Class IX Session 2025-26
Subject - Mathematics
Sample Question Paper - 2

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

Read the following instructions carefully and follow them:

1. This question paper contains 38 questions.
2. This Question Paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Questions no. 1-18 are multiple choice questions (MCQs) and questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.
4. In Section B, Questions no. 21-25 are very short answer (VSA) type questions, carrying 02 marks each.
5. In Section C, Questions no. 26-31 are short answer (SA) type questions, carrying 03 marks each.
6. In Section D, Questions no. 32-35 are long answer (LA) type questions, carrying 05 marks each.
7. In Section E, Questions no. 36-38 are case study-based questions carrying 4 marks each with sub-parts of the values of 1,1 and 2 marks each respectively.
8. All Questions are compulsory. However, an internal choice in 2 Questions of Section B, 2 Questions of Section C and 2 Questions of Section D has been provided. An internal choice has been provided in all the 2 marks questions of Section E.
9. Draw neat and clean figures wherever required.
10. Take $\pi = 22/7$ wherever required if not stated.
11. Use of calculators is not allowed.

Section A

1. If g = $t^{\frac{2}{3}} + 4t^{\frac{-1}{2}}$, what is the value of g when t = 64? **[1]**

   a) 16 b) $\frac{33}{2}$

   c) $\frac{257}{16}$ d) $\frac{31}{2}$

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

   a) 2x – y = 12 b) x + 3y = 1

   c) 3x + y = 0 d) 2x + y = 9

3. The signs of abscissa and ordinate of a point in quadrant II are respectively ________. **[1]**

   a) (-, +) b) (-, -)

   c) (+, +) d) (+, -)

4. To draw a histogram to represent the following frequency distribution : **[1]**

Class interval	5-10	10-15	15-25	25-45	45-75
Frequency	6	12	10	8	15

The adjusted frequency for the class 25-45 is

a) 5
b) 6
c) 3
d) 2

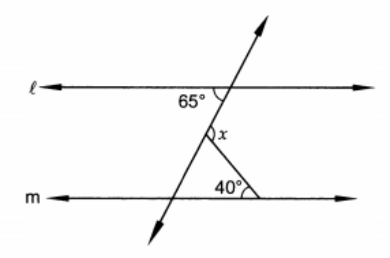
5. The linear equation 3x - 5y = 15 has **[1]**

a) infinitely many solutions
b) two solutions
c) no solution
d) a unique solution

6. Euclid's Postulate 1 is **[1]**

a) A straight line may be drawn from any one point to any other point.
b) All right angles are equal to one another.
c) A terminated line can be produced indefinitely.
d) A terminated line can be produced definitely.

7. In Fig. if *l* || *m*, then *x* = **[1]**



a) 65°
b) 105°
c) 25°
d) 40°

8. The diagonals of a rectangle PQRS intersect at O. If ∠ROQ = 60°, then find ∠OSP. **[1]**

a) 60°
b) 50°
c) 70°
d) 80°

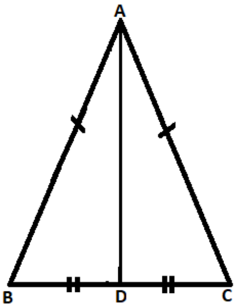
9. The factors of $x^3 - x^2y - xy^2 + y^3$, are **[1]**

a) $(x + y)^2(x - y)$
b) $(x + y)(x^2 - xy + y^2)$
c) $(x - y)^2(x + y)$
d) $(x + y)(x^2 + xy + y^2)$

10. The graph of the linear equation 2x + 3y = 6 is a line which meets the x-axis at the point **[1]**

a) (0,3)
b) (2, 0)
c) (0 ,2)
d) (3,0)

11. In the adjoining figure, AB = AC and AD is median of $\triangle ABC$, then ∠ADC is equal to **[1]**



a) 60°

b) 75°

c) 120°

d) 90°

12. The lengths of the diagonals of a rhombus are 16 cm and 12 cm. The length of each side of the rhombus is **[1]**

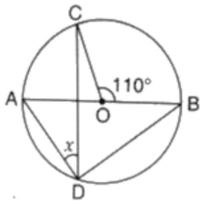
a) 8 cm

b) 12 cm

c) 10 cm

d) 9 cm

13. The value of x in the given figure is **[1]**



a) 25^o

b) 35^o

c) 45^o

d) 30^o

14. The product $\sqrt[3]{2} \cdot \sqrt[4]{2} \cdot \sqrt[12]{32}$ is equal to **[1]**

a) $\sqrt{2}$

b) 2

c) $\sqrt[12]{32}$

d) $\sqrt[12]{2}$

15. The distance between the graph of the equations x = - 3 and x = 2 is **[1]**

a) 2

b) 1

c) 5

d) 3

16. In ΔABC and ΔDEF its is given that $\angle B = \angle E$ and $\angle C = \angle F$ in order that $\Delta ABC \cong \Delta DEF$ we must have **[1]**

a) AB = DF

b) $\angle A = \angle D$

c) AC = DE

d) BC = EF

17. If a - b = -8 and ab = -12, then $a^3 - b^3$ = **[1]**

a) -240

b) -244

c) -224

d) -260

18. The total surface area of a cube of side 20 cm is **[1]**

a) 2400 cm^2

b) 160 cm^2

c) 240 cm^2

d) 1600 cm^2

19. **Assertion (A):** The sides of a triangle are 3 cm, 4 cm and 5 cm. Its area is 6 cm^2. **[1]**
Reason (R): If 2s = (a + b + c), where a, b, c are the sides of a triangle, then area = $\sqrt{(s-a)(s-b)(s-c)}$.

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):** For all values of k, $(\frac{-3}{2}, k)$ is a solution of the linear equation 2x + 3 = 0. **[1]**

Reason (R): The linear equation ax + b = 0 can be expressed as a linear equation in two variables as ax + y + b = 0.

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

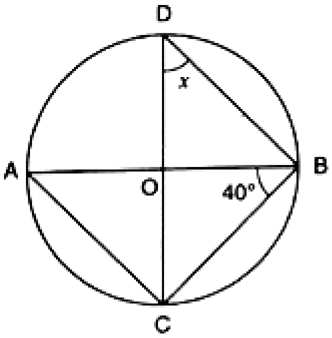
b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

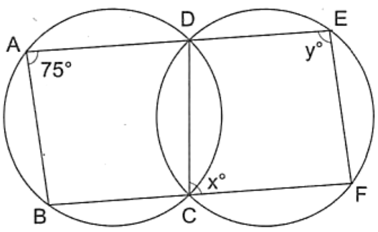
Section B

21. If O is the centre of the circle, find the value of x: **[2]**

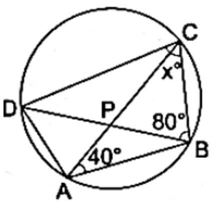


22. The area of a trapezium is 475 cm^2 and the height is 19 cm. Find the lengths of its two parallel sides if one side is 4 cm greater than the other. **[2]**

23. In the given figure, ∠BAD = 75°, ∠DCF = x° and ∠DEF = y°. Find the values of x and y. **[2]**



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



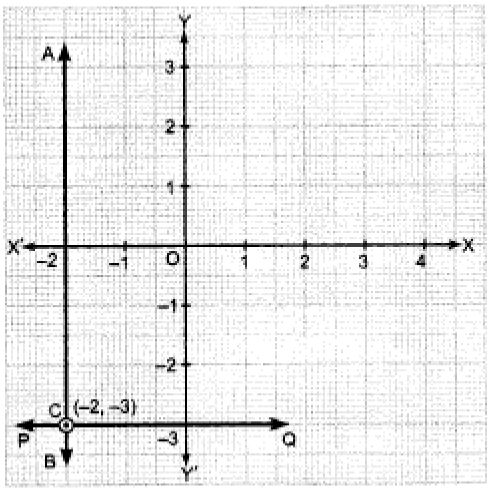
OR

An equilateral triangle of side 9 cm is inscribed in a circle. Find the radius of the circle.

25. Give the equations of two lines passing through (2, 14). How many more such lines are there, and why? **[2]**

OR

Write the linear equation represented by line AB and PQ. Also find the co-ordinate of intersection of line AB and PQ.



Section C

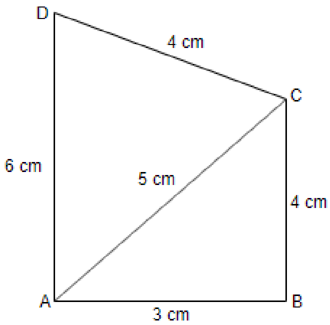
26. Rationalize the denominator of $\frac{1}{\sqrt{7}-\sqrt{6}}$ **[3]**

27. Factorise: $8a^3 - b^3 - 12a^2b + 6ab^2$ **[3]**

28. Find the cost of laying grass in a triangular field of sides 50 m, 65 m and 65 m at the rate of Rs7 per m^2. **[3]**

OR

Find the area of a quadrilateral ABCD in which AB = 3 cm, BC = 4 cm, CD = 4 cm, DA = 5cm and AC = 5 cm.

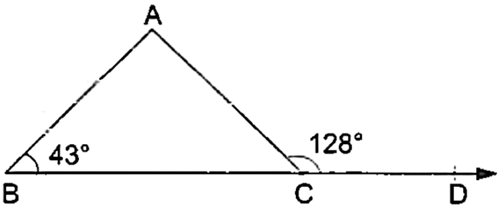


29. A hemispherical bowl made of brass has inner diameter 10.5 cm. Find the cost of tinplating it on the inside at the rate of Rs. 4 per 100 cm^2. **[3]**

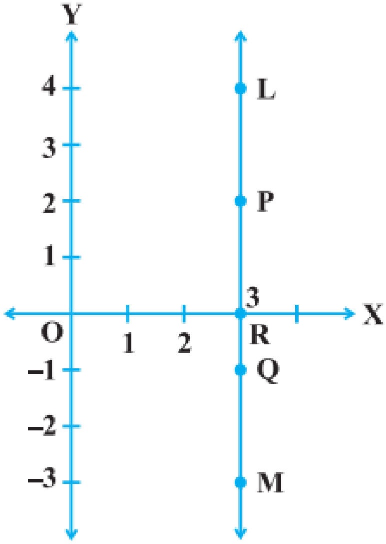
30. If △ABC is an isosceles triangle with AB = AC. Prove that the perpendiculars from the vertices B and C to their opposite sides are equal. **[3]**

OR

In the given figure, side BC of $\triangle ABC$ is produced to D. If $\angle ACD = 128^\circ$ and $\angle ABC = 43^\circ$, find $\angle BAC$ and $\angle ACB$.



31. In Figure, LM is a line parallel to the y-axis at a distance of 3 units. **[3]**



i. What are the coordinates of the points P, R and Q?

ii. What is the difference between the abscissa of the points L and M?

Section D

32. Simplify: $\frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}}$. **[5]**

OR

If $a = 3 - 2\sqrt{2}$, find the value of $a^2 - \frac{1}{a^2}$.

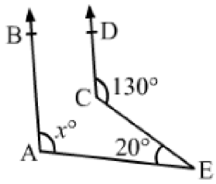
33. Read the following statements which are taken as axioms: **[5]**

i. If a transversal intersects two parallel lines, then corresponding angles are not necessarily equal.

ii. If a transversal intersect two parallel lines, then alternate interior angles are equal.

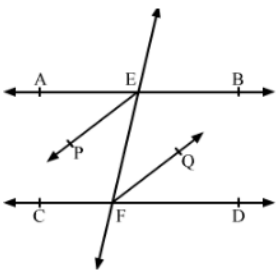
Is this system of axioms consistent? Justify your answer.

34. In the given figure, AB || CD. Find the value of x° **[5]**



OR

In the given figure, AB || CD and a transversal t cuts them at E and F respectively. If EP and FQ are the bisectors of ∠AEF and ∠EFD respectively, prove that EP || FQ.



35. The daily pocket expenses of 150 students in a school are given below: **[5]**

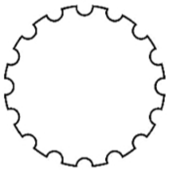
Pocket expenses (in ₹)	50-60	60-70	70-80	80-90	90- 100	100- 110	110- 120
Number of students (Frequency)	12	16	25	20	32	27	18

Construct frequency polygon representing the above data.

Section E

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

A golf ball is spherical with about 300 - 500 dimples that help increase its velocity while in play. Golf balls are traditionally white but available in colours also. In the given figure, a golf ball has diameter 4.2 cm and the surface has 315 dimples (hemi-spherical) of radius 2 mm.

i. Find the surface area of one such dimple. (1)
ii. Find the volume of the material dug out to make one dimple. (1)
iii. Find the total surface area exposed to the surroundings. (2)

OR

Find the volume of the golf ball. (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.

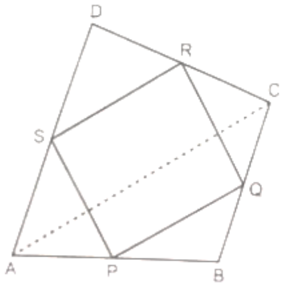
i. What is the second equation formed? (1)
ii. What is the present age of Reeta in years? (1)
iii. What is the present age of Ranjeet in years? (2)

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 ∠RSP = 30^o, then find ∠RQP. (1)

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

OR

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

Solution

Section A

1. **(b)** $\frac{33}{2}$

   Explanation:

   g = $t^{\frac{2}{3}} + 4t^{\frac{-1}{2}}$

   = $t^{\frac{2}{3}} + 4 \times \frac{1}{t^{\frac{1}{2}}}$

   = $(64)^{\frac{2}{3}} + 4 \times \frac{1}{64^{\frac{1}{2}}}$

   = $\left(4^3\right)^{\frac{2}{3}} + 4 \times \frac{1}{(8^2)^{\frac{1}{2}}}$

   = $4^{\frac{2}{3} \times 3} + 4 \times \frac{1}{8^{2 \times \frac{1}{2}}}$

   = $4^2 + \frac{4}{8}$

   = $16 + \frac{1}{2}$

   = $\frac{33}{2}$

2. **(a)** 2x – y = 12

   Explanation:

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

   2x - y = 12

   LHS = 2x - y

   2.5 - (-2)

   10 + 2

   12

   RHS = 12

   LHS = RHS

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

3. **(a)** (-, +)

   Explanation:

   (-, +)

4. **(d)** 2

   Explanation:

   Adjusted frequency = $\left(\frac{\text{frequency of the class}}{\text{width of the class}}\right) \times 5$

   Therefore, Adjusted frequency of 25 - 45 = $\frac{8}{20} \times 5 = 2$

5. **(a)** infinitely many solutions

   Explanation:

   Given linear equation: 3x - 5y = 15 Or, x = $\frac{5y+15}{3}$

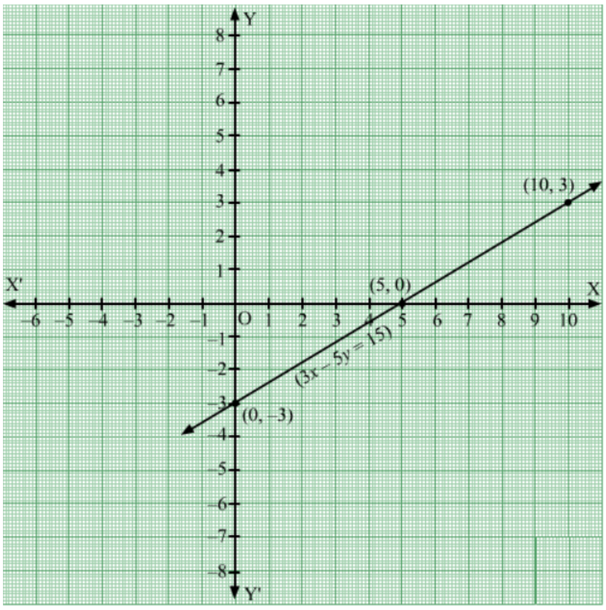
   When y = 0, x = $\frac{15}{3}$ = 5

   When y = 3, x = $\frac{30}{3}$ = 10

   When y = -3, x = $\frac{0}{3}$ = 0

xx	5	10	0
yy	0	3	-3

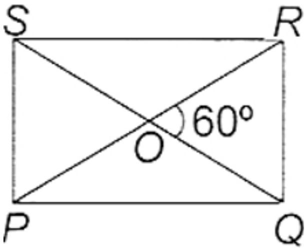
Plot the points A(5,0) , B(10,3) and C(0,−3). Join the points and extend them in both the directions.
We get infinite points that satisfy the given equation.
Hence, the linear equation has infinitely many solutions.



6. **(a)** A straight line may be drawn from any one point to any other point.
Explanation:
A straight line may be drawn from any one point to any other point.

7.
(b) 105°
Explanation:
Given that,
l ∥ m and n cuts them
Let,
$\angle 1 = 65^o$
$\angle 2 = x$
$\angle 3 = 40^o$
$\angle 1 = \angle 4 = 65^o$ (Alternate angle) (i)
$\angle 3 + \angle 4 + \angle 5 = 180^o$ (Angle sum property)
$40^o + 65^o + \angle 5 = 180^o$
$\angle 5 = 75^o$
Now,
$\angle 2 + \angle 5 = 180^o$ (Linear pair)
$x + 75^o = 180^o$
$x = 105^o$

8. **(a)** 60°
Explanation:
∠ROQ = ∠SOP = 60° ...(i) [Vertically opposite angles]



∴ PR = SQ ⇒ PO= SO (Diagonals of a rectangle are equal and bisect each other)
⇒ ∠OPS = ∠OSP ...(ii) [∵ In a triangle, angles opposite to equal sides are equal]

In $\triangle POS$, by angle sum property

$\angle OSP + \angle OPS + \angle SOP = 180°$

$\Rightarrow 2\angle OSP = 180° - 60°$ [Using (i) & (ii)]

$\Rightarrow \angle OSP = 60°$

9.

(c) $(x - y)^2(x + y)$

Explanation:

The given expression to be factorized is $x^3 - x^2y - xy^2 + y^3$

Take common x^2 from the first two terms and $-y^2$ from the last two terms. That is

$x^3 - x^2y - xy^2 + y^3 = x^2(x - y) - y^2(x - y)$

Finally, take common (x - y) from the two terms. That is

$x^3 - x^2y - xy^2 + y^3 = (x - y)(x^2 - y^2)$

$= (x - y)\{(x^2 - y^2)\}$

$= (x - y)(x + y(x - y)$

$= (x - y)^2(x + y)$

10.

(d) (3,0)

Explanation:

$2x + 3y = 6$ meets the X-axis.

Put $y = 0$,

$2x + 3(0) = 6$

$x = 3$

Therefore, graph of the given line meets X-axis at (3, 0).

11.

(d) 90°

Explanation:

As AD is the perpendicular bisector of BC, so $\angle ADC = \angle ADB = 90^o$

12.

(c) 10 cm

Explanation:

Let us assume a rhombus ABCD where,

AB = BC = CD = DA

Now, in triangle OBC by using Pythagoras theorem we get:

$BC^2 = OB^2 + OC^2$

$BC^2 = 6^2 + 8^2$

$BC^2 = 36 + 64$

$BC^2 = 100$

$BC = \sqrt{100}$

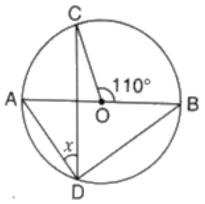
BC = 10 cm

$\therefore$ AB = BC = CD = DA = 10 cm

13.

(b) 35^o

Explanation:



$\angle CDB = \frac{110^0}{2} = 55^0$

Now, $\angle ADB = 90^0$ (Angle in a semicircle)

So, $\angle ADC = x = 90^0 - 55^0 = 35^0$

14.

(b) 2

Explanation:

$\sqrt[3]{2} \cdot \sqrt[4]{2} \cdot \sqrt[12]{32}$

= $\sqrt[3]{2} \cdot \sqrt[4]{2} \cdot \sqrt[12]{(2)^5}$

= $(2)^{\frac{1}{3}} \cdot (2)^{\frac{1}{4}} \cdot (2)^{\frac{5}{12}}$

= $(2)^{\frac{1}{3}+\frac{1}{4}+\frac{5}{12}}$

= $(2)^{\frac{4+3+5}{12}}$

= $(2)^{\frac{12}{12}}$

= 2

15.

(c) 5

Explanation:

Distance between the graph of the equations x = -3 and x = 2 is = 2 – (-3) = 5 units

16.

(d) BC = EF

Explanation:

In ΔABC and ΔDEF

$\angle B = \angle E$ and $\angle C = \angle F$

For congruence, BC = EF

Therefore by AAS axiom

$\Delta ABC \cong \Delta DEF$

17.

(c) -224

Explanation:

Using, $(a-b)^3 = a^3 - b^3 - 3ab(a-b)$

$\Rightarrow a^3 - b^3 = (a-b)^3 + 3ab(a-b)$

$\Rightarrow a^3 - b^3 = (-8)^3 + 3(-12)(-8)$

$\Rightarrow a^3 - b^3 = -512 + 288 = -224$

18. **(a)** 2400 cm^2

Explanation:

TSA of cube = $6a^2$

= $6 \times (20)^2$

= 6×400

= 2400 cm^2

19.

(c) A is true but R is false.

Explanation:

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

s = $\frac{3+4+5}{2}$ = 6 cm

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

= $\sqrt{(6)(6-3)(6-4)(6-5)}$

= $\sqrt{(6)(3)(2)(1)}$ = 6 cm^2

20.

(c) A is true but R is false.

Explanation:

($\frac{-3}{2}$, k) is a solution of 2x + 3 = 0

$2 \times \left(-\frac{3}{2}\right) + 3$ = -3 + 3 = 0

($\frac{-3}{2}$, k) is the solution of 2x + 3 = 0 for all values of k.

Also ax + b = 0 can be expressed as a linear equation in two variables as ax + 0·y + b = 0.

Section B

21. We have, ∠ABC = 40^o

∠ACB = 90^o (Angle in semi-circle)

In triangle ABC, by angle sum property

∠CAB + ∠ACB + ∠ABC = 180^o

∠CAB + 90^o + 40^o = 180^o

∠CAB = 50^o

Now, ∠COB = ∠CAB (Angle on same segment)

x = 50^o.

22. Area of trapezium $= \frac{1}{2} \times$ (Sum of the parallel side) $\times$ height

$\Rightarrow\ 475 = \frac{1}{2} \times (x + x + 4) \times 19cm$

$\Rightarrow\ 2x + 4 = \frac{950}{19} = 50$

$\Rightarrow\ 2x = 50 - 4 = 46; x = 46 \div 2 = 23$

Hence, the length of two parallel sides are 23 cm and (23 + 4) cm i.e., 23 cm and 27 cm.

23. We know that if one side of a cyclic quadrilateral is produced, then the exterior angle is equal to the interior opposite angle.

i.e., ∠BAD = ∠DCF = 75°

⇒ ∠DCF = x° = 75° ==> x° = 75°

Again, the sum of the opposite angles in a cyclic quadrilateral is 180°.

Thus, ∠DCF + ∠DEF = 180°

⇒ 75° + y° = 180°

⇒ y° = (180° - 75°) = 105° ==> y° = 105°

Hence, x° = 75° and y° = 105°

24. $\angle BDC = \angle BAC = 40^\circ$ [∠ in the same segment].

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

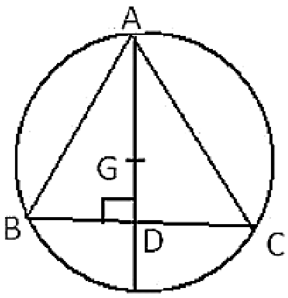
∴ 40^o + 80^o + x^o = 180^o

=> x^o = 60^o.

OR

Let ΔABC be an equilateral triangle of side 9 cm.

Let AD be one of its medians.



Then, AD ⊥ BC (ΔABC is an equilateral triangle)

Also, $BD = \left(\frac{BC}{2}\right) = \left(\frac{9}{2}\right) = 4.5\mathrm{cm}$

In right-angled ΔADB, we have:

$AB^2 = AD^2 + BD^2$ [USING PAYTHAGORAS THEOREM]

$\Rightarrow AD^2 = AB^2 - BD^2$

$\Rightarrow AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{(9)^2 - \left(\frac{9}{2}\right)^2}\mathrm{cm}$

$= \frac{9\sqrt{3}}{2}\mathrm{cm}$

In the equilateral triangle, the centroid and circumcentre coincide and AG: GD = 2: 1.

Now, radius $AG = \frac{2}{8}AD$

$\Rightarrow AG = \left(\frac{2}{3} \times \frac{9\sqrt{3}}{2}\right) = 3\sqrt{3}\mathrm{cm}$

∴ The radius of the circle is $3\sqrt{3}$ cm.

25. The equations of two lines passing through (2, 14) can be taken as

x + y = 16

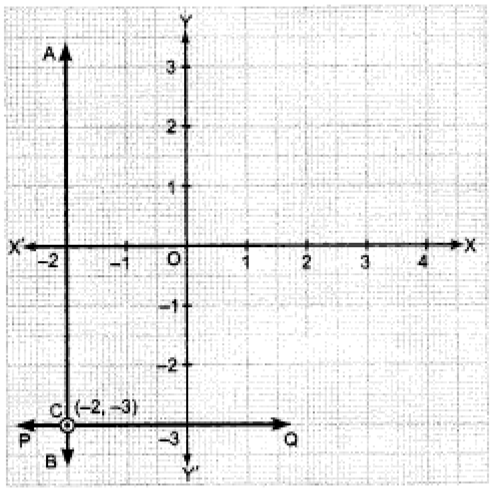
and 7x - y = 0

There are infinitely many such lines because through a point an infinite number of lines can be drawn.

OR

AB⇒x=-2

PQ⇒y=-3



Point of intersection of AB and PQ is $C(-2, -3)$.

Section C

26. $\frac{1}{\sqrt{7}-\sqrt{6}}$

We need to multiply the numerator and denominator of $\frac{1}{\sqrt{7}-\sqrt{6}}$ by $\sqrt{7}+\sqrt{6}, to get \frac{1}{\sqrt{7}-\sqrt{6}} \times \frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}+\sqrt{6}} = \frac{\sqrt{7}+\sqrt{6}}{(\sqrt{7}-\sqrt{6})(\sqrt{7}+\sqrt{6})}$

We need to apply the formula $(a-b)(a+b) = a^2 - b^2$ in the denominator to get

$\frac{1}{\sqrt{7}-\sqrt{6}} = \frac{\sqrt{7}+\sqrt{6}}{(\sqrt{7})^2-(\sqrt{6})^2}$

$= \frac{\sqrt{7}+\sqrt{6}}{7-6}$

$= \sqrt{7}+\sqrt{6}.$

Therefore, we conclude that on rationalizing the denominator of $\frac{1}{\sqrt{7}-\sqrt{6}}$ we get $\sqrt{7}+\sqrt{6}$.

27. $8a^3 - b^3 - 12a^2b + 6ab^2$
$= (2a)^3 - b^3 - 6ab(2a - b)$
$= (2a)^3 - b^3 - 3(2a)\ (b)\ (2a - b)$
$= (2a - b)^3$ [Using $(a - b)^3 = a^3 - b^3 - 3ab\,(a - b)$]
= (2a-b) (2a-b) (2a-b)

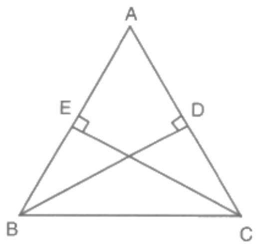
28. We have, 2s = 50 m + 65 m + 65 m = 180 m
S = 180 ÷ 2 = 90 m
Area of $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$
$= \sqrt{90(90-50)(90-65)(90-65)}$
$= \sqrt{90 \times 40 \times 25 \times 25} = 60 \times 25$
= 1500m^2.
Cost of laying grass at the rate of Rs7 per m^2 = Rs(1500 × 7) = Rs10,500.

OR

∴ Area of quadrilateral ABC=area of △ABC + area of △ACD....(i)
For △ABC, $s = \frac{3+4+5}{2} = 6cm$
∴ Area of △ABC=$\sqrt{6(6-3)(6-4)(6-5)}$
$= \sqrt{6 \times 3 \times 2 \times 1}$ sq cm = 6sq cm …(ii)
For △ACD, s'=$\frac{5+4+5}{2}$ =7cm
∴ area of △ACD = $\sqrt{7(7-5)(7-4)(7-5)}$
$= \sqrt{7 \times 2 \times 3 \times 2}$ sq cm = $4\sqrt{21}$ sq cm ...(iii)
By (i), (ii) and (iii),
Area of Quadrilateral ABCD = $(6 + 4\sqrt{21})$ sq cm

29. Inner radius (r) of hemispherical bowl = $\left(\frac{10.5}{2}\right)$ cm = 5.25 cm
Surface area of hemispherical bowl = $2\pi r$
= [2 × $\frac{22}{7}$ × (5.25)^2] cm^2
= 173.25 cm^2
Cost of tin-plating 100 cm^2 area = Rs. 4
Cost of tin-plating 173.25 cm^2 area = Rs. $\left(\frac{4 \times 173.25}{100}\right)$,= Rs. 6.93
Thus, the cost of tin-plating the inner side of hemispherical bowl is Rs. 6.93

30. In △ABC, we have
AB = AC [Given]
$\Rightarrow \angle B = \angle C$ [∵ Angles opp. to equal sides are equal] ...(i)



Now, in △BCE and △BCD, we have
$\angle B = \angle C$ [From (i)]
$\angle CEB = \angle BDC$ [Each equal to 90°]
and BC = BC [Common side]
So, by ASA(Angle Side Angle) criterion of congruence, we obtain
$\Delta BCE \cong \Delta BCD$
⇒ BD = CE [∵ Corresponding parts of congruent triangles are equal]
Hence, BD = CE

OR

Side BC of triangle ABC is produced to D
$\therefore \angle ACD = \angle A + \angle B$ [Exterior angle property]
$\Rightarrow 128^\circ = \angle A + 43^\circ$

$\Rightarrow \angle A = (128 - 43)^\circ$
$\Rightarrow \angle A = 85^\circ$
$\Rightarrow \angle BAC = 85^\circ$
Also, in triangle ABC
$\angle BAC + \angle ABC + \angle ACB = 180^\circ$ [Sum of the angles of a triangle]
$\Rightarrow 85^\circ + 43^\circ + \angle ACB = 180^\circ$
$\Rightarrow 128^\circ + \angle ACB = 180^\circ$
$\Rightarrow \angle ACB = 52^\circ$.

31. Given LM is a line parallel to the Y-axis and its perpendicular distance from Y-axis is 3 units.
   i. Coordinate of point P = (3,2)
   Coordinate of point Q = (3,-1)
   Coordinate of point R = (3, 0) [since its lies on X-axis, so its y coordinate is zero].
   ii. Abscissa of point L = 3, abscissa of point M=3
   $\therefore$ Difference between the abscissa of the points L and M = 3 – 3 = 0

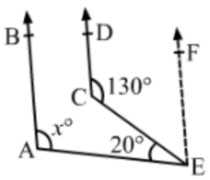
Section D

32. Given, $\frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}}$
$= \frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} \times \frac{\sqrt{10}-\sqrt{3}}{\sqrt{10}-\sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}} \times \frac{\sqrt{6}-\sqrt{5}}{\sqrt{6}-\sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}} \times \frac{\sqrt{15}-3\sqrt{2}}{\sqrt{15}-3\sqrt{2}}$
$= \frac{7\sqrt{3}(\sqrt{10}-\sqrt{3})}{(\sqrt{10})^2-(\sqrt{3})^2} - \frac{2\sqrt{30}-2\times 5}{(\sqrt{6})^2-(\sqrt{5})^2} - \frac{3\sqrt{30}-18}{(\sqrt{15})^2-(3\sqrt{2})^2}$
$= \frac{7(\sqrt{30}-3)}{10-3} - \frac{(2\sqrt{30}-10)}{6-5} - \frac{3\sqrt{30}-18}{15-18}$
$= \sqrt{30} - 3 - (2\sqrt{30} - 10) - (6 - \sqrt{30})$
$= \sqrt{30} - 3 - 2\sqrt{30} + 10 - 6 + \sqrt{30}$
$= 10 - 9 + 2\sqrt{30} - 2\sqrt{30} = 1$

OR

Given
a= $3 - 2\sqrt{2}$
$\Rightarrow$ a^2= $(3 - 2\sqrt{2})^2$
$= 3^2 - 2 \times 3 \times 2\sqrt{2} + (2\sqrt{2})^2$
$= 9 - 12\sqrt{2} + 8$
$= 17 - 12\sqrt{2}$
$\frac{1}{x^2} = \frac{1}{17-12\sqrt{2}}$
$= \frac{1}{17-12\sqrt{2}} \times \frac{17+12\sqrt{2}}{17+12\sqrt{2}}$
$= \frac{17+12\sqrt{2}}{17^2-(12\sqrt{2})^2}$
$= \frac{17+12\sqrt{2}}{289-288}$
$= 17 + 12\sqrt{2}$
So $a^2 - \frac{1}{a^2}$ = $(17 - 12\sqrt{2}) - (17 + 12\sqrt{2})$
$= 17 - 12\sqrt{2} - 17 - 12\sqrt{2}$
$= -24\sqrt{2}$

33. i. A system of axiom is called consistent if there is no statement which can be deduced from these axioms such that it contradicts any axiom. It is known that, if a transversal intersects two parallel lines, then each pair of corresponding angles are equal, which is a theorem. Therefore, Statement I is false and it is not an axiom.
   ii. It is known that, if a transversal intersects two parallel lines, then each pair of alternate interior angles are equal. It is also a theorem. So, Statement parallel is true and an axiom. Therefore, in the given statement, first is false and second is an axiom. Therefore, given system of axioms is not consistent.

34. 

Draw EF || AB || CD
EF || CD and CE is the transversal

Then,

$\angle ECD + \angle CEF = 180^\circ$

[Angles on the same side of a transversal line are supplementary]

$\Rightarrow 130^\circ + \angle CEF = 180^\circ$

$\Rightarrow \angle CEF = 50^\circ$

Again EF || AB and AE is the transversal

Then,

$\angle BAE + \angle AEF = 180^\circ$ [Angles on the same side of a transversal line are supplementary]

$\Rightarrow \angle BAE + \angle AEC + \angle CEF = 180^\circ$ $[\angle AEF = \angle AEC + \angle CEF]$

$\Rightarrow x^\circ + 20^\circ + 50^\circ = 180^\circ$

$\Rightarrow x^\circ + 170^\circ = 180^\circ$

$\Rightarrow x^\circ = 110^\circ$

OR

It is given that, AB || CD and t is a transversal

$\therefore \angle AEF = \angle EFD$ ....(i) (Pair of alternate interior angles)

EP is the bisectors of $\angle$AEF, (Given)

$\therefore \angle AEP = \angle FEP = \frac{1}{2}\angle AEF$

$\Rightarrow \angle AEF = 2\angle FEP$ ....(ii)

Also, FQ is the bisectors of $\angle$EFD

$\therefore \angle EFQ = \angle QFD = \frac{1}{2}\angle EFD$

$\Rightarrow \angle EFD = 2\angle EFQ$ ....(iii)

From equations (i), (ii) and (iii)

$2\angle \text{FEP} = 2\angle \text{EFQ}$

$\Rightarrow \angle FEP = \angle EFQ$

Thus, the lines EP and FQ are intersected by a transversal EF such that the pair of alternate interior angles formed are equal.

$\therefore EP \| FQ$ (If a transversal intersects two lines such that a pair of alternate interior angles are equal, then the two lines are parallel)

35. We take two imagined classes, namely 40-50 and 120-130, each with frequency 0.

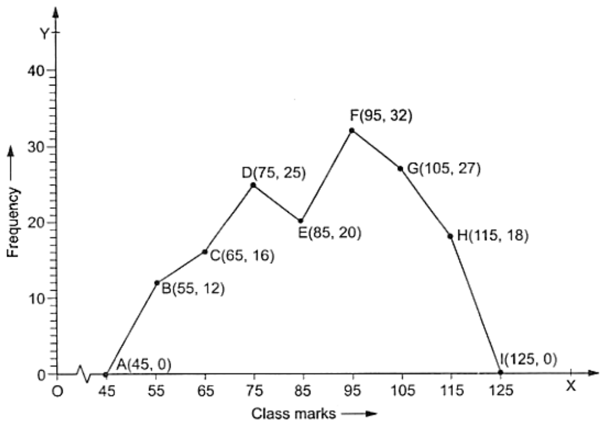
Now, we have the following frequency table:

Class interval (in ₹)	**Class mark**	**Frequency**
40-50	45	0
50-60	55	12
60-70	65	16
70-80	75	25
80-90	85	20
90-100	95	32
100-110	105	27
110-120	115	18
120-130	125	0

we plot the following points:

A(45, 0), B(55,12), C(65,16), D(75, 25), E(85, 20), E(95,32), G(105,27), H(115,18) and I(125, 0).

Join these points successively in pairs to get the required frequency polygon ABCDEFGHI, as shown below.



Section E

36. i. Diameter of golf ball = 4.2 cm

Radius of golf ball, R = 2.1 cm

Radius of dimple, r = 2mm = 0.2 cm

Surface area of each dimple = $2\pi r^2$

$2 \times \frac{22}{7} \times (0.2)^2 = 0.08$ cm^2

ii. Diameter of golf ball = 4.2 cm

Radius of golf ball, R = 2.1 cm

Radius of dimple ,r = 2mm = 0.2cm

Volume of the material dug out to make one dimple

= Volume of 1 dimple

$= \frac{2}{3}\pi r^3$

$= \frac{0.016\pi}{3}$ cm^3

iii. Diameter of golf ball = 4.2 cm

Radius of golf ball, R = 2.1 cm

Radius of dimple, r = 2mm = 0.2cm

The total surface area exposed to the surroundings

= surface area of golf ball − surface area of 315 dimples

= $4\pi R^2 - 315 \times 0.08\pi$

= $70.56\pi - 25.2\pi$ cm^2

= 45.36π cm^2

OR

Diameter of golf ball = 4.2 cm

Radius of golf ball, R = 2.1 cm

Radius of dimple, r = 2mm = 0.2cm

volume of the golf ball = volume of sphere − volume of 315 dimples

= $\frac{4}{3}\pi R^3 - 315 \times \frac{2}{3}\pi r^3$

= $\frac{4}{3}\pi(74.088 - 10.08)$

= $97.344\ \pi$cm^3

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.