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 π =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

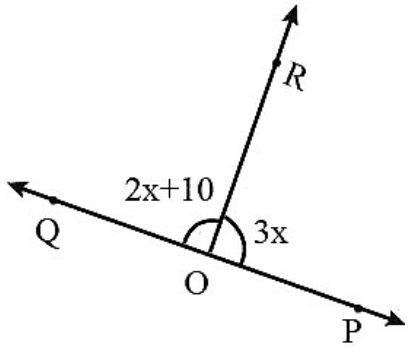
   c) 5 d) 6

6. The line segment with one end point at the centre and the other at any point on the circle is called _____. **[1]**

a) diameter b) sector

c) chord d) radius

7. Given $\angle POR = 3x$ and $\angle QOR = 2x + 10°$. If $\angle POQ$ is a straight line, then the value of x is **[1]**



a) 36° b) 30°

c) 34° d) 42^o

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

a) 115° b) 40°

c) 50° d) 25°

9. The remainder when $x^{31} - 31$ is divided by $x + 1$ is **[1]**

a) -32 b) 31

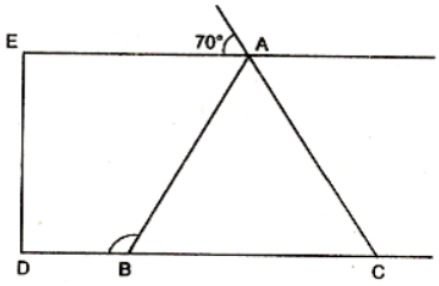
c) 30 d) 0

10. A linear equation in two variables is of the form ax + by + c = 0, where **[1]**

a) $a \neq 0$ and b = 0 b) a = 0 and b = 0

c) $a \neq 0$ and $b \neq 0$ d) a = 0 and $b \neq 0$

11. In figure, if AE||DC and AB = AC, the value of $\angle ABD$ is **[1]**



a) 110° b) 120°

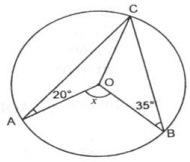
c) 130° d) 70°

12. Two adjacent angles of a parallelogram are in the ratio 4 : 5. The angles are **[1]**

a) 90°, 90° b) 80°, 100°

c) 60°, 120° d) 40°, 140°

13. In the given figure, a circle is centred at O. The value of x is : **[1]**



a) 110^o b) 55^o

c) 125^o d) 70^o

14. If $\sqrt{3} = 1.732$ and $\sqrt{2} = 1.414$, then the value of $\frac{1}{\sqrt{3}-\sqrt{2}}$ is **[1]**

a) 3.146 b) $\frac{1}{3.146}$

c) 0.318 d) $\frac{1}{\sqrt{1.732}-\sqrt{1.414}}$

15. The line represented by the equation x + y = 16 passes through (2, 14). How many more lines pass through the point (2, 14) **[1]**

a) 10 b) 2

c) many d) 100

16. In a $\triangle ABC$, if $\angle A - \angle B = 42^\circ$ and $\angle B - \angle C = 21^\circ$ then $\angle B$ = ? **[1]**

a) 95^o b) 63^o

c) 53^o d) 32^o

17. $\sqrt{3}$ is a polynomial of degree. **[1]**

a) 0 b) 2

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

18. An icecream cone has hemispherical top. If the height of the cone is 9 cm and base radius is 2.5 cm, then the volume of icecream is **[1]**

a) 91.67 cm^3 b) 96.67 cm^3

c) 90.67 cm^3 d) 91.76 cm^3

19. **Assertion (A):** The height of the triangle is 18 cm and its area is 72 cm^2. Its base is 8 cm. **[1]**
Reason (R): Area of a triangle = $\frac{1}{2} \times$ base $\times$ height

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 point (0, 3) lies on the graph of the linear equation 3x + 4y = 12. **[1]**
Reason (R): (0, 3) satisfies the equation 3x + 4y = 12.

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.

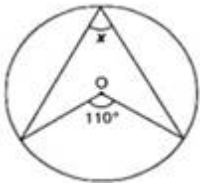
c) A is true but R is false. d) A is false but R is true.

Section B

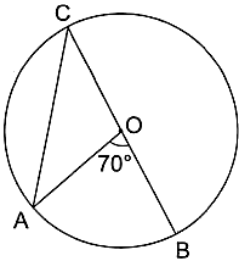
21. ABC and ADC are two right triangles with common hypotenuse AC. Prove that $\angle$ CAD = $\angle$ ABD. **[2]**

22. Find the area of equilateral triangle whose side is 12 cm using Heron's formula. **[2]**

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

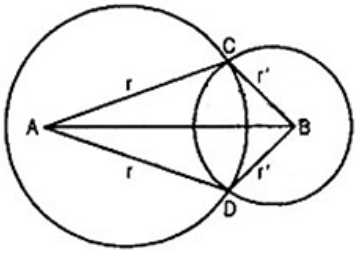


24. In the given figure, O is the centre of the circle and ∠AOB = 70°. Calculate the values of (i) ∠OCA, (ii) ∠OAC. **[2]**



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

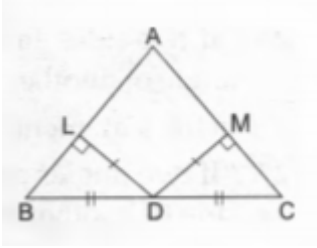
The sides of a triangular plot are in the ratio of 3 : 5 : 7 and its perimeter is 300 m. Find its area.

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. △ABC is an isosceles triangle in which AB = AC. Side BA is produced to D such that AD = AB. Show that ∠BCD is a right angle. **[3]**

OR

In $\Delta ABC, D$ 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

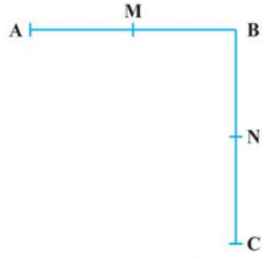
32. If $a = \frac{\sqrt{2}+1}{\sqrt{2}-1}$ and $b = \frac{\sqrt{2}-1}{\sqrt{2}+1}$, then find the value of $a^2 + b^2 - 4ab$. **[5]**

OR

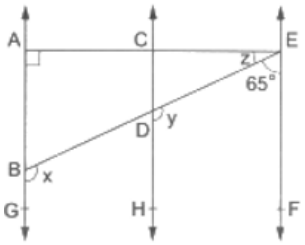
If x is a positive real number and exponents are rational numbers, simplify $\left(\frac{x^b}{x^c}\right)^{b+c-a} \cdot \left(\frac{x^c}{x^a}\right)^{c+a-b} \cdot \left(\frac{x^a}{x^b}\right)^{a+b-c}$.

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.

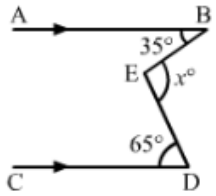


34. In the given figure, AB || CD || EF, $\angle DBG = x, \angle EDH = y, \angle AEB = z, \angle EAB = 90^\circ$ and $\angle BEF = 65^\circ$. Find the values of x, y and z. **[5]**



OR

In each of the figures given below, AB || CD. Find the value of x° 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^2 canvas costs ₹ 10? (1)

ii. How many persons can be accommodated in the tent, if each person requires 2 m^2 on the ground? (1)

iii. How many persons can be accommodated in the tent, if each person requires 15 m^3 of space to breathe in? (2)

OR

If each person requires 20 m^3 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)

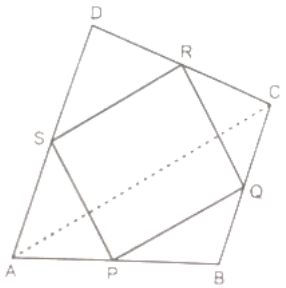
OR

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^{th} 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 $\angle RSP = 30^o$, then find $\angle RQP$. (1)

iii. If $\angle RSP = 50^o$, then find $\angle SPQ$? (2)

OR

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

Solution

Section A

1.

(c) $6\sqrt{5}$

Explanation: $\sqrt{12} = \sqrt{3 \times 2^2} = 2\sqrt{3}$ and $\sqrt{15} = \sqrt{5} \times \sqrt{3}$

so, $\sqrt{12} \times \sqrt{15} = 2\sqrt{3} \times \sqrt{3} \times \sqrt{5}$

$= 2 \times 3\sqrt{5} = 6\sqrt{5}$

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.

(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.

4. **(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.

5.

(b) 4

Explanation: (2, 0) is a solution of the linear equation 2x + 3y = k

$\Rightarrow 4 = k$

6.

(d) radius

Explanation: The radius of a circle is the distance from the center of the circle to any point on its circumference.

7.

(c) 34°

Explanation: Given,

POQ is a straight line

$\angle$POR + $\angle$QOR = 180^o (Linear pair)

3x + 2x + 10^o = 180^o

5x = 170^o

x = 34^o

8.

(c) 50°

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. **(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 cofficient 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 their 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°

Explanation: ∠EAP = ∠BCA (Corresponding angles)

∠BCA = 70°

∠CBA = ∠BCA (Angles opposite to equal sides are equal)

∠CBA = 70°

Now,

∠ABD + ∠CBA = 180°

∠ABD + 70 = 180°

∠ABD = 110°

12.

(b) 80°, 100°

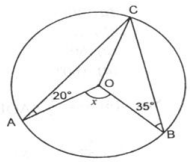
Explanation: Let the adjacent angles of a parallelogram be 4x and 5x and sum of adjacent angles of parallelogram is 180°.

∴ 4x + 5x = 180°

⇒ 9x = 180° ⇒ x = 20°

∴ Angles are 80° and 100°.

13. **(a)** 110^o

Explanation: 

∠ACO = ∠CAO = 20^o (because OA = OC)

∠OBC = ∠OCB = 35^o (because OB = OC)

∠ACB = 55^o

x = 2∠ACB = 2 × 55^o = 110^o

14. **(a)** 3.146

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

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

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

⇒ 1.732 + 1.414

⇒ 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^o

Explanation: Let

$\angle A - \angle B = 42^\circ$ .....(i) and

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

Adding (i) and (ii),we get

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

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

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

$\therefore \angle A + \angle B + \angle C = 180^\circ$ [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^3

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 cm^3

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

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

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

b = $\frac{72 \times 2}{18}$ = 8 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 = ADC[Each 90°]

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

Now we have $\overset{\frown}{CD}$ 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 = $\frac{12+12+12}{2}$ cm

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

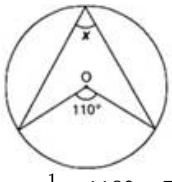
=18 cm

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

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

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

$= 36\sqrt{3}$ sq cm

23. 

x = $\frac{1}{2} \times 110° = 55°$

[$\because$ 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, ∠AOB = 2∠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)

=> ∠OAC = ∠OCA [Base angles of an isosceles triangle are equal]

=> ∠OAC= 35°

OR

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

We have to prove ∠ACB = ∠ADB

Proof: In triangles ABC and ABD,

AC = AD = r

BC = BD = r

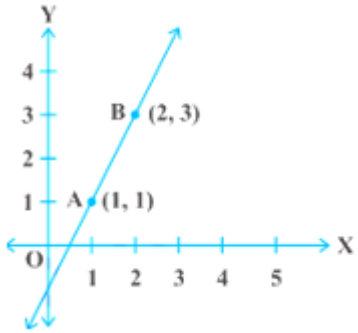
AB = AB [Common]

$\therefore \Delta ABC \cong \Delta ABD$

[SSS rule of congruency]

$\Rightarrow$ ∠ACB = ∠ADB [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 $\left(\frac{1}{2}, 0\right)$ an 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 or 2x - 5y = 0

Section C

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

Clearly, $OA = 1\ unit.$

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

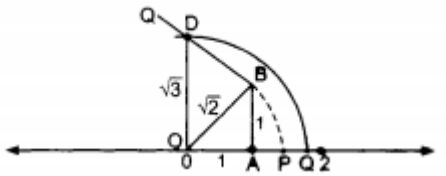
By Using Pythagoras theorem, we have

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

$= 1^2 + 1^2$

$= 2$

$\Rightarrow OB = \sqrt{2}$



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

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

By using Pythagoras theorem, we have

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

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

$= 2 + 1 = 3$

$OD = \sqrt{3}$

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

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

27. 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

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

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

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

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

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

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

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

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

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

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

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

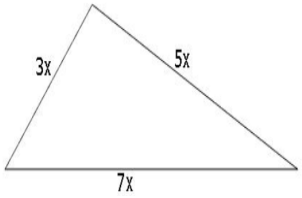
= 3 × 3 × 2 × 17

= 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.

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 × 20 m, 5 × 20 m and 7 × 20 m

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

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

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

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

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

29. For heap of wheat

Diameter = 10.5 m

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

Height (h) = 3 m

∴ Volume = $\frac{1}{3}\pi r^2 h$

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

= 86.625 m^3

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

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

$= \sqrt{36.5625}$ = 6.05 m

∴ Curved surface area =πrl

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

∴ The area of the canvas required is 99.825 m^2

30. 

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 ..... (1)

AC = AD ..... [As given : AB = AC and AD = AB]

In $\triangle$ACD,

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

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

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

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

In $\triangle$BCD

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

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

$\angle$BCD + $\angle$BCD = 180^o . . .[From (3)]

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

$\therefore \angle$BCD = 90^o

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

OR

Given that in a $\triangle \mathrm{ABC}, \mathrm{D}$ 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 ΔBLD and ΔCMD

$\angle \mathrm{BLD} = \angle \mathrm{CMD} = 90^{\circ}$

BD = CD

DL = DM

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

$\Delta \mathrm{BLD} \cong \Delta \mathrm{CMD}$

The corresponding parts of the congruent triangled are equal.

$\angle \mathrm{ABD} = \angle \mathrm{ACD}$

In $\triangle \mathrm{ABC},$ we have

$\Rightarrow$ AB = AC

sides opposite to equal angles are equal

31. y = x

We have, y = x

Let x = 1 : y = 1

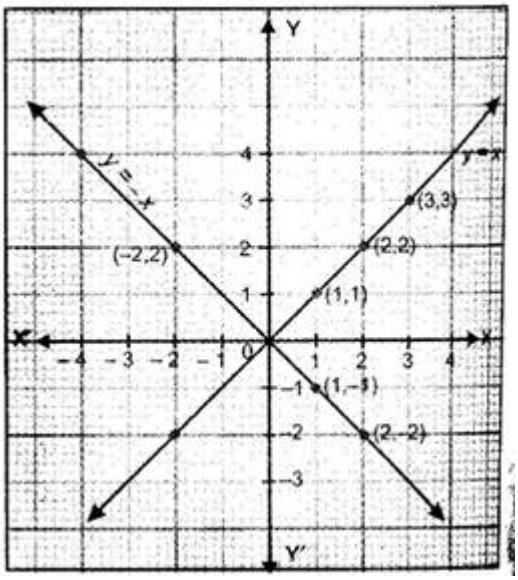
Let x = 2 : y = 2

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

Let x = 1 : y = -1

Let x = 2 : y = -2

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

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

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

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

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

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

$\therefore \quad b = 3-2\sqrt{2}$ ...(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.

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

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

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

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

$= x^{b^2-ab-c^2+ac+c^2-bc-a^2+ab+a^2-ac-b^2+bc}$

$= x^0$

= 1

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

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

BM = AM…(2)

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

BN = NC…(3)

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

AM = NC…(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.

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

$\Rightarrow$ 65° + y = 180°

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

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

$\therefore$ x = y = 115° [corresponding angles]

Now, ABG is a straight line.

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

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

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

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

We know that the sum of the angles of a triangle is 180°.

From $\triangle$EAB, we get

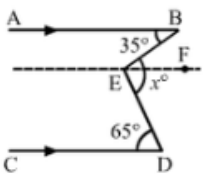
$\angle EAB + \angle ABE + \angle BEA = 180^\circ$

$\Rightarrow$ 90° + 65° + z = 180°

$\Rightarrow$ z = (180° - 155°) = 25°

$\therefore$ x = 115°, y = 115° and z = 25°

OR



Draw EF $\parallel$ AB $\parallel$ CD

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

Then,

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

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

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

Then,

$\angle DEF = \angle FED$

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

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

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

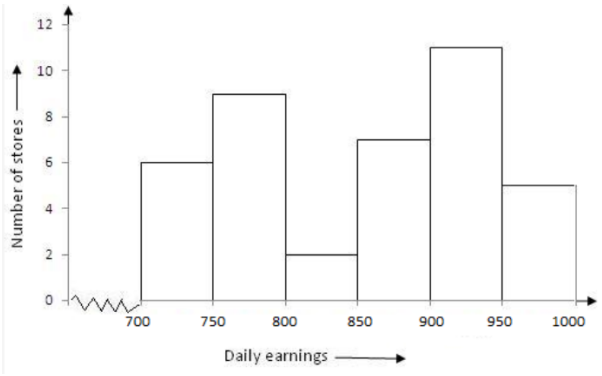
$x^\circ = 100^\circ$

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

h = Height of the conical tent = 9 m

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

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

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

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

ii. We have,

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

h = Height of the conical tent = 9 m

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

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

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

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

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

iii. We have,

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

h = Height of the conical tent = 9 m.

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

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

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

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

We have, Air space required person = 15 m^3

$\therefore$ 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 = 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 m^3 of space to breathe

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

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

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

h = 13.25 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

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

$\Rightarrow$ z = $\frac{7}{3} \times y$

$\Rightarrow$ z = $\frac{7}{3} \times 15$

$\Rightarrow$ 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 ΔADC, P and Q are mid points of sides AB and BC of ΔABC, then by mid-point theorem SR || AC and SR = $\frac{1}{2}$AC similarly PQ || AC and PQ = $\frac{1}{2}$AC.

Therefore SR || 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^o, Opposite angles of a parallelogram are equal.

iii. Adjacent angles of a parallelogram are supplementary.

Thus, $\angle$RSP + $\angle$SPQ = 180^o

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

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

$= 130^{o}$

OR

RQ = 3 cm

Opposite side of a parallelogram are equal.