

22. If O is the centre of the circle, find the value of x in the below figure: **[2]**



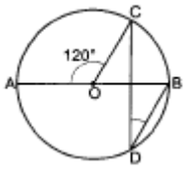

23. A cylinder and a cone have equal heights and equal radii of their bases. If their curved surface areas are in the ratio 8:5. Show that the ratio of radius to height of each is 3:4. **[2]**

24. If O is the centre of the circle, find the value of x in given figure: **[2]**




OR

In given figure, ∠AOC = $120^o$. Find ∠BDC.




25. Write four solutions of the equation: $\pi x + y = 9$ **[2]**

OR

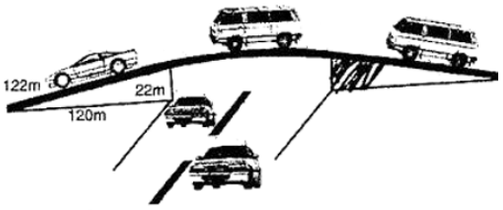
Solve the following equation for x: (5x + 1)(x + 3) - 8 = 5(x + 1)(x + 2)

**Section C**

26. Locate $\sqrt{13}$ on the number line. **[3]**

27. Factorize: $6x^2 + 5x - 6$ **[3]**

28. The triangular side walls of a flyover have been used for advertisements. The sides of the walls are 122 m, 22 m and 120 m (see Fig.). The advertisements yield an earning of ₹ 5000 per $m^2$ per year. A company hired one of its walls for 3 months. How much rent did it pay? **[3]**




OR

The cost of leveling the ground in the form of a triangle having the sides 51m, 37m and 20m at the rate of Rs.3 per $m^2$ is Rs.918. State whether the statement is true or false and justify your answer.

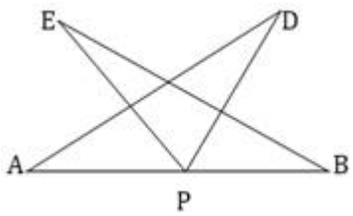
29. A family spends Rs. 500 monthly as a fixed amount on milk and extra milk costs Rs.20 per kg. Taking quantity of extra milk as x and total expenditure on milk as y. Write a linear equation and fill the table. **[3]**

| **x** | 0 | - | 2 |
|---|---|---|---|
| **y** | - | 1000 | - |

30. AB is a line segment and P is the mid-point. D and E are points on the same side of AB such that ∠ BAD = ∠ ABE and ∠ EPA = ∠ DPB. Show that: **[3]**

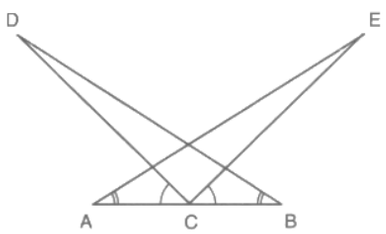
i. $\Delta DAP \cong \Delta EBP$

ii. AD = BE (See figure)

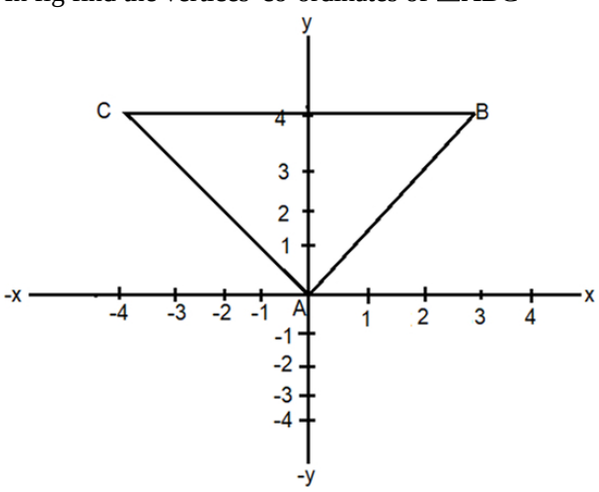



OR

In figure, AC = BC, ∠DCA = ∠ECB and ∠DBC = ∠EAC. Prov triangles DBC and EAC are congruent, and hence DC = EC and BD = AE.




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



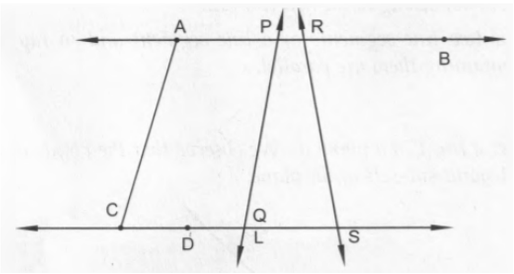

**Section D**

32. Write the following in the descending order of magnitude. $\sqrt[3]{2}, \sqrt{3}, \sqrt[6]{5}$. **[5]**

OR

If $x = \frac{5-\sqrt{21}}{2}$, prove that $\left(x^3 + \frac{1}{x^3}\right) - 5\left(x^2 + \frac{1}{x^2}\right) + \left(x + \frac{1}{x}\right) = 0$ .

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




i. Five line segments

ii. Five rays

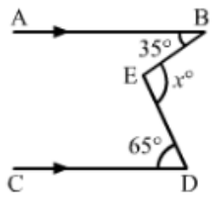
iii. Four collinear points

iv. Two pairs of non-intersecting line segments

34. Prove that the bisectors of a pair of vertically opposite angles are in the same straight line. **[5]**

OR

In each of the figures given below, AB || CD. Find the value of x° in each case.




35. A survey conducted by an organisation for the cause of illness and death among the women between the ages 15 - 44 (in years) worldwide, found the following figure (in %): **[5]**

| S.No. | Cause of illness and death | Female fatality rate (%) |
|---|---|---|
| 1 | Reproductive health conditions | 32 |
| 2 | Neuropsychiatric conditions | 26 |
| 3 | Injuries | 13 |
| 4 | Cardiovascular conditions | 5 |
| 5 | Respiratory conditions | 4 |
| 6 | Other causes | 20 |

i. Represent the information given above graphically.

ii. Which condition is the major cause of women's ill health and death worldwide?

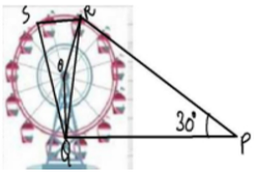
**Section E**

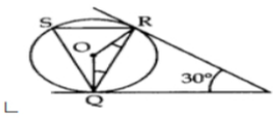
36. **Read the text carefully and answer the questions:** **[4]**

A Ferris wheel (or a big wheel in the United Kingdom) is an amusement ride consisting of a rotating upright wheel with multiple passenger-carrying components (commonly referred to as passenger cars, cabins, tubs, capsules, gondolas, or pods) attached to the rim in such a way that as the wheel turns, they are kept upright, usually by gravity.

After taking a ride in Ferris wheel, Aarti came out from the crowd and was observing her friends who were enjoying the ride . She was curious about the different angles and measures that the wheel will form. She forms

the figure as given below




(i) Find ∠ROQ.

(ii) Find ∠RQP.

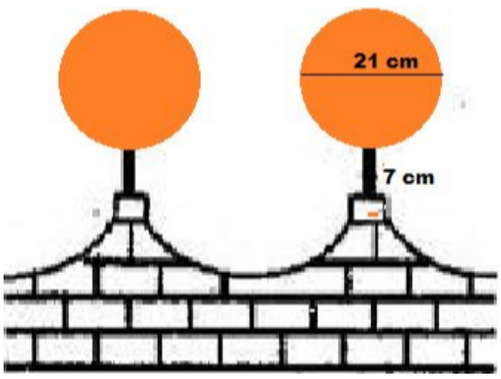
(iii) Find ∠RSQ.

**OR**

Find ∠ORP.

37. **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 $cm^2$.

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

**OR**

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

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

Harish makes a poster in the shape of a parallelogram on the topic SAVE ELECTRICITY for an inter-school competition as shown in the follow figure.


(i) If ∠A = $(4x + 3)^o$ and ∠D = $(5x - 3)^o$, then find the measure of ∠B.

(ii) If ∠B = $(2y)^o$ and ∠D = $(3y - 6)^o$, then find the value of y.

(iii) If ∠A = $(2x - 3)^o$ and ∠C = $(4y + 2)^o$, then find how x and y relate.

**OR**

If AB = (2y - 3) and CD = 5 cm then what is the value of y?

# Solution

## Section A

1.

**(b)** 25

**Explanation:** $\sqrt{5^n}$ = 125

$\Rightarrow 5^{\frac{n}{2}} = 5^3$

Comparing, we get

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

Now

$5^{\sqrt[n]{64}}$

$= 5^{\sqrt[6]{64}}$

$= 5^{(64)^{\frac{1}{6}}}$

$= 5^{(2^6)^{\frac{1}{6}}}$

$= 5^{2^{6\times\frac{1}{6}}}$

$= 5^2$

$= 25$

2. **(a)** Parallel to x-axis at a distance 6 units from the origin

**Explanation:** As y = a is an equation of a line parallel to x-axis at a distance of a units from the origin.

3.

**(c)** on y-axis

**Explanation:** If the x co-ordinate of a point is zero, then this point always lies on y-axis.

4.

**(c)** 5 cm

**Explanation:** Use unitary method

0.25 cm - 100 people

So 1 cm - 400 people

So for 2000 people:

$\frac{2000}{400}$ = 5 cm

5. **(a)** 2x – 5y = 0

**Explanation:** In linear equation power of variable x and y should be 1 and here, the given linear equation has two variable x and y.

6.

**(b)** An axiom

**Explanation:** This is Euclid's second axiom stating addition of equals. An algebraic version of Euclid's second axiom would read "if x = y, and if a = b, then x + a = y + b."

7.

**(c)** (ii) and (iii) only

**Explanation:** Let AB, CD and EF intersect at O

$\angle$AOD = $\angle$COB (Vertically opposite angle)

b = e (i)

$\angle$EOC = $\angle$DOF (Vertically opposite angle)

f = c (ii)

Adding (i) and (ii), we get

b + f = c + e (iii)

Now,

$\angle ADE + \angle EOC + \angle COB = 180^o$

$a + f + e = 180^o$

$a + c + e = 180^o$ [From (ii)]

8.

**(c)** $50^\circ$

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

9.

**(b)** 4

**Explanation:** The biquadratic polynomial is a polynomial of the fourth degree. Biquadratic polynomial = $a(x^2)^2 + b(x)^2 + c = ax^4 + bx^2 + c$.

10.

**(c)** -1

**Explanation:** For finding value of 'k', we put x = 2 and y = -1 iin a equation x + 3y – k = 0

x+3 y-k=0

2+3(-1)=k

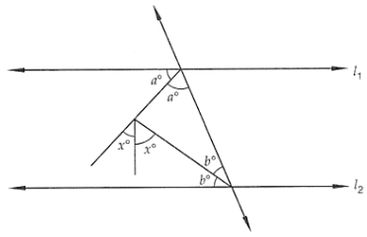
2-3=k

k=-1

11.

**(b)** 45

**Explanation:**




From figure,

$\angle ACS = 180^\circ - 2b^\circ$

Also $\angle ACS = \angle PAC = 2a^\circ$(alternate angles)

$\Rightarrow 2a^\circ = 180^\circ - 2b^\circ$

$\Rightarrow a^0 + b^0 = 90^\circ$

Now, in $\triangle ABC$

$a^0 + b^0 + \angle ABC = 180^\circ$

$\angle ABC = 180^\circ - 2x^\circ$

$\Rightarrow a^\circ + b^0 + 180^6 - 2x^0\ 180^\circ$

$\Rightarrow 2x^\circ = a^\circ + b^\circ = 90^\circ$

$\Rightarrow x^\circ = 45^\circ$

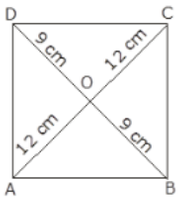
12.

**(b)** 15 cm

**Explanation:**

Given,

ABCD is a rhombus




AC = 24 cm, BD = 18 cm

AB = BC = CD = DA [side of rhombus]

We know that diagonals of rhombus bisect each other at $90^o$

In right Δ AOB

$AB^2 = BO^2 + AO^2$

$AB^2 = 12^2 + 9^2 = 144 + 81 = 225$

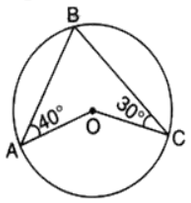
$AB = \sqrt{225} = 15$ cm

Side of rhombus = 15 cm

13.

**(b)** $140^o$

**Explanation:**




OA = OB = OC = Radius

so, $\angle OAB = \angle ABO = 40°$

and, $\angle OCB = \angle ABO = 30°$

Thus, $\angle ABC = 30 + 40 = 70°$

So, $\angle AOC = 70 \times 2 = 140°$ {Angle subtended by arc at centre is twice of angle subtended at circumference}

14.

**(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

15.

**(d)** 2x – y = 12

**Explanation:** x = 5 and y = -2 is the solution of the linear equation 2x – y = 12

2x - y = 12

LHS = 2x - y

2.5 - (-2)

10 + 2

12

RHS = 12

LHS = RHS

It means that x = 5 and y = -2 is the solution of the linear equation 2x - y = 12.

16. **(a)** CA = RP

**Explanation:** Corresponding sides are equal for two congruent triangles.

17.

**(b)** $(x^2 + 3x + 5)(x^2 - 3x + 5)$

**Explanation:** The given expression to be factorized is $x^4 + x^2 + 25$

This can be written in the form

$x^4 + x^2 + 25 = (x^2)^2 + 2.\ x^2.5 + (5)^2 - 9x^2$

$= \left\{(x^2)^2 + 2x^2.5 + (5)^2\right\} - (3x)^2$

$= (x^2 + 5)^2 - (3x)^2$

$= (x^2 + 5)^2 - (3x)^2$

$= (x^2 + 5 + 3x)\ (x^2 + 5 - 3x)$

18. **(a)** a cone and a cylinder

**Explanation:** A cylindrical pencil sharpened at one edge is the combination of a cone and a cylinder.

19. **(d)** A is false but R is true.

**Explanation:** The height of the triangle,

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

$9 = \frac{\sqrt{3}}{2}a$

$a = \frac{9\times2}{\sqrt{3}} = \frac{18}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

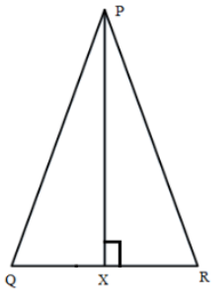
$= \frac{18\sqrt{3}}{3} = 6\sqrt{3}$ cm

20. **(c)** A is true but R is false.

**Explanation:** If (3, 1) lies on the graph of x - 2y = 1

For x - 2y = 1, (3, 1) is a solution as $3 - 2 \times 1 = 1$

**Section B**

21. 


Let △PQR be an isosceles triangle and PX ⊥ QR.

Now,

Area of triangle = 360 $cm^2$

$\Rightarrow \frac{1}{2} \times QR \times PX = 360$

$\Rightarrow h = \frac{720}{80} = 9\text{cm}$

Now,

$QX = \frac{1}{2} \times 80$ = 40 cm and PX = 9 cm

Also, by Pythagoras theorem for △PXQ

$PX^2 + QX^2 = PQ^2$

$\Rightarrow a^2 = (40)^2 + 9^2$

$a = \sqrt{40^2 + 9^2} = \sqrt{1600 + 81} = \sqrt{1681} = 41\text{cm}$

∴ Perimeter = 80 + 41 + 41 = 162 cm

22. In triangle DAB, by angle sum property

$\angle ADB + \angle DAB + \angle ABD = 180^\circ$

$32^\circ + \angle DAB + 50^\circ = 180^\circ$

$\angle DAB = 98^\circ$

Now, $\angle DAB + \angle DCB = 180^\circ$ (Opposite angle of cyclic quadrilateral)

$98^\circ + x = 180^\circ$

$x = 180^\circ - 98^\circ$

$= 82^\circ$.

23. A cylinder and a cone have equal heights and equal radii of their bases.

So, According to the question,

$= \frac{Curved\ surface\ area\ of\ cylinder}{Curved\ surface\ area\ of\ cone} = \frac{2\pi rh}{\pi rl} = \frac{2\pi rh}{\pi r\sqrt{r^2+h^2}}$

$\frac{8}{5} = \frac{2h}{\sqrt{r^2+h^2}}$

$\Rightarrow \frac{64}{25} = \frac{4h^2}{r^2+h^2}$

$\Rightarrow 64r^2 + 64h^2 = 100h^2$

$\Rightarrow 64r^2 = 100h^2 - 64h^2$

$\Rightarrow 64r^2 = 36h^2$

$\Rightarrow \frac{r^2}{h^2} = \frac{36}{64} = \frac{9}{16}$

$\Rightarrow \frac{r}{h} = \frac{3}{4}$

$\therefore$ r:h = 3:4

24. $\angle BDC = \angle BAC = 30^\circ$ [$\angle$ in the same segment].

In $\triangle$BCD, the sum of the angles is 180°.

$\angle CBD + \angle BCD + \angle BDC = 180^\circ$

$\Rightarrow 70^o + x^o + 30^o = 180^o$

$\Rightarrow x^o = 180^o - 70^o - 30^o$

$\Rightarrow x^o = 80^o$

OR

Here it is given that; $\angle AOC = 120^o$

Now $\angle AOC + \angle BOC = 180°$ ( by Linear pair property)

$\Rightarrow 120° + \angle BOC = 180°$

$\angle BOC = 180° - 120° = 60°$

Now, $\angle BOC = 2\ \angle BDC$

$\Rightarrow 60° = 2\ \angle BDC$

$\Rightarrow \angle BDC = 30°$

25. $\pi x + y = 9$

$\Rightarrow y = 9 - \pi x$

Put x = 0, we get $y = 9 - \pi(0) = 9 - 0 = 9$

put x = 1, we get $y = 9 - \pi(1) = 9 - \pi$

Put x = –1, we get $y = 9 - \pi(-1) = 9 + \pi$

Put x = $\frac{9}{\pi}$, we get $y = 9 - \pi\left(\frac{9}{\pi}\right) = 9 - 9 = 0$

$\therefore$ Four solutions are (0, 9), (1, 9 – $\pi$), (–1, 9 + $\pi$) and $\left(\frac{9}{\pi}, 0\right)$.

OR

According to the question, given equation is $(5x + 1)(x + 3) - 8 = 5(x + 1)(x + 2)$.

$\Rightarrow \left(5x^2 + 15x + x + 3\right) - 8 = 5\left(x^2 + 2x + x + 2\right)$

$\Rightarrow\ 5x^2 + 16x + 3 - 8 = 5\left(x^2 + 3x + 2\right)$

$\Rightarrow 5x^2 + 16x - 5 = 5x^2 + 15x + 10$

$\Rightarrow 16x - 15x = 15$

$\Rightarrow\ x = 15$

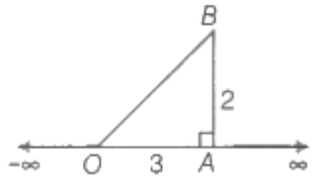
**Section C**

26. Here, 13 = 9 + 4 = $3^2 + 2^2$ [sum of square of two natural numbers]

So, we take a = 3 and b = 2

Draw OA = 3 units on number line and then draw AB = 2 units, such that AB ⊥ OA.

Join OB.



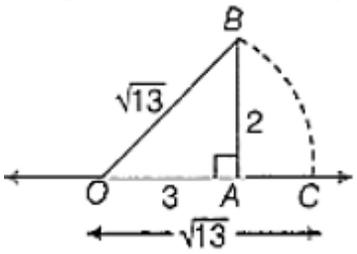

By using Pythagoras theorem, in ΔOAB

$OB = \sqrt{OA^2 + AB^2}$

$= \sqrt{3^2 + 2^2}$

$= \sqrt{9 + 4} = \sqrt{13}$

Taking O as centre and radius equal to OB, draw an arc, which cuts the number line at C. Hence, OC represents $\sqrt{13}$.




27. $6x^2 + 5x - 6$

$6x^2 + 5x - 6 = 6x^2 + 9x - 4x - 6$

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

$= (3x - 2)(2x + 3)$.

Therefore, we conclude that on factorizing the polynomial $6x^2 + 5x - 6 we get (3x - 2)(2x + 3)$

28. Given: = 122 m, = 22 m and = 120 m

Semi-perimeter of triangle (s)= $\frac{122+22+120}{2} = \frac{264}{2}$ = 132 m Using Heron's Formula,

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

= $\sqrt{132(132-122)(132-22)(132-120)}$

$= \sqrt{132 \times 10 \times 110 \times 12}$

$= \sqrt{11 \times 12 \times 10 \times 10 \times 11 \times 12}$

= 10 × 11 × 12

= 1320 $m^2$

∵ Rent for advertisement on wall for 1 year = Rs. 5000 per $m^2$

∴ Rent for advertisement on wall for 3 months for 1320 $m^2$; $\frac{5000}{12} \times 3 \times 1320$

= Rs.1650000

Hence rent paid by company = Rs. 16,50,000

OR

True, Let a = 51m, b = 37m, c = 20m

$s = \frac{a+b+c}{2} = \frac{51+37+20}{2} = \frac{108}{2} = 54\text{m}$

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

$= \sqrt{54(54-51)(54-37)(54-20)}$

$= \sqrt{54 \times 3 \times 17 \times 34}$

$= \sqrt{9 \times 3 \times 2 \times 3 \times 17 \times 17 \times 2}$

= 3 × 3 × 2 × 17

= 306 $m^2$

Cost of leveling the ground = Rs.3 × 306 = Rs.918.

Hence the cost of leveling the ground in the form of a triangle is Rs 918.

29. According to the question x is extra milk and y is the expenditure for the month

If the quantity of extra milk be 'x' and expenditure be Rs. 'y' then the given condition.

y = 20x + 500 (As Rs.500 is the fixed expenditure) ...(i)

Put x = 0 in equation (i)

y = 20(0) + 500 = 0 + 500

y = Rs.500

When no extra milk is taken the expenditure remains Rs.500 same

Put y = 1000 in equation (i)

1000 = 20x + 500

1000 - 500 = 20x

500 = 20x

x = $\frac{500}{20} = 25\text{kg}$

When the 25 kg of milk is taken extra the expenditure increased as Rs.1000

Put x = 2 in equation (i)

y = 20(2) + 500

y = 40 + 500

y = Rs. 540

When the 2 kg of milk is taken extra the expenditure increased by Rs.40 i.e. Rs. 540

| **x** | 0 | 25 | 2 |
|---|---|---|---|
| **y** | 500 | 1000 | 540 |

30. Given that $\angle EPA = \angle DPB$

Adding $\angle\text{EPD}$ on both sides, we get

$\angle\text{EPA} + \angle\text{EPD} = \angle\text{DPB} + \angle\text{EPD}$

$\Rightarrow \angle APD = \angle BPE$ …….(i)

Also given ,$\angle BAD = \angle ABE \Rightarrow \angle PAD = \angle PBE$ .....(ii)

Now in $\Delta$ APD and $\Delta$ BPE,

$\angle PAD = \angle PBE$. [from (ii) ]

AP = PB [P is the mid-point of AB]

$\angle APD = \angle BPE$ [From (i)]

Hence ,by ASA congruency criteria;

$\Delta DAP \cong \Delta EBP$

$\Rightarrow$ AD = BE [ By C.P.C.T.] Proved

OR

We have,

$\angle DCA = \angle ECB$

$\Rightarrow \angle DCA + \angle ECD = \angle ECB + \angle ECD$

$\Rightarrow \angle ECA = \angle DCB$ ...(i)

Now, in $\triangle$DBC and $\triangle$EAC, we have

$\angle DCB = \angle ECA$ [From (i)]

BC = AC [Given]

and, $\angle DBC = \angle EAC$ [Given]

So, ASA (Angle-Side-Angle) criterion of congruence, we obtain

$\Delta DBC \cong \Delta EAC$

$\Rightarrow$ DC = EC and BD = AE

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

**Section D**

32. Given

$\sqrt[3]{2} = 2^{\frac{1}{3}}; \sqrt{3} = 3^{\frac{1}{2}}; \sqrt[6]{5} = 5^{\frac{1}{6}}$

LCM of 3,2 and 6 = 6

$\therefore \quad 2^{\frac{1}{3}} = 2^{\left(\frac{1}{3}\times\frac{2}{2}\right)} = 2^{\frac{2}{6}} = \left(2^2\right)^{\frac{1}{6}} = 4^{\frac{1}{6}}$

$3^{\frac{1}{2}} = 3^{\left(\frac{1}{2}\times\frac{3}{3}\right)} = 3^{\frac{3}{6}} = \left(3^3\right)^{\frac{1}{6}} = (27)^{\frac{1}{6}}$

Clearly, $(27)^{\frac{1}{6}} > 5^{\frac{1}{6}} > 4^{\frac{1}{6}}$

So, $3^{\frac{1}{2}} > 5^{\frac{1}{6}} > 2^{\frac{1}{3}}$

or $\sqrt{3} > \sqrt[6]{5} > \sqrt[3]{2}$

Hence, the correct descending order is $\sqrt{3}$, $\sqrt[6]{5}$ and $\sqrt[3]{2}$.

OR

Given, $x = \frac{5-\sqrt{21}}{2}$

$\therefore \quad \frac{1}{x} = \frac{2}{5-\sqrt{21}}$

$= \frac{2}{(5-\sqrt{21})} \times \frac{(5+\sqrt{21})}{(5+\sqrt{21})}$

$= \frac{2(5+\sqrt{21})}{(5)^2-(\sqrt{21})^2}$

$= \frac{2(5+\sqrt{21})}{(25-21)} = \frac{2(5+\sqrt{21})}{4} = \frac{5+\sqrt{21}}{2}$

$\therefore \quad x + \frac{1}{x} = \left(\frac{5-\sqrt{21}}{2}\right) + \left(\frac{5+\sqrt{21}}{2}\right) = \frac{5-\sqrt{21}+5+\sqrt{21}}{2} = \frac{10}{2} = 5$

$\therefore \left(x + \frac{1}{x}\right)^2 = 5^2 = 25$

$\Rightarrow \quad x^2 + \frac{1}{x^2} + 2 \times x \times \frac{1}{x} = 25$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right) + 2 = 25 \Rightarrow \left(x^2 + \frac{1}{x^2}\right) =$ 25 - 2 = 23

$x + \frac{1}{x} = 5 \Rightarrow \left(x + \frac{1}{x}\right)^3 = (5)^3 = 125$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times x \times \frac{1}{x}\left(x + \frac{1}{x}\right) = 125$

$\Rightarrow \left(x^3 + \frac{1}{x^3}\right) + 3 \times 5 = 125$

$\Rightarrow \left(x^3 + \frac{1}{x^3}\right) =$ 125-15 =110.

$\therefore \quad \left(x^3 + \frac{1}{x^3}\right) - 5\left(x^2 + \frac{1}{x^2}\right) + \left(x + \frac{1}{x}\right)$

= 110 - 5 × 23 + 5 = 110 - 115 + 5 = 115 - 115 = 0

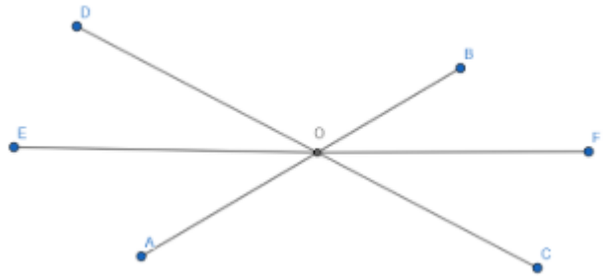
33. i. Five line segments are: $\overline{PQ}, \overline{PN}, \overline{RS}, \overline{ND}, \overline{TL}$

ii. Five rays are: $\overrightarrow{QC}, \overrightarrow{PM}, \overrightarrow{RB}, \overrightarrow{DF}, \overrightarrow{LH}$

iii. Four Collinear points are: A, P, R, B

iv. Two pairs of non-intersecting line segments are: PN, RS and PQ, TL

34. AB and CD are straight lines intersecting at O. OE the bisector of angles ∠AOD and OF is the bisector of ∠BOC.




*∠AOC = ∠BOD (vertically opposite angles)*

Also,

OE is the bisector of *∠AOD* and OF is the bisector of *∠BOC*

To prove: EOF is a straight line.

*∠AOD = ∠BOC = 2x* (Vertically opposite angle) ...(i)

As OE and OF are bisectors.So *∠AOE = ∠BOF = x .....(ii)*

*∠AOD + ∠BOD = 180° (linear pair)*

*∠AOE + ∠EOD + ∠DOB = 180°*

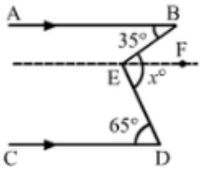
From (ii)

*∠BOF + ∠EOD + ∠DOB = 180°*

∠EOF = $180^o$

EF is a straight line.

OR




Draw EF || AB || CD

Now, AB ∥ EF and BE is the transversal.

Then,

$\angle ABE = \angle BEF$ [Alternate Interior Angles]

$\Rightarrow \angle BEF = 35^\circ$

Again, EF ∥ CD and DE is the transversal

Then,

$\angle DEF = \angle FED$

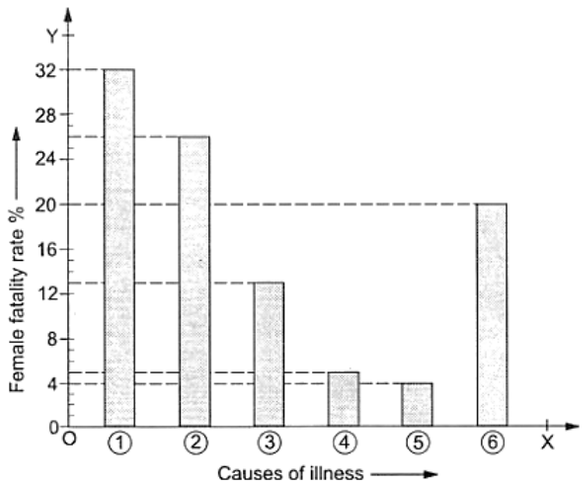
$\Rightarrow \angle FED = 65^\circ$

$\therefore x^\circ = \angle BEF + \angle FED$

$x^\circ = 35^\circ + 65^\circ$

$x^\circ = 100^\circ$

35. Draw the bars of the same width having their heights proportional to female fatality rate %, keeping the same space between two consecutive bars, as shown below.




i. The required information has been given above graphically.

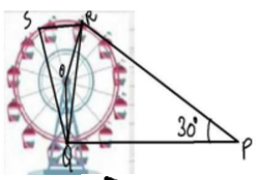
ii. Clearly, the reproductive health conditions are the major cause of women's ill health and death worldwide.

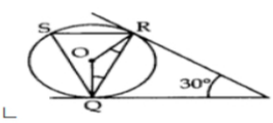
**Section E**

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

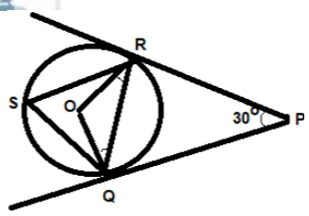
A Ferris wheel (or a big wheel in the United Kingdom) is an amusement ride consisting of a rotating upright wheel with multiple passenger-carrying components (commonly referred to as passenger cars, cabins, tubs, capsules, gondolas, or pods) attached to the rim in such a way that as the wheel turns, they are kept upright, usually by gravity.

After taking a ride in Ferris wheel, Aarti came out from the crowd and was observing her friends who were enjoying the ride . She was curious about the different angles and measures that the wheel will form. She forms the figure as given below




(i)

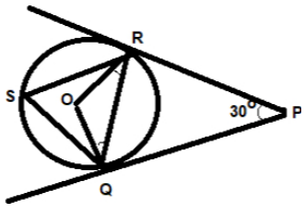



$\angle ROQ + \angle RPQ = 180^o$

$\angle ROQ + 30^o = 180^o$

$\angle ROQ = 150^o$

(ii)

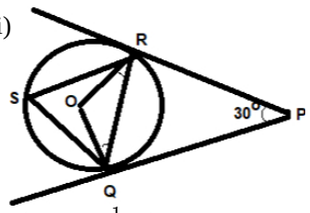



$\angle RQP = \angle OQP - \angle OQR$

$= 90^o - 15^o$

$= 75^o$

(iii)

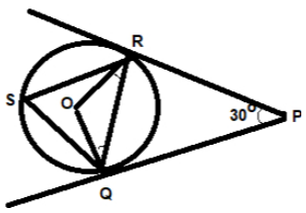



$\angle RSQ = \frac{1}{2} \angle ROQ$

$= \frac{1}{2} \times 150^o$

$\angle RSQ = 75^o$

OR

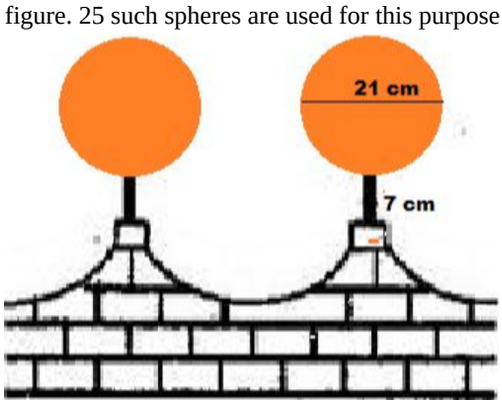



$\angle ORP = 90^o$

$\because$ radius and tangent are $\perp$ at point of contact

37. **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 $cm^2$

(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 $cm^2$

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

Thus total cost

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

(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 × 8800 = ₹ 880

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 × 11 × 21 × 21

= 121275 $cm^3$

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

Harish makes a poster in the shape of a parallelogram on the topic SAVE ELECTRICITY for an inter-school competition as shown in the follow figure.


(i) Since, ABCD is a parallelogram.

∠A + ∠D = $180^o$ (adjacent angles of a quadrilateral are equal)

$(4x + 3)^o + (5x + 3)^o = 180^o$

$9x = 180^o$

x = 20

$\angle D = (5x - 3)^o = 97^o$

∠D = ∠B (opposite angles of a parallelogram are equal)

Thus, $\angle B = 97^o$

(ii) ∠B = ∠D (opposite angles of a parallelogram are equal)

⇒ 2y = 3y - 6

⇒ 2y - 3y = -6

⇒ -y = -6

⇒ y = 6

(iii) ∠A = ∠C (opposite angles of a parallelogram are equal)

⇒ 2x - 3 = 4y + 2

⇒ 2x = 4y + 5

⇒ x = 2y + $\frac{5}{2}$

OR

AB = CD

$\Rightarrow 2y - 3 = 5$

$\Rightarrow 2y = 8$

$\Rightarrow y = 4$