



**Class IX Session 2024-25**  
**Subject - Mathematics**  
**Sample Question Paper - 2**

**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 carrying 04 marks each.
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 2 marks questions of Section E.
8. Draw neat figures wherever required. Take  $\pi = 22/7$  wherever required if not stated.

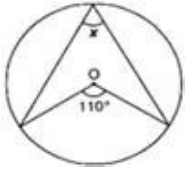
**Section A**

1.  $\sqrt{12} \times \sqrt{15} =$  [1]  
a) 5  
b)  $5\sqrt{6}$   
c)  $6\sqrt{5}$   
d) 6
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. Point (- 10,0) lies [1]  
a) on the negative direction of the y-axis  
b) on the negative direction of the X-axis  
c) in the third quadrant  
d) in the fourth quadrant
4. In a histogram the class intervals or the groups are taken along [1]  
a) X-axis  
b) Y-axis  
c) both of X-axis and Y-axis  
d) in between X and Y axis
5. If (2, 0) is a solution of the linear equation  $2x + 3y = k$ , then the value of k is [1]  
a) 2  
b) 4  
c) 5  
d) 6

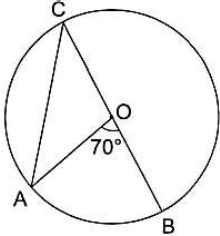




23. Find an angle marked as  $x$  in given figure where  $O$  is the centre of the circle: [2]

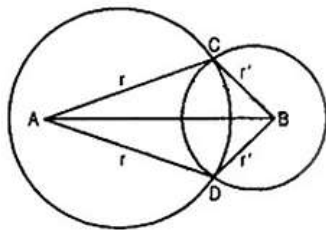


24. In the given figure,  $O$  is the centre of the circle and  $\angle AOB = 70^\circ$ . Calculate the values of (i)  $\angle OCA$ , (ii)  $\angle OAC$ . [2]



OR

Prove that the line of centres of two intersecting circles subtends equal angles at the two points of intersection.



25. The following values of  $x$  and  $y$  are thought to satisfy a linear equation : [2]

|     |   |   |
|-----|---|---|
| $x$ | 1 | 2 |
| $y$ | 1 | 3 |

OR

Cost of pen is two half times the cost of a pencil. Express this situation as a linear equation in two variable.

### Section C

26. Locate  $\sqrt{3}$  on the number line. [3]  
 27. If  $x^2 + \frac{1}{x^2} = 34$ , find  $x^3 + \frac{1}{x^3} - 9$ . [3]  
 28. 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. [3]

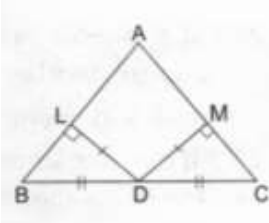
OR

The sides of a triangular plot are in the ratio of 3 : 5 : 7 and its perimeter is 300 m. Find its area.

29. A heap of wheat is in the form of a cone whose diameter is 10.5 m and height is 3 m. Find its volume. The heap is to be covered by canvas to protect it from rain. Find the area of the canvas required. [3]  
 30.  $\triangle ABC$  is an isosceles triangle in which  $AB = AC$ . Side  $BA$  is produced to  $D$  such that  $AD = AB$ . Show that  $\angle BCD$  is a right angle. [3]

OR

In  $\triangle ABC$ ,  $D$  is the midpoint of  $BC$ . if  $DL \perp AB$  and  $DM \perp AC$  such that  $DL = DM$ . prove that  $AB = AC$ .



31. Draw the graphs of  $y = x$  and  $y = -x$  in the same graph. Also find the co-ordinates of the point where the two lines intersect. [3]

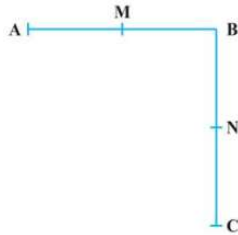
**Section D**

32. If  $a = \frac{\sqrt{2}+1}{\sqrt{2}-1}$  and  $b = \frac{\sqrt{2}-1}{\sqrt{2}+1}$ , then find the value of  $a^2 + b^2 - 4ab$ . [5]

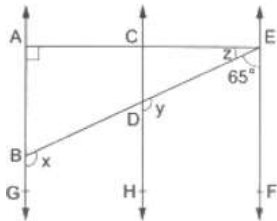
OR

If  $x$  is a positive real number and exponents are rational numbers, simplify  $\left(\frac{x^b}{x^c}\right)^{b+c-a} \cdot \left(\frac{x^c}{x^a}\right)^{c+a-b} \cdot \left(\frac{x^a}{x^b}\right)^{a+b-c}$ .

33. i.  $AB = BC$ ,  $M$  is the mid-point of  $AB$  and  $N$  is the mid-point of  $BC$ . Show that  $AM = NC$ . [5]  
 ii.  $BM = BN$ ,  $M$  is the mid-point of  $AB$  and  $N$  is the mid-point of  $BC$ . Show that  $AB = BC$ .

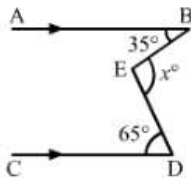


34. In the given figure,  $AB \parallel CD \parallel EF$ ,  $\angle DBG = x$ ,  $\angle EDH = y$ ,  $\angle AEB = z$ ,  $\angle EAB = 90^\circ$  and  $\angle BEF = 65^\circ$ . Find the values of  $x$ ,  $y$  and  $z$ . [5]



OR

In each of the figures given below,  $AB \parallel CD$ . Find the value of  $x^\circ$  in each case.



35. The following table shows the average daily earnings of 40 general stores in a market, during a certain week: [5]

|                           |         |         |         |         |         |          |
|---------------------------|---------|---------|---------|---------|---------|----------|
| Daily earning (in rupees) | 700-750 | 750-800 | 800-850 | 850-900 | 900-950 | 950-1000 |
| Number of stores          | 6       | 9       | 2       | 7       | 11      | 5        |

Draw a histogram to represent the above data.

**Section E**

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

Vinod and Basant have an adventure tourism business in Rishikesh. They have a resort in Rishikesh but now they are planning to build some tent houses too.

The newly built tent house will have all the basic amenities and it will attract the young tourists coming for

adventure. Their conical tent is 9 m high and the radius of its base is 12 m.



- i. What is the cost of the canvas required to make it, if 1 m<sup>2</sup> canvas costs ₹ 10? (1)
- ii. How many persons can be accommodated in the tent, if each person requires 2 m<sup>2</sup> on the ground? (1)
- iii. How many persons can be accommodated in the tent, if each person requires 15 m<sup>3</sup> of space to breathe in? (2)

**OR**

If each person requires 20 m<sup>3</sup> of space to breathe in and 100 person can be accommodated then what should be height of tent? (2)

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

Reeta was studying in the class 9th C of St. Surya Public school, Mehrauli, New Delhi-110030

Once Ranjeet and his daughter Reeta were returning after attending teachers' parent meeting at Reeta's school.

As the home of Ranjeet was close to the school so they were coming by walking.

Reeta asked her father, "Daddy how old are you?"

Ranjeet said, "Sum of ages of both of us is 55 years, After 10 years my age will be double of you."



- i. What is the second equation formed? (1)
- ii. What is the present age of Reeta in years? (1)
- iii. What is the present age of Ranjeet in years? (2)

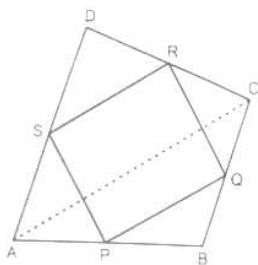
**OR**

If the ratio of age of Reeta and her mother is 3 : 7 then what is the age of Reeta's mother in years? (2)

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

Modern curricula include several problem-solving strategies. Teachers model the process, and students work independently to copy it. Sheela Maths teacher of class 9<sup>th</sup> wants to explain the properties of parallelograms in a creative way, so she gave students colored paper in the shape of a quadrilateral and then ask the students to make

a parallelogram from it by using paper folding.



- i. How can a parallelogram be formed by using paper folding? (1)
- ii. If  $\angle RSP = 30^\circ$ , then find  $\angle RQP$ . (1)
- iii. If  $\angle RSP = 50^\circ$ , then find  $\angle SPQ$ ? (2)

**OR**

If  $SP = 3$  cm, Find the  $RQ$ . (2)





Today is your  
**OPPORTUNITY** to build the  
**TOMORROW** you want.

**ADMISSIONS OPEN**

Session 2024-25

*for*

**AMU XI ENTRANCE**

Science / Diploma / Commerce / Humanities

**Batches Starting Soon**

**Vineet Coaching & Guidance Centre**

VCGC Tower, Phase I, ADA Colony, Ramghat Road, Aligarh-202001 (UP)

website : [www.vcgc.in](http://www.vcgc.in) | E-Mail : [vcgc.official@gmail.com](mailto:vcgc.official@gmail.com)

 **8923803150, 9997447700**



# XI AMU ENTRANCE RESULTS 2023-24



**Aakash Gaur**



**Kanika Garg**



**Riddhima Tomar**



**Tanmay Mudgal**



**Aastha Sharma**



**Ayush Senger**



**Prabhat Singh**



**Anubhav Gupta**



**Akash Basu**



**Shaurya Gangal**



**Abhishek Gaur**



**Rudraksh Chaudhary**



**Aryan Tiwari**



**Pakhi Garg**



**Rashi Singh**



**Ragini Singh**



**Pratishtha Sharma**



**Aaliya Singh**



**Kanika Singh**



**Yashika**



**Manav Kushwaha**



**Saloni Chaudhary**



**Ayushi Dhanger**



**Ayushi Gautam**



**Mugdha Singh**



**Afifa Malik**



**Khushi Varshney**



**Bhoomi Agarwal**



**Sanchi Popli**



**Shubhi Awasthi**



**Prisha Tanwar**



**Khanak**



**Sanyogita**



**Aakash Sharma**



**Ipshita Upadhyay**



**Yashi Vashishtha**



**Divya Singh**



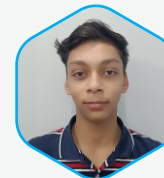
**Karnika Singh**



**Harshit Chaudhary**



**Vivek Gautam**



**Lalit Dhanger**



**Prachi Singh**



**Harshit Raghav**



**Srishty**



**Vanshika Garg**



**Aman Varshney**



**Pranjal Tiwari**



**Priyanshi Dhanger**



**Purnank Nandan**

and many more...

 **8923803150, 9997447700**



@vcgc.aligarh



@vcgc\_aligarh



@VCGC Aligarh



VCGC Online



VCGC Online App

# Solution

## Section A

- (c)  $6\sqrt{5}$   
**Explanation:**  $\sqrt{12} = \sqrt{3 \times 2^2} = 2\sqrt{3}$  and  $\sqrt{15} = \sqrt{5} \times \sqrt{3}$   
so,  $\sqrt{12} \times \sqrt{15} = 2\sqrt{3} \times \sqrt{3} \times \sqrt{5}$   
 $= 2 \times 3\sqrt{5} = 6\sqrt{5}$
- (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.
- (b) on the negative direction of the X-axis  
**Explanation:** In point  $(-10, 0)$  y-coordinate is zero, so it lies on X-axis and its x-coordinate is negative, so the point  $(-10, 0)$  lies on the X-axis in the negative direction.
- (a) X-axis  
**Explanation:** Histogram states that a two dimensional frequency density diagram is called as a histogram. The histograms are diagrams which represent the class interval and the frequency in the form of a rectangle. There will be as many adjoining rectangles as there are class intervals.
- (b) 4  
**Explanation:**  $(2, 0)$  is a solution of the linear equation  $2x + 3y = k$   
 $\Rightarrow 4 = k$
- (d) radius  
**Explanation:** The radius of a circle is the distance from the center of the circle to any point on its circumference.
- (c)  $34^\circ$   
**Explanation:** Given,  
POQ is a straight line  
 $\angle POR + \angle QOR = 180^\circ$  (Linear pair)  
 $3x + 2x + 10^\circ = 180^\circ$   
 $5x = 170^\circ$   
 $x = 34^\circ$
- (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 formed between diagonals. Either it is of  $130$  or  $50$ .  $50$  is an acute angle. So, it is a correct option.
- (a)  $-32$   
**Explanation:**  $x^{31} - 31$   
Using remainder theorem.  
 $= (-1)^{31} - 31$   
 $= -1 - 31$   
 $= -32$

10.

(c)  $a \neq 0$  and  $b \neq 0$

**Explanation:** A linear equation in two variables is of the form  $ax + by + c = 0$  as  $a$  and  $b$  are coefficient of  $x$  and  $y$  so if  $a = 0$  and  $b = 0$  or either of one is zero in that case the equation will be one variable or there will be no equation respectively.

therefore when  $a \neq 0$  and  $b \neq 0$  then only the equation will be in two variable

11. (a)  $110^\circ$

**Explanation:**  $\angle EAP = \angle BCA$  (Corresponding angles)

$$\angle BCA = 70^\circ$$

$\angle CBA = \angle BCA$  (Angles opposite to equal sides are equal)

$$\angle CBA = 70^\circ$$

Now,

$$\angle ABD + \angle CBA = 180^\circ$$

$$\angle ABD + 70 = 180^\circ$$

$$\angle ABD = 110^\circ$$

12.

(b)  $80^\circ, 100^\circ$

**Explanation:** Let the adjacent angles of a parallelogram be  $4x$  and  $5x$  and sum of adjacent angles of parallelogram is  $180^\circ$ .

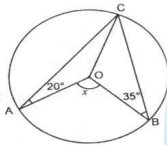
$$\therefore 4x + 5x = 180^\circ$$

$$\Rightarrow 9x = 180^\circ \Rightarrow x = 20^\circ$$

$\therefore$  Angles are  $80^\circ$  and  $100^\circ$ .

13. (a)  $110^\circ$

**Explanation:**



$$\angle ACO = \angle CAO = 20^\circ \text{ (because } OA = OC)$$

$$\angle OBC = \angle OCB = 35^\circ \text{ (because } OB = OC)$$

$$\angle ACB = 55^\circ$$

$$x = 2\angle ACB = 2 \times 55^\circ = 110^\circ$$

14. (a) 3.146

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

$$\Rightarrow \frac{1}{\sqrt{3}-\sqrt{2}} \times \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}}$$

$$\Rightarrow \frac{\sqrt{3}+\sqrt{2}}{3-2} = \sqrt{3} + \sqrt{2}$$

$$\Rightarrow 1.732 + 1.414$$

$$\Rightarrow 3.146$$

15.

(c) many

**Explanation:** There are many lines pass through the point (2, 14).

For example

$$x - y = -12$$

$$2x + y = 18$$

and many more.

16.

(c)  $53^\circ$

**Explanation:** Let

$$\angle A - \angle B = 42^\circ \dots\dots(i) \text{ and}$$

$$\angle B - \angle C = 21^\circ \dots\dots(ii)$$

Adding (i) and (ii), we get

$$\angle A - \angle C = 63^\circ \dots (iii)$$

$$\angle B = \angle A - 42^\circ \dots [using (i)]$$

$$\angle C = \angle A - 63^\circ [Using (iii)]$$

$$\therefore \angle A + \angle B + \angle C = 180^\circ \text{ [Sum of the angles of a triangle]}$$

$$\Rightarrow \angle A + \angle A - 42^\circ + \angle A - 63^\circ = 180^\circ$$

$$\Rightarrow 3\angle A - 105^\circ = 180^\circ$$

$$\Rightarrow 3\angle A = 285^\circ$$

$$\therefore \angle B = (95 - 42)^\circ$$

$$\Rightarrow \angle B = 53^\circ$$

17. (a) 0

**Explanation:**  $\sqrt{3}$  is a constant term, so it is a polynomial of degree 0.

18. (a) 91.67 cm<sup>3</sup>

**Explanation:** Height of ice-cream cone is 9 cm and radius of the hemispherical top is 2.5 cm.

Now, Volume of ice-cream cone = Volume of cone + volume of Hemispherical top

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

$$= \frac{1}{3}\pi r^2 (h + 2r)$$

$$= \frac{1}{3} \times \frac{22}{7} \times 2.5 \times 2.5 (9 + 5)$$

$$= \frac{1}{3} \times \frac{22}{7} \times 2.5 \times 2.5 \times 14$$

$$= 91.67 \text{ cm}^3$$

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

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

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

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

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 have ABC and ADC two right triangles, right angled at B and D respectively.

$$\Rightarrow \angle ABC = \angle ADC [\text{Each } 90^\circ]$$

If we draw a circle with AC (the common hypotenuse) as diameter, this circle will definitely pass through of an arc AC, Because B and D are the points in the alternate segment of an arc AC.

Now we have  $\widehat{CD}$  subtending  $\angle CBD$  and  $\angle CAD$  in the same segment.

$$\therefore \angle CAD = \angle CBD$$

Hence proved.

22. in equilateral triangle, all sides are equal. let's sides are a=12

$$S = \frac{12+12+12}{2} \text{ cm}$$

$$= \frac{36}{2} \text{ cm}$$

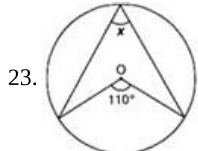
$$= 18 \text{ cm}$$

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

$$= \sqrt{18(18-12)(18-12)(18-12)}$$

$$= \sqrt{18 \times 6 \times 6 \times 6}$$

$$= 36\sqrt{3} \text{ sq cm}$$



23.

$$x = \frac{1}{2} \times 110^\circ = 55^\circ$$

[ $\therefore$  Angle subtended by an arc of a circle at the centre is double the angle subtended by it at any point of the remaining part of the circle.]

24. i. The angle subtended by an arc of a circle at the centre is double the angle subtended by the arc at any point on the circumference.

Thus,  $\angle AOB = 2\angle OCA$

$$\Rightarrow \angle OCA = \left(\frac{\angle AOB}{2}\right) = \left(\frac{70^\circ}{2}\right) = 35^\circ$$

ii.  $OA = OC$  (Radius of a circle)

$\Rightarrow \angle OAC = \angle OCA$  [Base angles of an isosceles triangle are equal]

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

OR

Let two circles with respective centers A and B intersect each other at points C and D.

We have to prove  $\angle ACB = \angle ADB$

Proof: In triangles ABC and ABD,

$$AC = AD = r$$

$$BC = BD = r$$

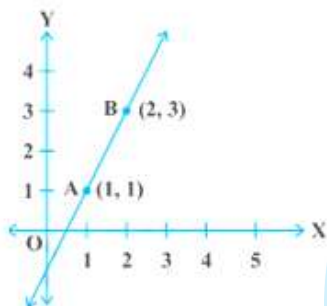
$$AB = AB \text{ [Common]}$$

$$\therefore \triangle ABC \cong \triangle ABD$$

[SSS rule of congruency]

$$\Rightarrow \angle ACB = \angle ADB \text{ [By CPCT]}$$

25. From the table, we get two points A (1,1) and B (2,3) which lie on the graph of the linear equation Obviously, the graph will be a straight line so we first plot the points A and B and join them as shown in the fig from the fig we see that the graph cuts the x axis at the point  $(\frac{1}{2}, 0)$  and y - axis at the point (0, -1)



OR

Let cost of pen Rs x and cost of a pencil be Rs. y.

According to statement of the question, we have

$$x = 2\frac{1}{2}y$$

$$\Rightarrow 2x = 5y \text{ or } 2x - 5y = 0$$

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

Clearly,  $OA = 1 \text{ unit}$ .

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

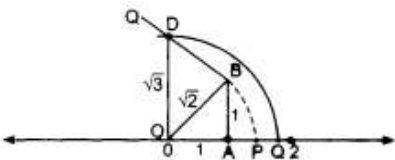
By Using Pythagoras theorem, we have

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

$$= 1^2 + 1^2$$

$$= 2$$

$$\Rightarrow OB = \sqrt{2}$$



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

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

$$OD^2 = (\sqrt{2})^2 + 1^2$$

$$= 2 + 1 = 3$$

$$OD = \sqrt{3}$$

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. As we know

$$\left(x + \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} + 2 = 34 + 2 = 36$$

$$\left(x + \frac{1}{x}\right) = 6$$

On cubing both sides, we get

$$\left(x + \frac{1}{x}\right)^3 = 6^3$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 216$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times 6 = 216$$

$$\Rightarrow x^3 + \frac{1}{x^3} = 198$$

$$\Rightarrow x^3 + \frac{1}{x^3} - 9 = 198 - 9 = 189$$

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

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

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

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

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

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

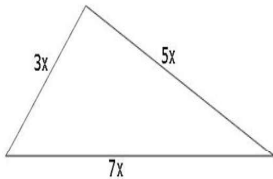
$$= 3 \times 3 \times 2 \times 17$$

$$= 306 \text{ m}^2$$

Cost of leveling the ground = Rs.3  $\times$  306 = Rs.918.

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

OR



Suppose that the sides in metres are 3x, 5x and 7x.

Then, we know that  $3x + 5x + 7x = 300$  (Perimeter of the triangle)

Therefore,  $15x = 300$ , which gives  $x = 20$ .

So the sides of the triangles are  $3 \times 20$  m,  $5 \times 20$  m and  $7 \times 20$  m

i.e., 60m, 100m and 140m.

$$\text{We have } s = \frac{60+100+140}{2} = 150 \text{ m}$$

$$\text{and area will be } = \sqrt{150(150-60)(150-100)(150-140)}$$

$$= \sqrt{150 \times 90 \times 50 \times 10}$$

$$= 1500\sqrt{3} \text{ m}^2$$

29. For heap of wheat

Diameter = 10.5 m

$$\therefore \text{Radius (r)} = \frac{10.5}{2} \text{ cm} = 5.25 \text{ m}$$

Height (h) = 3 m

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

$$= \frac{1}{3} \times \frac{22}{7} \times (5.25)^2 \times 3$$

$$= 86.625 \text{ m}^3$$

$$\text{Slant height, } l = \sqrt{r^2 + h^2}$$

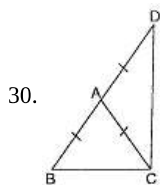
$$= \sqrt{(5.25)^2 + (3)^2} = \sqrt{27.5625 + 9}$$

$$= \sqrt{36.5625} = 6.05 \text{ m}$$

$$\therefore \text{Curved surface area} = \pi r l$$

$$= \frac{22}{7} \times 5.25 \times 6.05 = 99.825 \text{ m}^2$$

$\therefore$  The area of the canvas required is 99.825 m<sup>2</sup>



Given :  $\triangle ABC$  is an isosceles triangle in which  $AB = AC$ .

Side BA is produced to D such that  $AD = AB$ .

To Prove :  $\angle BCD$  is a right angle.

Proof : As  $ABC$  is an isosceles triangle

$$\angle ABC = \angle ACB \dots\dots (1)$$

$$AC = AD \dots\dots [As\ given : AB = AC\ and\ AD = AB]$$

In  $\triangle ACD$ ,

$$\angle CDA = \angle ACD \dots\dots [\angle s\ opposite\ to\ equal\ side\ of\ a\ \triangle]$$

$$\angle CBD = \angle ACD \dots\dots (2)$$

$$\angle ABC + \angle CDB = \angle ACB + \angle ACD \dots\dots [Adding\ corresponding\ sides\ from\ (1)\ and\ (2)]$$

$$\angle ABC + \angle CDB = \angle BCD \dots\dots (3)$$

In  $\triangle BCD$

$$\angle BCD + \angle DBC + \angle CDB = 180^\circ \dots\dots [Sum\ of\ three\ angles\ of\ a\ triangle]$$

$$\therefore \angle BCD + \angle ABC + \angle CDB = 180^\circ$$

$$\angle BCD + \angle BCD = 180^\circ \dots\dots [From\ (3)]$$

$$\therefore 2\angle BCD = 180^\circ$$

$$\therefore \angle BCD = 90^\circ$$

$\therefore \angle BCD$  is a right angle proved.

OR

Given that in a  $\triangle ABC$ , D is the midpoint of BC and  $DL \perp AB$  and  $DM \perp AC$  also,  $DL = DM$

To prove  $AB = AC$

Proof: IN right-angled triangles  $\triangle BLD$  and  $\triangle CMD$

$$\angle BLD = \angle CMD = 90^\circ$$

$$BD = CD$$

$$DL = DM$$

Thus, by right angle hypotenuse side criterion of congruence, we have

$$\triangle BLD \cong \triangle CMD$$

The corresponding parts of the congruent triangles are equal.

$$\angle ABD = \angle ACD$$

In  $\triangle ABC$ , we have

$$\Rightarrow AB = AC$$

sides opposite to equal angles are equal

31.  $y = x$

We have,  $y = x$

$$\text{Let } x = 1 : y = 1$$

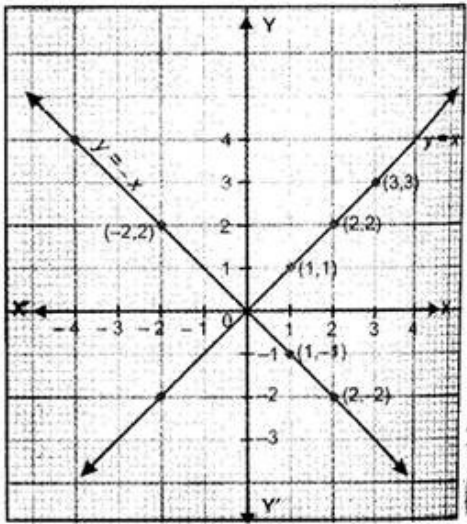
$$\text{Let } x = 2 : y = 2$$

$$\text{Let } x = 3 : y = 3$$

Thus, we have the following table :

|   |   |   |   |
|---|---|---|---|
| x | 1 | 2 | 3 |
| y | 1 | 2 | 3 |

By plotting the points (1, 1), (2, 2) and (3, 3) on the graph paper and joining them by a line, we obtain the graph of  $y = x$ .



$$y = -x$$

We have,  $y = -x$

$$\text{Let } x = 1 : y = -1$$

$$\text{Let } x = 2 : y = -2$$

$$\text{Let } x = -2 : y = -(-2) = 2$$

Thus, we have the following table exhibiting the abscissa and ordinates of the points of the line represented by the equation  $y = -x$ .

|   |    |    |    |
|---|----|----|----|
| x | 1  | 2  | -2 |
| y | -1 | -2 | 2  |

Now, plot the points (1, -1), (2, -2) and (-2, 2) and join them by a line to obtain the line represented by the equation  $y = -x$ .

The graphs of the lines  $y = x$  and  $y = -x$  are shown in figure.

Two lines intersect at O (0, 0).

### Section D

$$32. \text{ Given, } a = \frac{\sqrt{2}+1}{\sqrt{2}-1} \text{ and } b = \frac{\sqrt{2}-1}{\sqrt{2}+1}$$

$$\text{Here, } a = \frac{\sqrt{2}+1}{\sqrt{2}-1} = \frac{\sqrt{2}+1}{\sqrt{2}-1} \times \frac{\sqrt{2}+1}{\sqrt{2}+1} = \frac{(\sqrt{2}+1)^2}{(\sqrt{2})^2-1^2}$$

$$= \frac{(\sqrt{2})^2+1+2\sqrt{2}}{2-1} = \frac{2+1+2\sqrt{2}}{1} = 3 + 2\sqrt{2}$$

$$\therefore a = 3 + 2\sqrt{2} \dots(i)$$

$$b = \frac{\sqrt{2}-1}{\sqrt{2}+1} = \frac{\sqrt{2}-1}{\sqrt{2}+1} \times \frac{\sqrt{2}-1}{\sqrt{2}-1} = \frac{(\sqrt{2}-1)^2}{(\sqrt{2})^2-1^2}$$

$$= \frac{(\sqrt{2})^2+1^2-2\sqrt{2}}{2-1} = \frac{2+1-2\sqrt{2}}{1} = 3 - 2\sqrt{2}$$

$$\therefore b = 3 - 2\sqrt{2} \dots(ii)$$

From equation (i) and (ii)

$$a + b = 3 + 2\sqrt{2} + 3 - 2\sqrt{2} = 6$$

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

$$= 9 - 4 \times 2 = 9 - 8 = 1$$

$$\therefore a^2 + b^2 - 4ab = a^2 + b^2 + 2ab - 6ab$$

$$= (a + b)^2 - 6ab$$

$$= 6^2 - 6$$

$$= 36 - 6 = 30$$

OR

Given.

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

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

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



$$\begin{aligned}
&= (x^2 - ab - c^2 + ac)(x^2 - bc - a^2 + ab)(x^2 - ac - b^2 + bc) \\
&= x^2 - ab - c^2 + ac + c^2 - bc - a^2 + ab + a^2 - ac - b^2 + bc \\
&= x^0 \\
&= 1
\end{aligned}$$

33. i. From the above figure, We have  $AB = BC \dots (1)$  [Given]

Now, A, M, B are the three points on a line, and M lies between A and B such that M is the mid point of AB [Given], then  $AM + MB = AB \dots (2)$  Also B, N, C are three points on a line such that N is the mid point of BC [Given]

Similarly,  $BN + NC = BC \dots (3)$

So, we get  $AM + MB = BN + NC$

From (1), (2), (3) and Euclid's first axiom

Since M is the mid-point of AB and N is the mid-point of BC, therefore

$$2AM = 2NC \text{ i.e. } AM = NC$$

Hence,  $AM = NC$ . Proved

Using axiom 6, things which are double of the same thing are equal to one another.

ii. From the above figure, We have  $BM = BN \dots (1)$  [ Given ]

As M is the mid-point of AB [Given] , so that

$$BM = AM \dots (2)$$

And N is the mid-point of BC [Given]

$$BN = NC \dots (3)$$

From (1), (2) and (3) and Euclid's first axiom, we get

$$AM = NC \dots (4)$$

Adding (4) and (1), we get

$$AM + BM = NC + BN$$

Hence,  $AB = BC$  Proved

[By axiom 2 if equals are added to equals, the wholes are equal]

34.  $EF \parallel CD$  and  $ED$  is the transversal.

$$\therefore \angle FED + \angle EDH = 180^\circ \text{ [co-interior angles]}$$

$$\Rightarrow 65^\circ + y = 180^\circ$$

$$\Rightarrow y = (180^\circ - 65^\circ) = 115^\circ.$$

Now  $CH \parallel AG$  and  $DB$  is the transversal

$$\therefore x = y = 115^\circ \text{ [corresponding angles]}$$

Now,  $ABG$  is a straight line.

$$\therefore \angle ABE + \angle EBG = 180^\circ \text{ [sum of linear pair of angles is } 180^\circ]$$

$$\Rightarrow \angle ABE + x = 180^\circ$$

$$\Rightarrow \angle ABE + 115^\circ = 180^\circ$$

$$\Rightarrow \angle ABE = (180^\circ - 115^\circ) = 65^\circ$$

We know that the sum of the angles of a triangle is  $180^\circ$ .

From  $\triangle EAB$ , we get

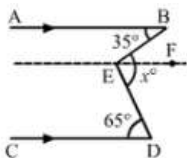
$$\angle EAB + \angle ABE + \angle BEA = 180^\circ$$

$$\Rightarrow 90^\circ + 65^\circ + z = 180^\circ$$

$$\Rightarrow z = (180^\circ - 155^\circ) = 25^\circ$$

$$\therefore x = 115^\circ, y = 115^\circ \text{ and } z = 25^\circ$$

OR



Draw  $EF \parallel AB \parallel CD$

Now,  $AB \parallel EF$  and  $BE$  is the transversal.

Then,

$$\angle ABE = \angle BEF \text{ [Alternate Interior Angles]}$$

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

Again,  $EF \parallel CD$  and  $DE$  is the transversal

Then,

$$\angle DEF = \angle FED$$

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

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

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

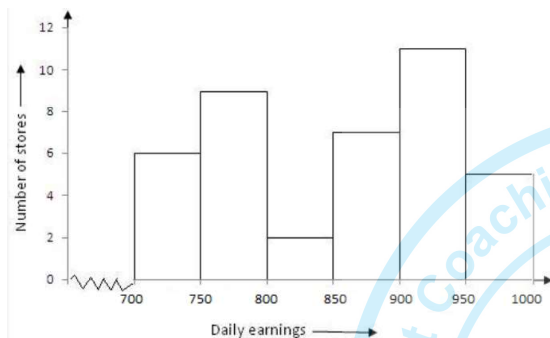
$$x^\circ = 100^\circ$$

35. The following table shows the average daily earnings of 40 general stores in a market, during a certain week:

| Daily earning (in ₹) | 700-750 | 750-800 | 800-850 | 850-900 | 900-950 | 950-1000 |
|----------------------|---------|---------|---------|---------|---------|----------|
| Number of stores     | 6       | 9       | 2       | 7       | 11      | 5        |

Clearly, the given frequency distribution is in the exclusive form. We take class intervals, i.e. daily earnings (in ₹) along x-axis and frequencies i.e. number of stores along y-axis. So, we get the required histogram.

Since the scale on X-axis starts at 700, a kink(break) is indicated near the origin to show that the graph is drawn to scale beginning at 700.



### Section E

36. i. We have,

$$r = \text{Radius of the base of the conical tent} = 12 \text{ m}$$

$$h = \text{Height of the conical tent} = 9 \text{ m}$$

$$\therefore l = \text{Slant height of the conical tent} = \sqrt{r^2 + h^2}$$

$$= \sqrt{12^2 + 9^2} \text{ m} = \sqrt{225} \text{ m} = 15$$

$$\text{Area of lateral surface} = \pi r l = \frac{22}{7} \times 12 \times 15 \text{ m}^2 = 565.7 \text{ m}^2$$

$$\therefore \text{Total cost of canvas} = ₹(565.2 \times 10) = ₹ 5652$$

ii. We have,

$$r = \text{Radius of the base of the conical tent} = 12 \text{ m}$$

$$h = \text{Height of the conical tent} = 9 \text{ m}$$

$$\therefore l = \text{Slant height of the conical tent} = \sqrt{r^2 + h^2}$$

$$= \sqrt{12^2 + 9^2} \text{ m} = \sqrt{225} \text{ m} = 15$$

$$\text{Area of the base of the conical tent} = \pi r^2 = \frac{22}{7} \times 12 \times 12 \text{ m}^2 = 452.16 \text{ m}^2$$

Since each person requires 2 sq. meters of floor area.

$$\therefore \text{Max. no. of persons who will have enough space on the ground} = \frac{452.16}{2} = 226$$

iii. We have,

$$r = \text{Radius of the base of the conical tent} = 12 \text{ m}$$

$$h = \text{Height of the conical tent} = 9 \text{ m.}$$

$$\therefore l = \text{Slant height of the conical tent} = \sqrt{r^2 + h^2}$$

$$= \sqrt{12^2 + 9^2} \text{ m} = \sqrt{225} \text{ m} = 15$$

$$\text{Volume of the conical tent} = \frac{1}{3} \times \text{Area of the base} \times \text{Height}$$

$$\Rightarrow \text{Volume of the conical tent} = \frac{1}{3} \times 452.16 \times 9 \text{ m}^3$$

We have, Air space required person =  $15 \text{ m}^3$

$$\therefore \text{No. of persons who will have enough air space to breathe in} = \frac{1356.48}{15} = 90$$

Hence, 90 persons can be accommodated.

**OR**

We have,

$r$  = Radius of the base of the conical tent = 12 m

$h$  = Height of the conical tent = 9 m.

$$\therefore l = \text{Slant height of the conical tent} = \sqrt{r^2 + h^2}$$
$$= \sqrt{12^2 + 9^2} \text{ m} = \sqrt{225} \text{ m} = 15$$

Let new height is  $H$  and radius = 12 m

Each person requires  $20 \text{ m}^3$  of space to breathe

Thus volume of air required for 100 persons =  $20 \times 100 = 2000 \text{ m}^3$

$$2000 = \frac{1}{3} \pi \times r^2 h$$

$$2000 = \frac{1056h}{7}$$

$h = 13.25 \text{ m}$

Thus new height would be 13.25 m.

37. i.  $x - 2y = 10$

ii.  $x + y = 55$  ... (i) and  $x - 2y = 10$  ... (ii)

Subtracting (ii) from (i)

$$x + y - x + 2y = 55 - 10$$

$$\Rightarrow 3y = 45$$

$$\Rightarrow y = 15$$

So present age of Reeta is 15 years.

iii.  $x + y = 55$  ... (i) and  $x - 2y = 10$  ... (ii)

Subtracting (ii) from (i)

$$x + y - x + 2y = 55 - 10$$

$$\Rightarrow 3y = 45$$

$$\Rightarrow y = 15$$

Put  $y = 15$  in equation (i)

$$x + y = 55$$

$$\Rightarrow x + 15 = 55$$

$$\Rightarrow x = 55 - 15 = 40$$

So Ranjeet's present age is 40 years.

**OR**

Let Reeta's mother age be ' $z$ '.

Given Reeta age : Her mother age =  $7 : 5$

We know that Reeta age = 15 years

$$\frac{\text{Mother age}}{\text{Reeta age}} = \frac{7}{5}$$

$$\Rightarrow z = \frac{7}{5} \times 15$$

$$\Rightarrow z = \frac{7}{5} \times 15$$

$\Rightarrow$  Here Mother age = 35 years

Hence Reeta's mother's age is 35 years.

38. i. By joining mid points of sides of a quadrilateral one can make parallelogram.

$S$  and  $R$  are mid points of sides  $AD$  and  $CD$  of  $\triangle ADC$ ,  $P$  and  $Q$  are mid points of sides  $AB$  and  $BC$  of  $\triangle ABC$ , then by mid-point theorem  $SR \parallel AC$  and  $SR = \frac{1}{2} AC$  similarly  $PQ \parallel AC$  and  $PQ = \frac{1}{2} AC$ .

Therefore  $SR \parallel PQ$  and  $SR = PQ$

A quadrilateral is a parallelogram if a pair of opposite sides is equal and parallel.

Hence  $PQRS$  is parallelogram.

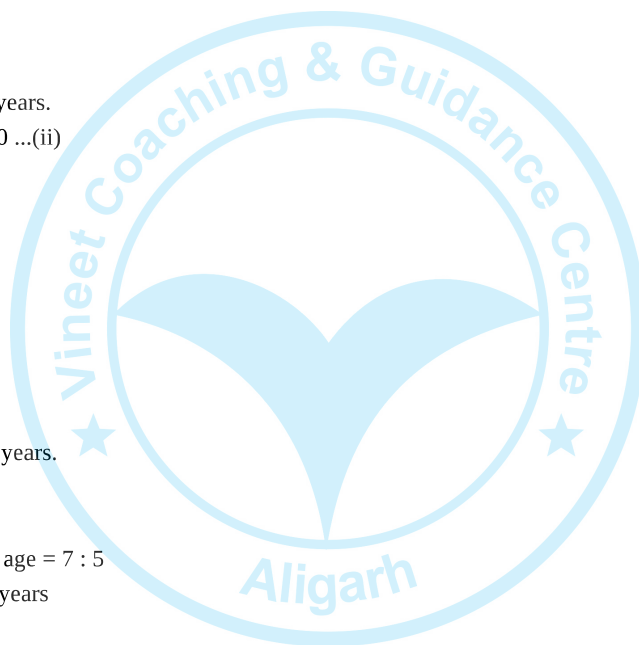
ii.  $\angle RQP = 30^\circ$ , Opposite angles of a parallelogram are equal.

iii. Adjacent angles of a parallelogram are supplementary.

$$\text{Thus, } \angle RSP + \angle SPQ = 180^\circ$$

$$50^\circ + \angle SPQ = 180^\circ$$

$$\angle SPQ = 180^\circ - 50^\circ$$



=  $130^\circ$

**OR**

RQ = 3 cm

Opposite side of a parallelogram are equal.

