Goa Board
Class IX Mathematics
Term II
Sample Paper - 1 Solution

(SECTION – A)

1. Correct Answer: C
Graph of equation x = k is parallel to the y-axis.

2. Correct Answer: B
As this data will be available through some agency only and will not be collected by the student himself, it is known as secondary data.

3. Correct Answer: A
The positive solutions of the equation ax + by + c = 0 always lie in the 1st quadrant.

4. Correct Answer: C
Perpendicular from the centre of a circle to a chord bisects the chord.
Given, PR = 5 cm and OR = 12 cm

$PO = \sqrt{(12)^2 + (5)^2}$

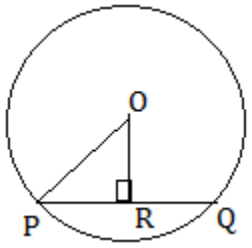
$\Rightarrow PO = \sqrt{144 + 25}$

$\Rightarrow PO = \sqrt{169}$

$\Rightarrow PO = 13$

PO = radius = 13 cm

∴ Diameter = 26 cm



5. Correct Answer: D
As the cylinder is dripped vertically to half its height, therefore half the total surface area of the cylinder would be painted.

6. Correct Answer: A

Let a be the lower limit of the class.

Hence a + 8 is the upper limit of the class.

Also,

$$\frac{\text{Upper limit} + \text{lower limit}}{2} = \text{Class} - \text{mark}$$

$$\Rightarrow \frac{a + (a+8)}{2} = 10$$

$$\Rightarrow a + (a+8) = 20$$

$$\Rightarrow 2a = 20 - 8$$

$$\Rightarrow 2a = 12$$

$$\Rightarrow a = 6$$

The lower limit of the class is 6.

7. Correct Answer: A

Diagonal of a cuboid = $\sqrt{l^2 + b^2 + h^2} = 11$

$$\Rightarrow l^2 + b^2 + h^2 = 121$$

Given,

$l + b + h = 19$

$$(l + b + h)^2 = 361$$

$$\Rightarrow l^2 + b^2 + h^2 + 2(lb + bh + lh) = 361$$

$$\Rightarrow 121 + 2(lb + bh + lh) = 361$$

$$\Rightarrow 2(lb + bh + lh) = 361 - 121 = 240$$

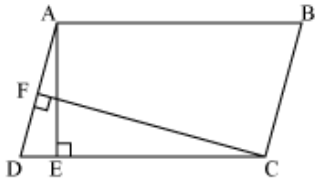
Hence, the surface area of the cuboid is 240 cm^2.

8. Correct Answer: C

If the adjacent sides of a quadrilateral are equal, then the quadrilateral is a kite.

(SECTION – B)

9. In parallelogram ABCD, CD = AB = 16 cm
[Opposite sides of a parallelogram are equal]
We know that,
Area of parallelogram = Base × corresponding altitude
Area of parallelogram ABCD = CD × AE = AD × CF
16 cm × 8 cm = AD × 10 cm
Thus, the length of AD is 12.8 cm.



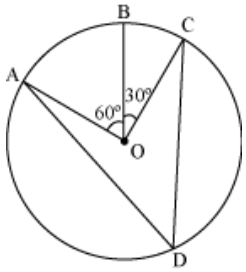
10.

i. Mean is appropriate measure of central tendency in all the cases where it is important to take all observations into account and data does not have any extreme values for example in case of temperature of a month.

ii. Mean is not suitable in cases where there are very high and low values for example salary in a company.

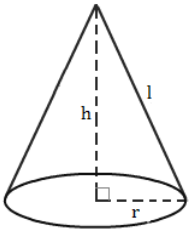
11. We may observe that
$m\angle AOC = m\angle AOB + m\angle BOC = 60° + 30° = 90°$
We know that the angle subtended by an arc at its centre is double the angle subtended by it at any point on the remaining part of the circle.

$$m\angle ADC = \frac{1}{2}m\angle AOC = \frac{1}{2}\times 90° = 45°$$



12. When rotated about the side of 4 cm.
Given,
r = 3 cm, h = 4 cm, l = 5 cm

$$\text{Volume of solid} = \frac{1}{3}\pi r^2 h = \left(\frac{1}{3}\times\pi\times(3)^2\times 4\right)cm^3 = 37.68cm^3$$



13. Total number of bags = 11
Number of bags containing more than 5 kg of flour = 7

$$\text{Required probability} = \frac{7}{11}$$

14. 9 students have A blood groups, 6 have B, 3 have AB and 12 have O.

So, the table representing the data in the form of a frequency distribution table is as follows:

Blood group	Number of students
A	9
B	6
AB	3
O	12
Total	30

As 12 students have the O blood group and 3 have AB blood group, O is the most common blood group and AB is the rarest blood group.

(SECTION – C)

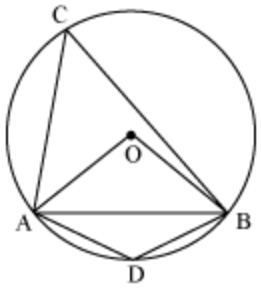
15. In ΔOAB

$AB = OA = OB =$ radius

$\therefore \Delta OAB$ is an equilateral triangle.

So, each interior angle of this triangle will be of $60°$.

$\therefore m\angle AOB = 60°$



Now, $\angle ACB = \frac{1}{2}\angle AOB = \frac{1}{2}(60°) = 30°$

In cyclic quadrilateral ACBD,

$m\angle ACB + m\angle ADB = 180°$ (Opposite angle in cyclic quadrilateral)

$\Rightarrow m\angle ADB = 180° - 30° = 150°$

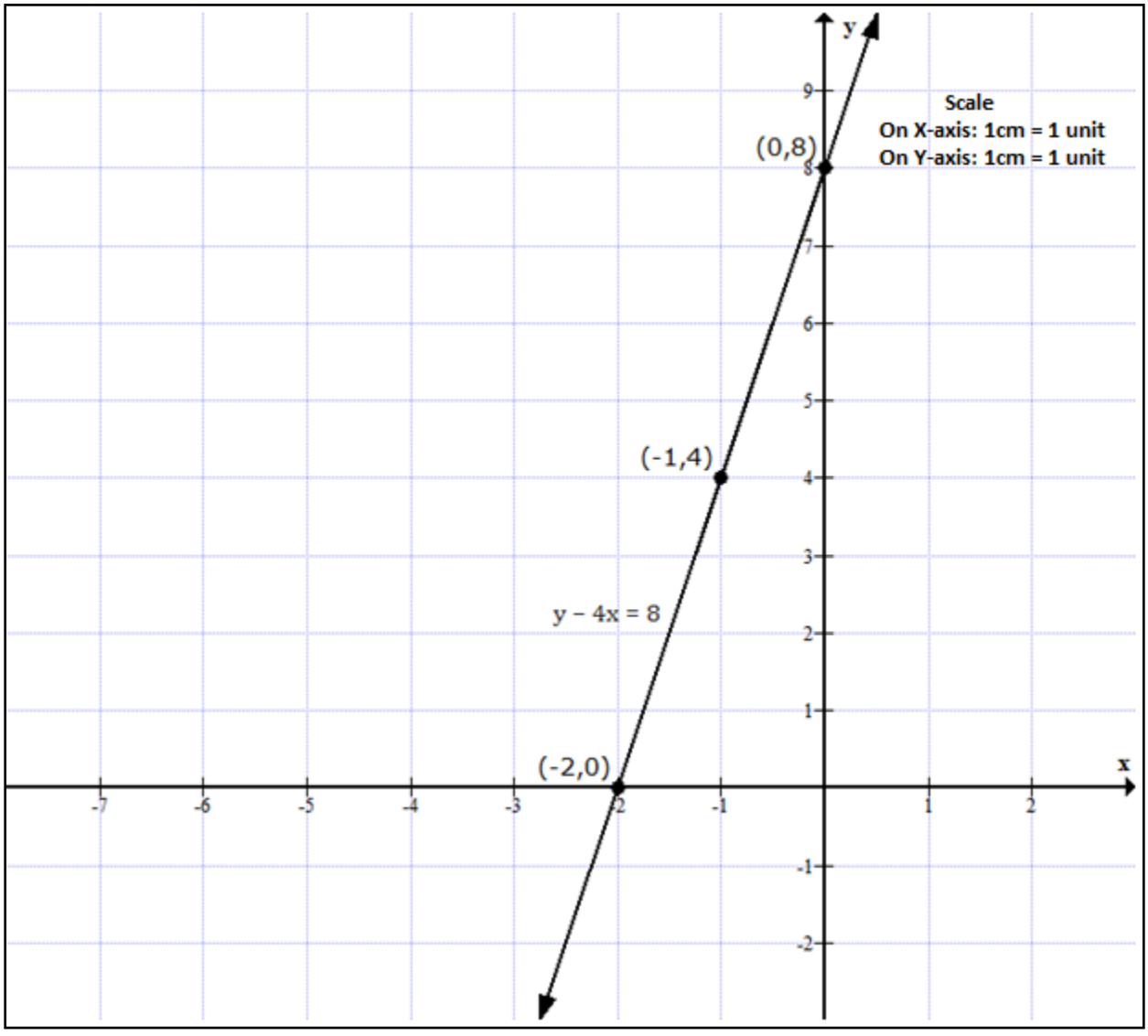
Hence, angles subtended by this chord at a point on major arc and minor arc are $30°$ and $150°$ respectively

16. The given equation is $y - 4x = 8$.

$y - 4x = 8 \Rightarrow y = 8 + 4x$

x	0	–1	–2
y	8	4	0

Now plot the points (0, 8), (–1, 4) and (–2, 0). Draw a line passing through these points.



17. The given tank is cuboidal in shape having its length (l) as 20 m, breadth (b) as 15 m and height (h) as 6m.

Capacity of tank = l × b × h

⇒ Capacity of tank = (20 × 15 × 6) m^3 = 1800 m^3

⇒ Capacity of tank = 1800000 litres

Water consumed by people of the village in 1 day = 4000 × 150 litres = 600000 litres

Let us assume that the water in the tank lasts for n days.

Water consumed by all people of the village in n days = capacity of tank

⇒ n × 600000 = 18000000

⇒ n = 30

Water in this tank will last for 30 days.

OR

Given,

Length (l) = 5 m, Breadth (b) = 4 m, Height (h) = 3 m

Four walls and the ceiling of the room are to be white-washed. The floor of the room is not to be white-washed.

Area to be white-washed = Area of walls + Area of ceiling of room = 2lh + 2bh + lb

= [2 × 5 × 3 + 2 × 4 × 3 + 5 × 4] m^2

= (30 + 24 + 20) m^2

∴ Area to be white-washed = 74 m^2

Cost of white-washing per m^2 area = Rs. 7.50

Cost of white-washing 74 m^2 area = Rs. (74 × 7.50) = Rs. 555

18. Total number of bags is 5.

i. Number of bags in which more than 40 seeds germinated out of 50 seeds is 3.

P (germination of more than 40 seeds in a bag) = $\frac{3}{5}$ = 0.6

ii. Number of bags in which 49 seeds germinated = 0

P (germination of 49 seeds in a bag) = $\frac{0}{5}$ = 0

iii. Number of bags in which more than 35 seeds germinated = 5.

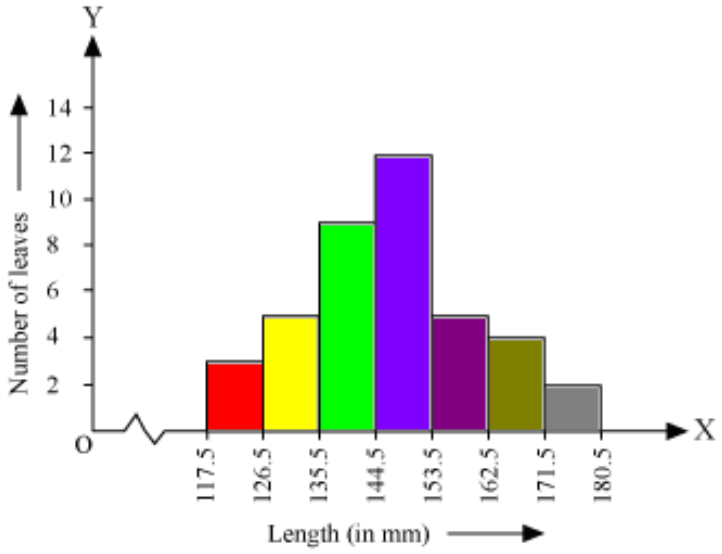
The required probability = $\frac{5}{5}$ = 1

19.

i. The length of leaves is represented in discontinuous class intervals with a difference of 1mm in between them. So we have to add $\frac{1}{2} = 0.5\text{mm}$ to each upper class limit and also have to subtract 0.5 mm from the lower class limits so as to make our class intervals continuous.

Length (in mm)	Number of leaves
117.5 – 126.5	3
126.5 – 135.5	5
135.5 – 144.5	9
144.5 – 153.5	12
153.5 – 162.5	5
162.5 – 171.5	4
171.5 – 180.5	2

Now taking length of leaves on the x-axis and number of leaves on the y-axis we can draw the histogram of this information as below:



Here 1 unit on the y-axis represents 2 leaves.

ii. Other suitable graphical representation of this data could be a frequency polygon.

iii. No as maximum numbers of leaves (i.e. 12) have their length in between of 144.5 mm and 153.5 mm. It is not necessary that all have their lengths as 153 mm.

20. Total distance covered = x km.

Fare for the 1st kilometre = Rs. 8

Fare for the remaining distance per kilometre= Rs. (x – 1) x 5

Total fare = 8 + (x – 1) 5

$y = 8 + 5x - 5$

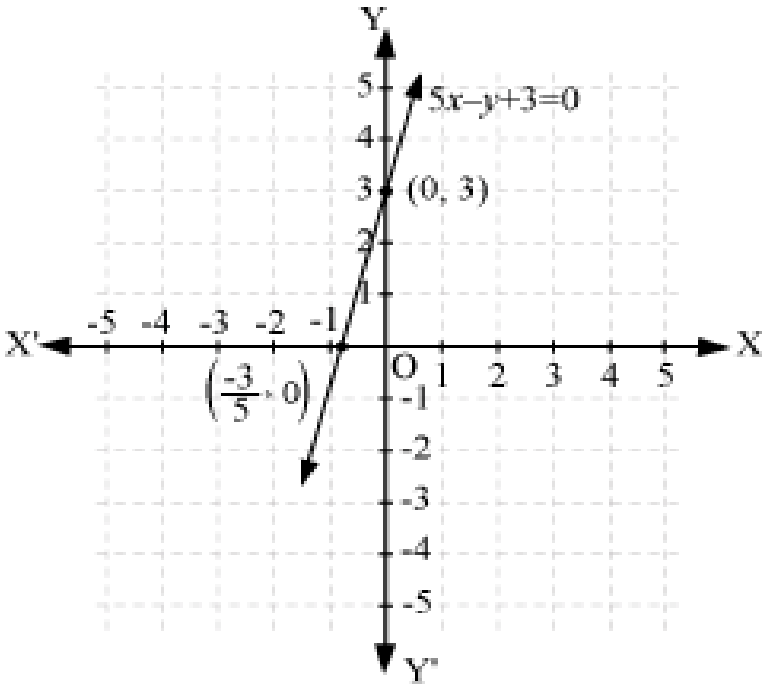
$y = 5x + 3$

$5x - y + 3 = 0$

We observe that point (0, 3) and $\left(-\frac{3}{5}, 0\right)$ satisfy the above equation. So these are solutions of this equation.

x	0	$\frac{-3}{5}$
y	3	0

Now we may draw the graph of this equation as below



Here we may find that the variables x and y are representing the distance covered and fare paid for that distance respectively and these quantities may not be negative. Hence we will consider only those values of x and y which are lying in 1st quadrant.

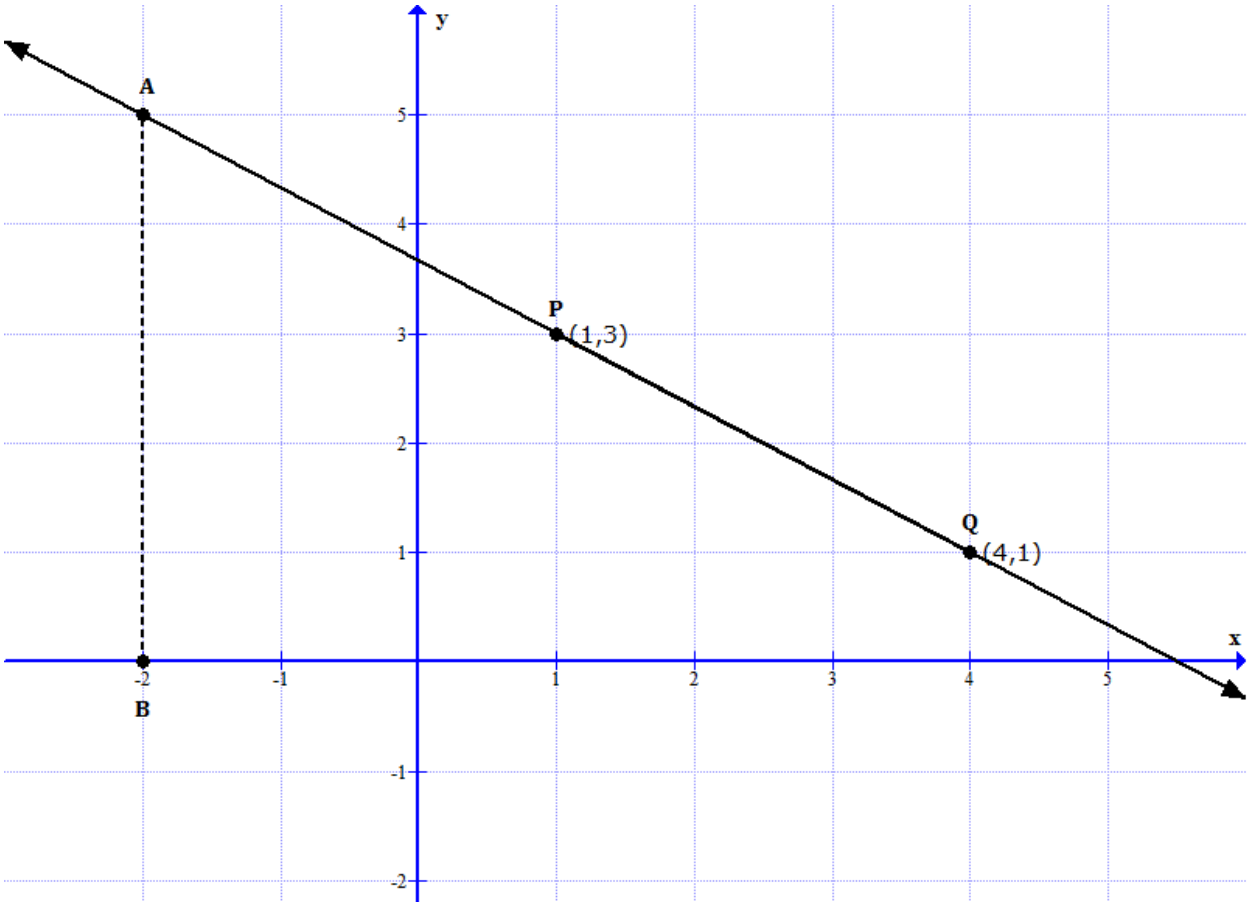
OR

The given equation is $2x + 3y = 11$.

$\Rightarrow y = \frac{11-2x}{3}$

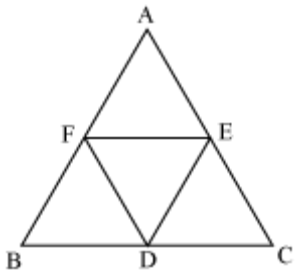
x	1	4
y	3	1

Plot points (1, 3), (4, 1). Draw line passing through the points.



From the graph we can see that if y = 5 then the value of x is –2.

21.



In ΔABC,
E and F are midpoints of side AC and AB respectively.
By using the mid-point theorem we get,

$EF \parallel CB$ and $EF = \frac{1}{2}(CB)$

As D is the midpoint of CB

$\Rightarrow BD = \frac{1}{2}(CB)$

So, BD = EF
The line segments BF and DE join two parallel lines EF and BD of the same length.
Hence the line segments BF and DE will also be parallel to each other and also equal in length.
Therefore BDEF is a parallelogram.
Similarly we can prove that DCEF and AFDE are also parallelograms.
We know that the diagonals of a parallelogram divide it into two triangles of equal area.

∴ Area (ΔBFD) = area (ΔDEF) (for parallelogram BDEF)
Area (ΔCDE) = area (ΔDEF) (for parallelogram DCEF)
Area (ΔAFE) = area (ΔDEF) (for parallelogram AFDE)
∴ Area (ΔAFE) = area (ΔBFD) = area (ΔCDE) = area (ΔDEF)
Now,
Area (ΔAFE) + area (ΔBDF) + area (ΔCDE) + area (ΔDEF) = area (ΔABC)
⇒ Area (ΔDEF) + area (ΔDEF) + area (ΔDEF) + area (ΔDEF) = area (ΔABC)
⇒ 4 area (ΔDEF) = area (ΔABC)

$\Rightarrow$ Area (ΔDEF) = $\frac{1}{4}$ area (ΔABC)

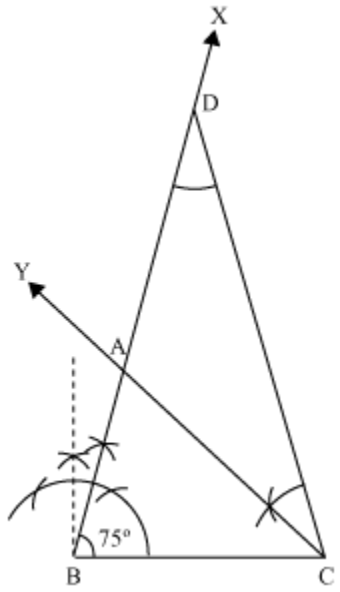
22. The steps of construction for the required triangle are as follows:

Step I: Draw a line segment BC of 7 cm. At point B draw an angle of 75° say ∠ XBC.

Step II: Cut a line segment BD = 13 cm (that is equal to AB + AC) from the ray BX.

Step III: Join DC and make ∠DCY equal to ∠BDC.

Step IV: Let CY intersects BX at A. ΔABC is the required triangle.



23. Total surface area of one brick = 2(lb + bh + lh)

= [2(22.5 ×10 + 10 × 7.5 + 22.5 × 7.5)] cm^2

= 2(225 + 75 + 168.75) cm^2

= (2 × 468.75) cm^2

= 937.5 cm^2

Let n bricks be painted by the paint in the container.

Area of n bricks = (n ×937.5) cm^2 = 937.5n cm^2

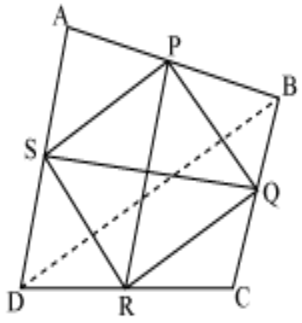
Area that can be painted by paint in the container = 9.375 m^2 = 93750 cm^2

∴ 93750 = 937.5 n

n = 100

Therefore, 100 bricks can be painted out by the paint of the container.

24. Let ABCD be a quadrilateral in which P, Q, R and S are mid-points of sides AB, BC, CD and DA respectively.



Join PQ, QR, RS, SP and BD.

In ΔABD, S and P are the mid points of AD and AB respectively.

By using the mid-point theorem, we can say that

$SP \parallel BD$ and $SP = \frac{1}{2} BD$ ... (1)

Similarly in ΔBCD

$QR \parallel BD$ and $QR = \frac{1}{2} BD$ ... (2)

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

$SP \parallel QR$ and $SP = QR$

As in quadrilateral SPQR, one pair of opposite sides are equal and parallel to each other.

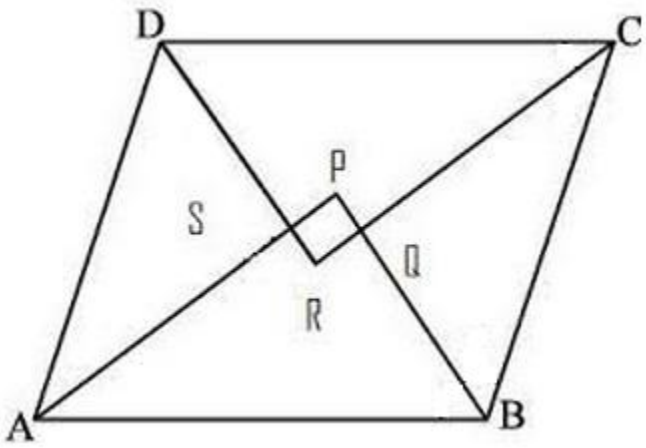
So, SPQR is a parallelogram.

Since, diagonals of a parallelogram bisect each other.

Hence, PR and QS bisect each other.

(SECTION – D)

25.



Since DS bisect ∠D and AS bisects ∠A, therefore,

$$\angle DAS + \angle ADS = \frac{1}{2}\angle A + \frac{1}{2}\angle D$$

$$\Rightarrow m\angle DAS + m\angle ADS = \frac{1}{2}(m\angle A + m\angle D) = \frac{1}{2}\times 180° = 90°$$

∠ A and ∠ D are interior angles on the same sides of the transversal.

Also,

m∠ DAS + m∠ADS + m∠DSA = 180° (Angle sum property of triangle)

⇒ 90° + m∠DSA = 180°

⇒ m∠DSA = 90°

So, m∠PSR = 90°

Similarity, it can be shown that m∠APB = 90° or m∠SPQ = 90°.

Similarly, m∠PQR = 90° and m∠SRQ = 90°.

So, PQRS is a quadrilateral which is all angles are right angles.

We have shown that m∠PSR = m∠PQR = 90° and m∠SPQ = m∠SRQ = 90°.

So both the pairs of opposite angles are equal.

Therefore, PQRS is a parallelogram in which one angle (in fact all angles) is 90°.

So, PQRS is a rectangle.

26. The steps of construction for the required triangle are as follows:

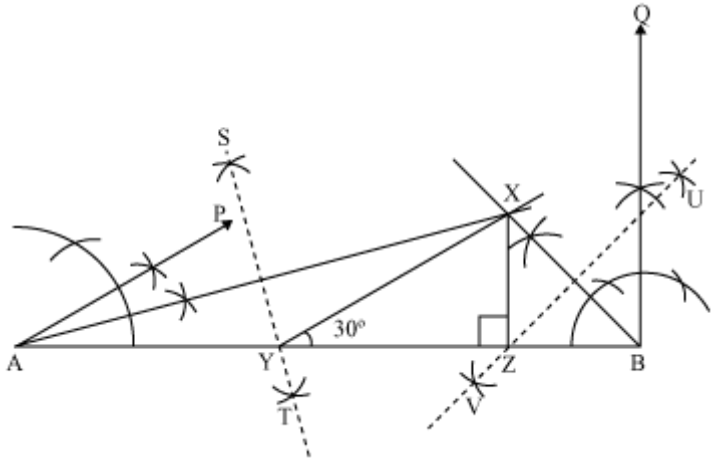
Step I: Draw a line segment AB of 11 cm (As XY + YZ + ZX = 11 cm).

Step II: Construct ∠PAB of 30° at point A and an angle ∠QBA of 90° at point B.

Step III: Bisect ∠PAB and ∠QBA. Let these bisectors intersect each other at point X.

Step IV: Draw perpendicular bisector ST of AX and UV of BX.

Step V: Let ST intersects AB at Y and UV intersects AB at Z. Join XY and XZ. ΔXYZ is the required triangle.



OR

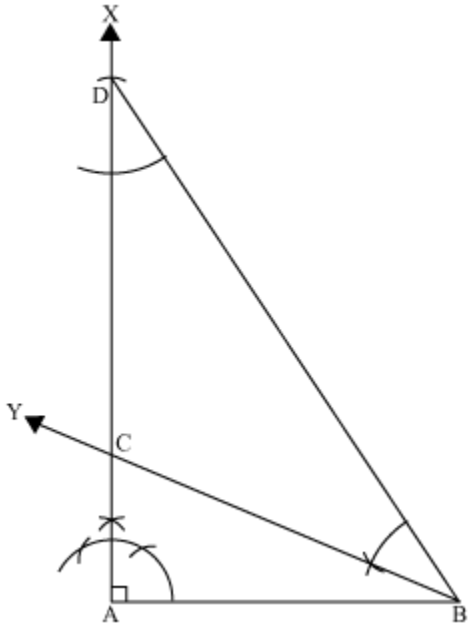
The steps of construction for the required triangle are as follows:

Step I: Draw line segment AB of 12 cm. Draw a ray AX making 90° with AB.

Step II: Cut a line segment AD of 18 cm. (As sum of other two sides is 18) from ray AX.

Step III: Join DB and make an ∠DBY equal to ∠ADB.

Step IV: Let BY intersect AX at C. Join AC and BC. ΔABC is the required triangle.



27. Let the first number be x and second number be y.

According to the given information,

$2x+3y=12+50\%(x)$

$\Rightarrow 2x+3y=12+\frac{50}{100}(x)$

$\Rightarrow 2x+3y=12+\frac{1}{2}(x)$

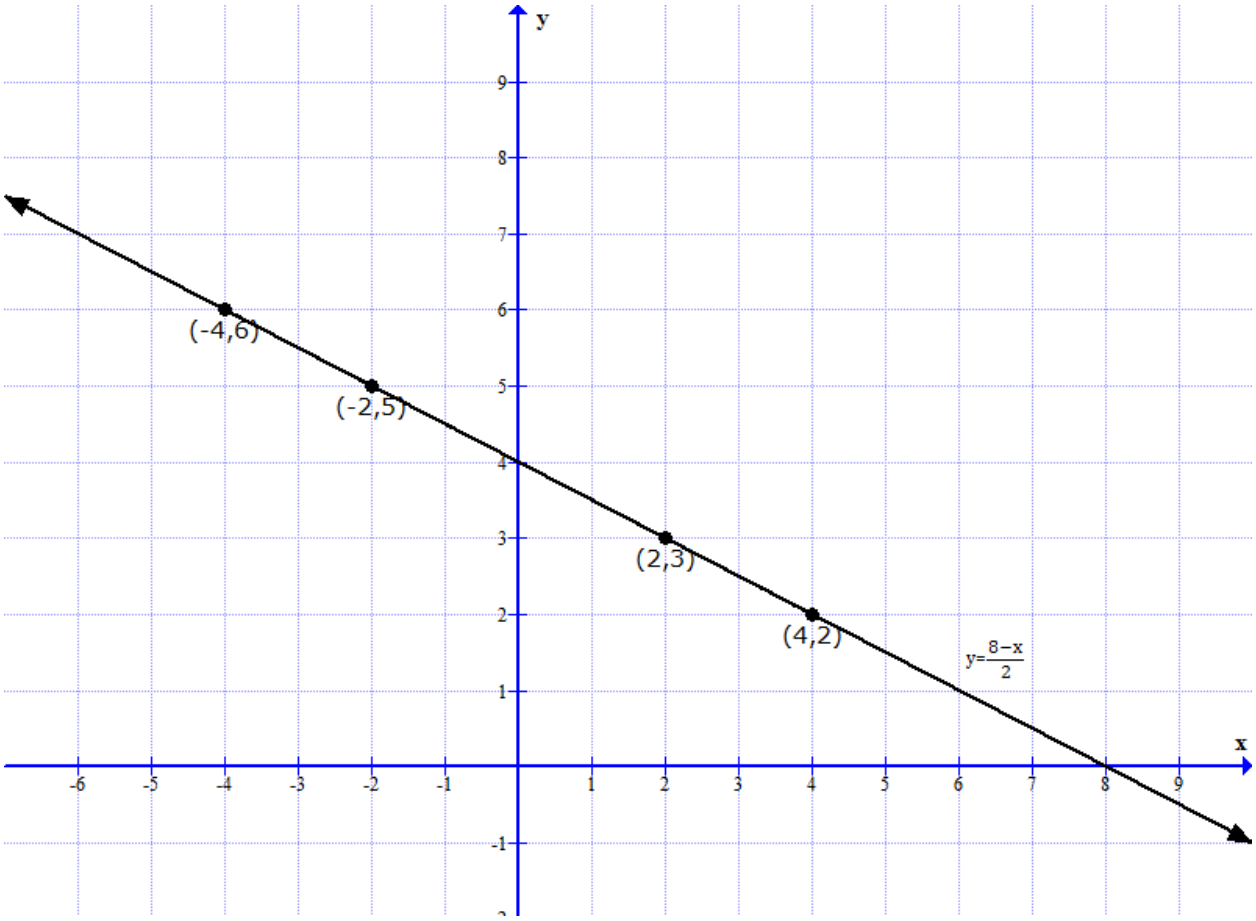
$\Rightarrow 4x-x+6y=24$

$\Rightarrow 3x+6y=24$

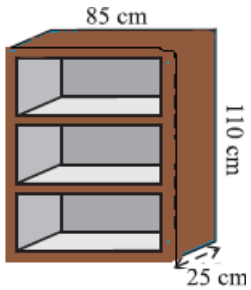
$\Rightarrow x+2y=8$

Let us plot the graph of the equation $y=\frac{8-x}{2}$.

x	-4	-2	2	4
y	6	5	3	2



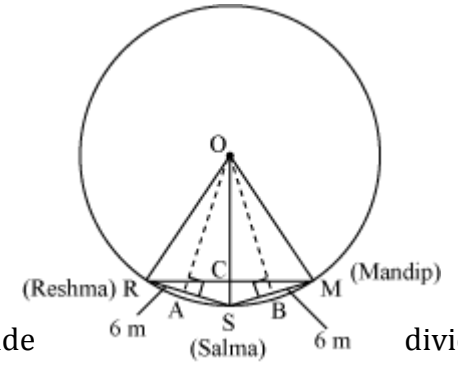
28. Given,



External length (l) of bookshelf = 85 cm.
External breadth (b) of bookshelf = 25 cm.
External height (h) of bookshelf = 110 cm.
External surface area of shelf excluding its front face = lh + 2 (lb + bh)
External surface area of shelf excluding its front face = [85 × 110 + 2 (85 × 25 + 25 × 110)] cm^2
External surface area of shelf excluding its front face = 19100 cm^2
Area of front face = [85 × 110 – 75 × 100 + 2 (75 × 5)] cm^2
= 1850 + 750 cm^2 = 2600 cm^2
Area to be polished = (19100 + 2600) cm^2 = 21700 cm^2
Cost of polishing 1 cm^2 area = Rs 0.20
Cost of polishing 21700 cm^2 area = Rs. (21700 × 0.20) = Rs. 4340
Now, length (l), breadth (b) height (h) of each row of bookshelf is 75 cm, 20 cm, and 30 cm $\left(=\frac{110-20}{3}\right)$ respectively.
Area to be painted in 1 row = 2 (l + h) b + lh
= [2 (75 + 30) × 20 + 75 × 30] cm^2
= (4200 + 2250) cm^2
= 6450 cm^2
Area to be painted in 3 rows = (3 × 6450) cm^2 = 19350 cm^2
Cost of painting 1 cm^2 area = Rs. 0.10
Cost of painting 19350 cm^2 area = Rs. (19350 × 0.10) = Rs. 1935
Total expense required for polishing and painting the surface of the bookshelf = Rs. (4340 + 1935) = Rs. 6275

29. Let R, S and M be the position of Reshma, Salma and Mandip repectively.

$AR = AS = \frac{6}{2} = 3\text{m}$



OR = OS = OM = 5 m (radii of circle)

In ΔOAR

$OA^2 + AR^2 = OR^2$

$OA^2 + (3\text{ m})^2 = (5\text{ m})^2$

$OA^2 = (25 - 9)\text{ m}^2 = 16\text{ m}^2$

$OA = 4\text{ m}$

We know that in an isosceles triangle altitude divides the base, so in ΔRSM

$m\angle RCS$ will be 90° and RC = CM

$\text{Area of } \Delta ORS = \frac{1}{2} \times OA \times RS$

$\Rightarrow \frac{1}{2} \times RC \times OS = \frac{1}{2} \times 4 \times 6$

$RC \times 5 = 24$

$RC = 4.8$

$RM = 2RC = 2(4.8) = 9.6$

So, distance between Reshma and Mandip is 9.6 m.

30. Given that,

XY || BC $\Rightarrow$ EY || BC

BE || AC $\Rightarrow$ BE || CY

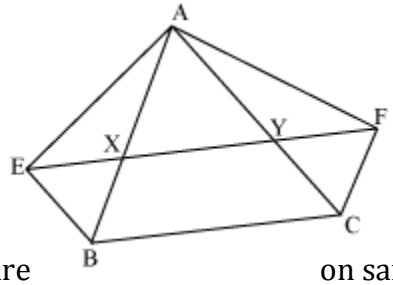
So, EBCY is a parallelogram.

It is given that

XY || BC $\Rightarrow$ XF || BC

FC || AB $\Rightarrow$ FC || XB

So, BCFX is a parallelogram.



Now parallelogram EBCY and parallelogram BCFX are on same base BC and between the same parallels BC and EF

$\therefore$ area (EBCY) = area (BCFX) ... (1)

Consider parallelogram EBCY and ΔAEB

These are on same base BE and are between same parallels BE and AC

$\therefore$ area (ΔABE) = $\frac{1}{2}$ area (EBCY) ... (2)

Also parallelogram BCFX and ΔACF are on same base CF and between same parallels CF and AB

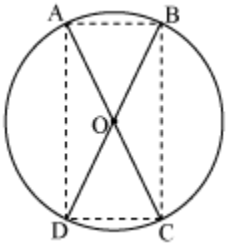
$\therefore$ area (ΔACF) = $\frac{1}{2}$ area (BCFX) ... (3)

From equations (1), (2), and (3), we have

Area (ΔABE) = area (ΔACF)

OR

Let two chords AB and CD intersect each other at point O.



In ΔAOB and ΔCOD

$OA = OC$ (given)

$OB = OD$ (given)

$\angle AOB = \angle COD$ (vertically opposite angles)

$\Delta AOB \cong \Delta COD$ (SAS congruence rule)

$AB = CD$ (by CPCT)

Similarly, we can prove $\Delta AOD \cong \Delta COB$

$\therefore AD = CB$ (by CPCT)

Since in quadrilateral ACBD opposite sides are equal in length.

Hence, ACBD is a parallelogram.

We know that opposite angles of a parallelogram are equal

$\therefore \angle A = \angle C$

But $m\angle A + m\angle C = 180°$ (ABCD is a cyclic quadrilateral)

$\Rightarrow m\angle A + m\angle A = 180°$

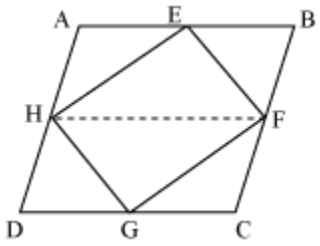
$\Rightarrow 2m\angle A = 180°$

$\Rightarrow m\angle A = 90°$

As ACBD is a parallelogram and one of its interior angles is 90°, so it is a rectangle.

$\angle A$ is the angle subtended by chord BD. And as $m\angle A = 90°$, so BD should be the diameter of the circle. Similarly AC is the diameter of the circle.

31. Construction: Join HF.



In parallelogram ABCD

AD = BC and AD || BC

(Opposite sides of a parallelogram are equal and parallel)

AB = CD

[Opposite sides of a parallelogram are equal]

$\Rightarrow \frac{1}{2}AD = \frac{1}{2}BC$ and AH || BF

$\Rightarrow$ AH = BF and AH || BF [$\because$ H and F are mid points of AD and BC]

Therefore, ABFH is a parallelogram.

Since ΔHEF and parallelogram ABFH are on the same base HF and between the same parallel lines AB and HF.

$\therefore$ area $(\Delta HEF) = \frac{1}{2}$ area (ABFH) ... (1)

Similarly, we can prove

$\therefore$ area $(\Delta HGF) = \frac{1}{2}$ area (HDCF) ... (2)

On adding equations (1) and (2), we have

$$\text{area}\left(\Delta HEF\right)+\text{area}\left(\Delta HGF\right)=\frac{1}{2}\text{area}\left(ABFH\right)+\frac{1}{2}\text{area}\left(HDCF\right)$$

$$=\frac{1}{2}\left[\text{area}\left(ABFH\right)+\text{area}\left(HDCF\right)\right]$$

$$\Rightarrow \text{area}\left(EFGH\right)=\frac{1}{2}\text{area}\left(ABCD\right)$$

32. Let the father's age be x and son's age be y.

After 2 years father's age will be (x + 2) and son's age will be (y + 2).

According to the given condition,

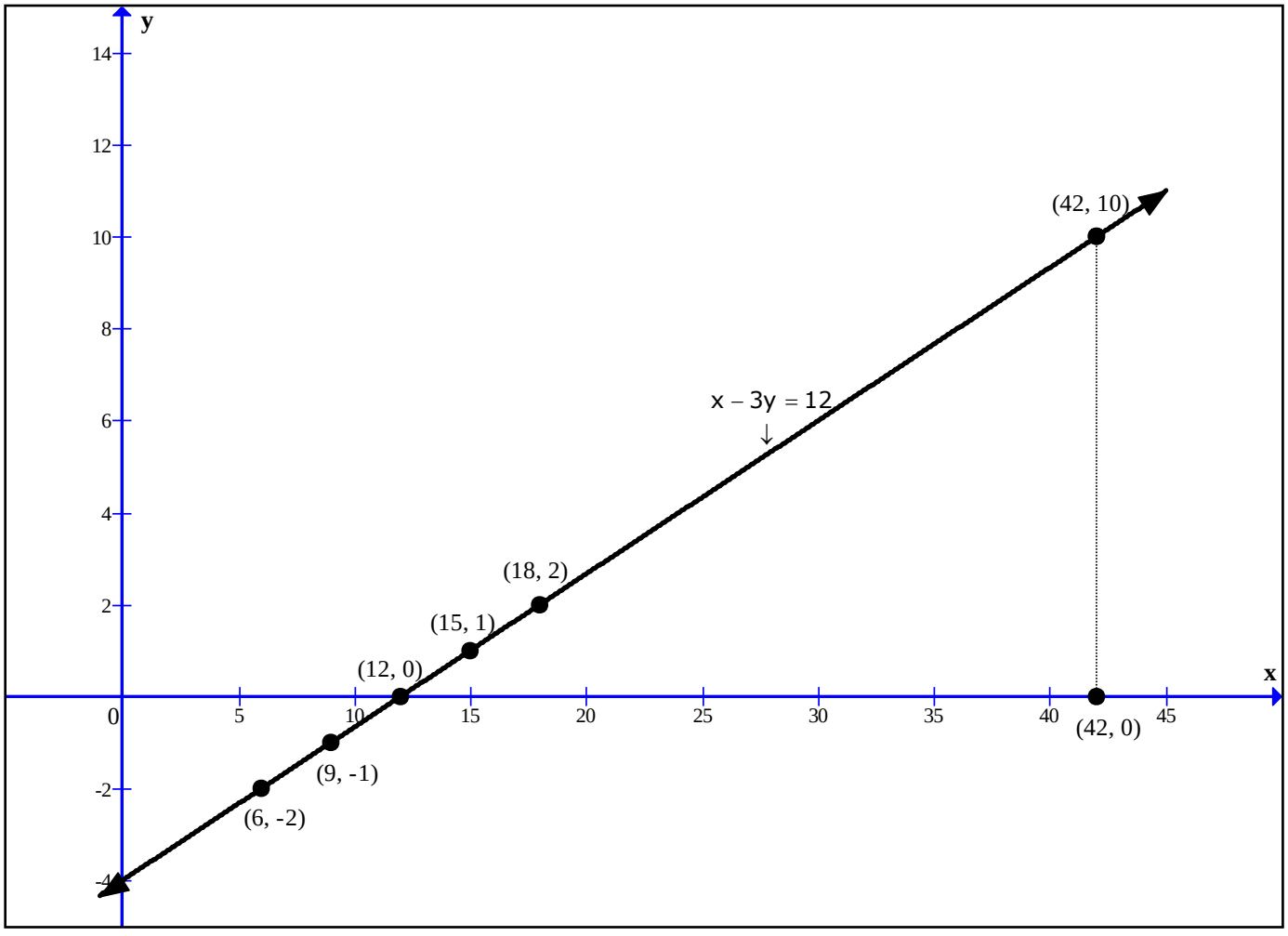
$x + 2 = 3(y + 2) + 8$

$\Rightarrow x + 2 = 3y + 6 + 8$

$\Rightarrow x - 3y = 14 - 2$

$\Rightarrow x - 3y = 12$

x	6	9	12	15	18	42
y	−2	−1	0	1	2	10



From the graph we can see that when the son is 10 years, the father's age is 42 years.

33. Let the diameter of the sphere be d.

Radius (r_1) of the sphere $= \frac{d}{2}$

It is given that the diameter of the sphere is decreased by 25%.

$\therefore$ New radius (r_2) of the sphere $= \frac{d}{2}\left(1 - \frac{25}{100}\right) = \frac{3}{8}d$

CSA (S_1) of the sphere = $4\pi r_1^2 = 4\pi\left(\frac{d}{2}\right)^2 = \pi d^2$

CSA (S_2) of the new sphere = $4\pi r_2^2 = 4\pi\left(\frac{3d}{8}\right)^2 = \frac{9}{16}\pi d^2$

Decrease in CSA of sphere = $S_1 - S_2 = \pi d^2 - \frac{9}{16}\pi d^2 = \frac{7}{16}\pi d^2$

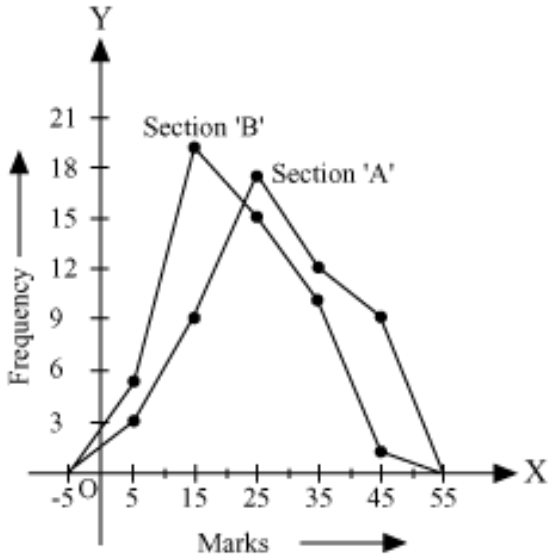
Percentage decrease in CSA of sphere $= \frac{S_1 - S_2}{S_1} \times 100 = \frac{7\pi d^2}{16\pi d^2} \times 100 = \frac{700}{16} = 43.75\%$

34. We can find class marks of given class intervals by using formula –

$$\text{Class mark} = \frac{\text{upper class limit} + \text{lower class limit}}{2}$$

Section A			Section B		
Marks	**Class marks**	**Frequency**	**Marks**	**Class marks**	**Frequency**
0 – 10	5	3	0 – 10	5	5
10 – 20	15	9	10 – 20	15	19
20 – 30	25	17	20 – 30	25	15
30 – 40	35	12	30 – 40	35	10
40 – 50	45	9	40 – 50	45	1

Now taking class marks on the x-axis and frequency on the y-axis and choosing an appropriate scale (1 unit = 3 for the y-axis) we can draw a frequency polygon as below:



From the graph we see that the performance of students of section ‘A’ is better than that of students of section ‘B’.