# CBSE SAMPLE PAPER - 06

## Class 09 - Mathematics

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

**General Instructions:**

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with subparts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E.
8. Draw neat figures wherever required. Take $\pi$ =22/7 wherever required if not stated.

### Section A

1. The decimal form of $\frac{1}{999}$ is **[1]**

   a) 0.999 b) $0.\overline{001}$

   c) $0.00\overline{1}$ d) $0.0\overline{01}$

2. The cost of 2 kg of apples and 1 kg of grapes on a day was found to be ₹160. A linear equation in two variables to represent the above data is **[1]**

   a) x - 2y = 160 b) 2x + y = 160

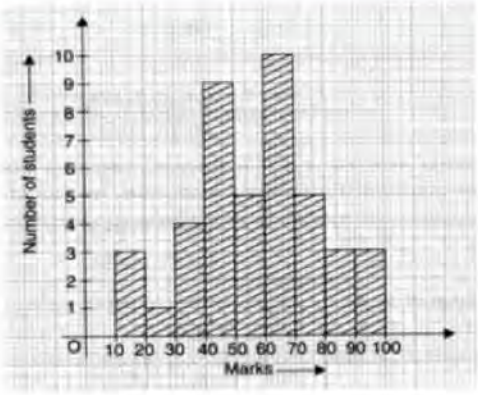
   c) x + y = 160 d) 2x - y = 160

3. The co-ordinates of a point above the x-axis lying on y-axis at a distance of 4 units are **[1]**

   a) (0, -4) b) (4, 0)

   c) (0, 4) d) (-4, 0)

4. In the given graph, the number of students who scored 60 or more marks is **[1]**




a) 22 b) 20

c) 21 d) 19

5. The graph of the linear equation y = x passes through the point **[1]**

a) $\left(\frac{3}{2}, \frac{-3}{2}\right)$ b) $\left(0, \frac{3}{2}\right)$

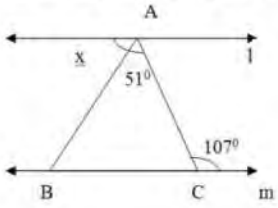
c) $\left(\frac{-1}{2}, \frac{1}{2}\right)$ d) (1 ,1)

6. The number of dimensions, a surface has **[1]**

a) 2 b) 1

c) 0 d) 3

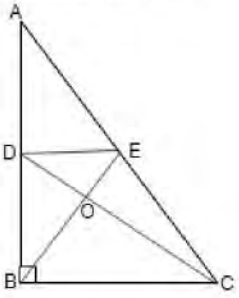
7. In the adjoining figure, l || m then ∠x is equal to :- **[1]**




a) 61° b) 56°

c) 66° d) 51°

8. Triangle ABC is right angled at B. Given that AC = 15cm, AB = 9cm and E and D are the mid-points of sides AC and AB res. Calculate the area of △ADE **[1]**




a) 11.5 $cm^2$ b) 12.5 $cm^2$

c) 13.5 $cm^2$ d) None of these

9. Which of the following is not a polynomial? **[1]**

a) $\sqrt{3}x^2 - 2\sqrt{3}x + 5$ b) $x + \frac{3}{x}$

c) $9x^2 - 4x + \sqrt{2}$ d) $\frac{3}{2}x^3 + 6x^2 - \frac{1}{\sqrt{2}}x - 8$

10. How many lines pass through two points? **[1]**

a) many

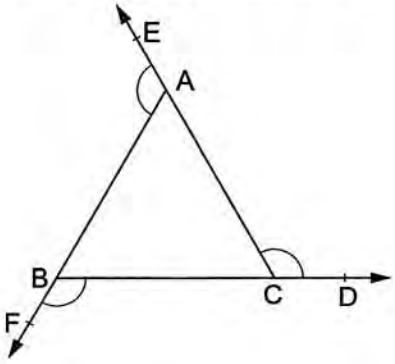
b) three

c) two

d) only one

11. The sides BC, CA and AB of △ABC have been produced to D, E and F respectively. **[1]**

$\angle BAE + \angle CBF + \angle ACD = ?$




a) 240°

b) 360°

c) 300°

d) 320°

12. If angles A, B, C and D of the quadrilateral ABCD, taken in order, are in the ratio 3:7:6:4, then ABCD is a **[1]**

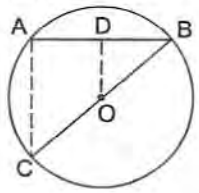
a) kite

b) parallelogram

c) rhombus

d) trapezium

13. In the given figure, AB is a chord of a circle with centre O and BOC is a diameter. If OD⊥AB such that OD = 6 cm, then AC = ? **[1]**




a) 9 cm

b) 15 cm

c) 7.5 cm

d) 12 cm

14. The value of 'x' in $3 + 2^x = (64)^{\frac{1}{2}} + (27)^{\frac{1}{3}}$ is **[1]**

a) 14

b) 8

c) 5

d) 3

15. The factors of $8a^3 + b^3 - 6ab + 1$, are **[1]**

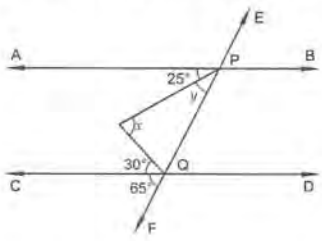
a) $(2a - b + 1)(4a^2 + b^2 - 4ab + 1 - 2a + b)$

b) $(2a + b - 1)(4a^2 + b^2 + 1 - 3ab - 2a)$

c) $(2a - 1 + b)(4a^2 + 1 - 4a - b - 2ab)$

d) $(2a + b + 1)(4a^2 + b^2 + 1 - 2ab - b - 2a)$

16. In Figure, AB and CD are parallel lines and transversal EF intersects them at P and Q respectively. If ∠APR = 25°, ∠RQC = 30° and ∠CQF = 65°, then **[1]**



a) x = 50°, y = 45°

b) x = 60°, y = 35°

c) x = 35°,y = 60°

d) x = 55°, y = 40°

17. If $x^2 + kx - 3 = (x - 3)(x + 1)$, then the value of 'k' is **[1]**

a) -3

b) 2

c) -2

d) 3

18. A conical tent is to accommodate 11 persons such that each person occupies 4 $m^2$ of space on the ground. They have 220 $m^3$ of air to breathe. The height of the cone is **[1]**

a) 20 m

b) 16 m

c) 14 m

d) 15 m

19. **Assertion (A):** The perimeter of a right angled triangle is 60 cm and its hypotenuse is 26 cm. The other sides of the triangle are 10 cm and 24 cm. Also, area of the triangle is 120 $cm^2$. **[1]**

**Reason (R):** $(Base)^2 + (Perpendicular)^2 = (Hypotenuse)^2$

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):** A linear equation 2x + 3y = 5 has a unique solution. **[1]**

**Reason (R):** A linear equation in two variables has infinitely many solutions.

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

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

c) A is true but R is false.

d) A is false but R is true.

## Section B

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

22. Factorize the polynomial $x^3 + 8y^3 + 64z^3 - 24xyz$ **[2]**

23. A hemisphere of lead of radius 9 cm is cast into a right circular cone of height 72 cm. Find the radius of the base of the cone. **[2]**

24. If f(z)= $z^2 - 3\sqrt{2}z - 1$ then find f(3 $\sqrt{2}$). **[2]**

OR

Evaluate: $(0.2)^3 - (0.3)^3 + (0.1)^3$

25. How many solution(s) of the equation 3x + 2 = 2x - 3 are there on the : **[2]**

i. Number line?

ii. Cartesian plane?

OR

Write two solutions of the equation 4x - 5y = 15.

## Section C

26. Find the value of $\frac{4}{(216)^{-\frac{2}{3}}} + \frac{1}{(256)^{-\frac{3}{4}}} + \frac{2}{(243)^{-\frac{1}{5}}}$ **[3]**

27. Find the remainder when $f(x) = 9x^3 - 3x^2 + 14x - 3$ is divided by g(x) = (3x -1). **[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 **[3]**

per $m^2$ is Rs.918. State whether the statement is true or false and justify your answer.

OR

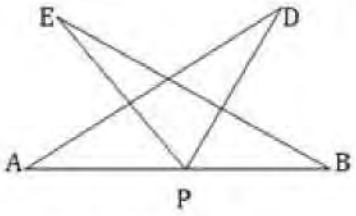
The sides of a triangular field are 41m, 40m and 9m. Find the number of rose beds that can be prepared in the field, if each rose bed on an average needs 900 $cm^2$ space.

29. For what value of c, the linear equation 2x + cy = 8 has equal values of x and y for its solution? **[3]**

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

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

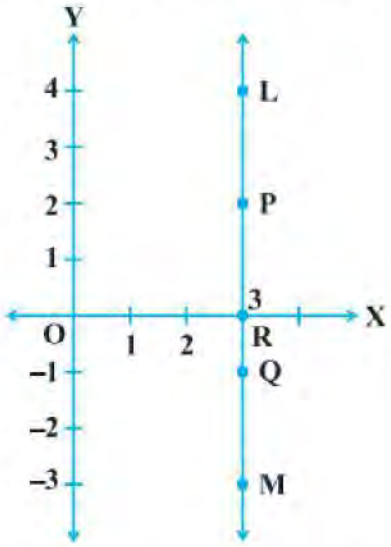
ii. AD = BE (See figure)




OR

In a $\triangle ABC$, $\angle A - \angle B = 33^o$ and $\angle B - \angle C = 18^o$ . Find the angles of the triangle.

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. If $a = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ and $b = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$, find the value of $a^2 + b^2 - 5ab$. **[5]**

OR

Represent $\sqrt{6}, \sqrt{7}, \sqrt{8}$ on the number line.

33. In the adjoining figure, name: **[5]**

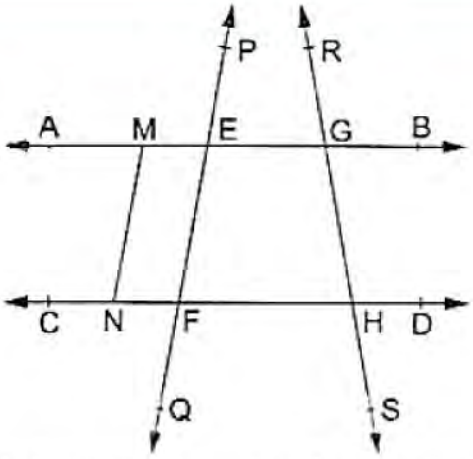
i. Six points

ii. Five line segments

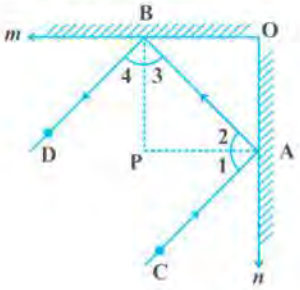
iii. Four rays

iv. Four lines

v. Four collinear points

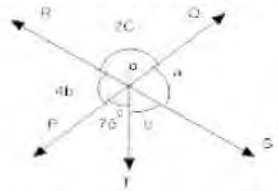



34. In figure, m and n are two plane mirrors perpendicular to each other. Show that the incident ray CA is parallel to reflected ray BD. **[5]**




OR

In fig two straight lines PQ and RS intersect each other at O, if ∠POT = 75° Find the values of a, b and c



35. The daily wages of 50 workers in a factory are given below: **[5]**

| Daily wages (in ₹) | 340-380 | 380-420 | 420-460 | 460-500 | 500-540 | 540-580 |
|---|---|---|---|---|---|---|
| Number of workers | 16 | 9 | 12 | 2 | 7 | 4 |

Construct a histogram to represent the above frequency distribution.

**Section E**

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

The principal of a school decided to give badges to students who are chosen for the post of Head boy, Head girl, Prefect and Vice Prefect. Badges are circular in shape with two colour area, red and silver, as shown in figure. The diameter of the region representing red colour is 22 cm and the silver colour is filled in 10.5 cm wide ring.

(i) Find the radius of circle representing the red region.

(ii) Find the area of the red region.

(iii) Find the radius of the circle formed by combining the red and silver region.

**OR**

Find the area of the silver region.

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

In the Meharali, New DTC bus stop was constructed. The bus stop is barricaded from the remaining part of the road, by using 50 hollow cones. Each hollow cone is made of recycled cardboard.

Each cone has a base diameter of 40 cm and a height of 1 m.

(i) Find the curved surface area of the cone.

(ii) What is the volume of a cone?

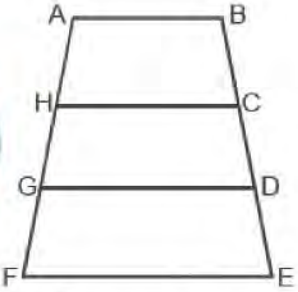
**OR**

If the cost of cardboard is ₹100 per $m^2$ then what will be cost of cardboard for 50 cones?

(iii) If the outer side of each of the cones is to be painted and the cost of painting is ₹12 per $m^2$, what will be the cost of painting all these cones?

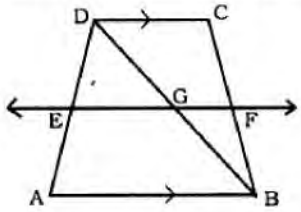
38. **Read the text carefully and answer the questions:** **[4]**

Sohan wants to show gratitude towards his teacher by giving her a card made by him. He has three pieces of trapezium pasted one above the other as shown in fig. These pieces are arranged in a way that AB || HC || GD || FE. Also AH = HG = GF and DE = 4 cm. He wants to decorate the card by putting up colored tape on the nonparallel sides of the trapezium.




(i) What is the difference between trapezium and parallelogram?

(ii) ABCD is a trapezium where AB || DC, BD is the diagonal and E is the midpoint of AD. A line is drawn through E parallel to AB intersecting BC at F. Show that BF = FC




**OR**

ABHC is a trapezium in which AB || HC and ∠A = ∠B = 45°. Find angles C and H of the trapezium.

(iii) Find the total length of colored tape required if GF = 6 cm.

**Solution**

**CBSE SAMPLE PAPER - 06**

**Class 09 - Mathematics**

**Section A**

1. **(b)** $0.\overline{001}$
   **Explanation:** When we divide 1 by 999 its result is 0.001001001001001.....
   So,
   $0.\overline{001} = \frac{1}{999}$
2. **(b)** 2x + y = 160
   **Explanation:** Let the cost of apples be ₹x per Kg and cost of grapes be ₹y per Kg. The cost of 2 kg of apples and 1 kg of grapes on a day was found to be ₹160.
   So the equation will be
   2x + y = 160
3. **(c)** (0, 4)
   **Explanation:** It lies on y-axis so it's abscissa = 0 and it lies on y-axis at a distance of 4unit.
   Thus point will be (0, 4).
4. **(c)** 21
   **Explanation:** Add the values corresponding to the height of the bar from 60 to 100
   10 + 5 + 3 + 3 = 21
5. **(d)** (1 ,1)
   **Explanation:** y = x, $\Rightarrow$ both the coordinates are the same. Hence (1, 1) is correct option.
6. **(a)** 2
   **Explanation:** the surface is that which has length and breadth. (1 dimension + 1 dimension = 2 dimension)
7. **(b)** 56°
   **Explanation:** x + 51° = 107° (Alternate interior angles)
   x = 107° - 51° = 56°
8. **(c)** 13.5 $cm^2$
   **Explanation:** As D and E are the midpoints of AB and AC.
   So, by mid point theorem
   DE = BC/2 = 12/2 = 6 cm
   AD = AB/2 = 9/2 = 4.5 cm
   Area of $\triangle$ADE = 0.5 $\times$ DE $\times$ AD
   = 0.5 $\times$ 6 $\times$ 4.5 = 13.5 cm square
9. **(b)** $x + \frac{3}{x}$
   **Explanation:** Cearly, $x + \frac{3}{x}$ is not a polynomial.
10. **(d)** only one
    **Explanation:** only one because if a line is passing through two points then that two points are solution of a single linear equation
    so only one line passes over two given points.
11. **(b)** $360^o$
    **Explanation:** We have :
    $\angle 1 + \angle BAE = 180^\circ$ ....(i)
    $\angle 2 + \angle CBF = 180^\circ$ .....(ii)
    $\angle 3 + \angle ACD = 180^\circ$ .....(iv)
    Adding (i),(ii) and (iii), we get:
    $(\angle 1 + \angle 2 + \angle 3) + (\angle BAE + \angle CBF + \angle ACD) = 540^\circ$
    $\Rightarrow 180^\circ + \angle BAE + \angle CBF + \angle ACD = 540^\circ$ $[\because \angle 1 + \angle 2 + \angle 3 = 180^\circ]$
    $\Rightarrow \angle BAE + \angle CBF + \angle ACD = 360^\circ$ .

12. **(d)** trapezium

**Explanation:** Let the angles be 3x, 7x, 6x, 4x

then 3x + 7x + 6x + 4x = 360

x = $\frac{360}{20}$ = 18

So angles are,

54°, 126°, 108° & 72°

Hence it is a trapezium.

13. **(d)** 12 cm

**Explanation:** OD ⊥ AB

i.e., D is the midpoint of AB.

Also, O is the midpoint of BC.

Now, in △ BAC, D is the midpoint of AB and O is the midpoint of BC.

∴ OD = $\frac{1}{2}$ AC (By mid point theorem)

⇒ AC = 2OD = (2 × 6) cm = 12 cm

⇒ AC = 12 cm

14. **(d)** 3

**Explanation:** $3 + 2^x = (64)^{\frac{1}{2}} + (27)^{\frac{1}{3}}$

$\Rightarrow 3 + 2^x = \sqrt{64} + \sqrt[3]{27}$

$\Rightarrow 3 + 2^x = 8 + 3$

$\Rightarrow 2^x = 8 = 2^3$

equating both,

x = 3

15. **(d)** $(2a + b + 1)(4a^2 + b^2 + 1 - 2ab - b - 2a)$

**Explanation:** $(2a + b + 1)(4a^2 + b^2 + 1 - 2ab - b - 2a)$

$8a^3 + b^3 + 1 - 6ab$

$=(2a)^3 + b^3 + 1^3 - 3 \times 2a \times b \times 1$

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

$=(2a+b+1)(4a^2+b^2+1-2ab-b-2a)$

16. **(d)** x = 55°, y = 40°

**Explanation:** ∠OQP = 180° - ∠OQF

= 180° - (30° + 65°)

⇒ ∠OQP = 85° ...(i)

∠APQ = ∠CQF (Corresponding angles)

⇒ 25° + y° = 65°

⇒ y° = 65° - 25°

⇒ y° = 40°

Now in △OPQ

∠0 + ∠OPQ + ∠PQO = 180°

⇒ x° + 40° + 85° = 180°

x° = 180° - 85° - 40° = 55°

⇒ x = 55°, y = 40°

17. **(c)** -2

**Explanation:** $x^2 + kx - 3 = (x - 3)(x + 1)$

=> $x^2 + kx - 3 = x^2 + (-3 + 1)x + (-3) \times 1$

=> $x^2 + kx - 3 = x^2 - 2x - 3$

On comparing the term, we get $k = -2$

18. **(d)** 15 m

**Explanation:** Suppose that the height of the cone is h m.

Area of the ground = 11 × 4 = 44 $m^2$

$\therefore \pi r^2 = 44 \Rightarrow r^2 = \frac{44\times7}{22} = 14$

Also, $\frac{1}{3}\pi r^2 h = 220$

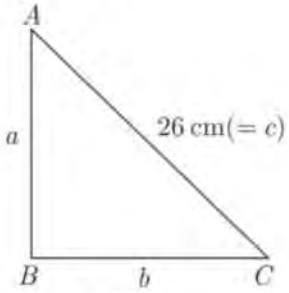
$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times 14h = 220$

$\Rightarrow h = \frac{220\times21}{22\times14} = 15$ m

Hence, the height of the cone is 15 m.

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

**Explanation:**




a + b + c = 60

a + b + 26 = 60

a + b = 34 ...(i)

Now, $26^2 = a^2 + b^2$ ...(ii)

Squaring (1) both sides, we get

$(a + b)^2 = (34)^2$

$a^2 + b^2 + 2ab = 34 \times 34$

$(26)^2 + 2ab = 1156$ [From (ii)]

2ab = 1156 - 676

2ab = 480

ab = 240 ...(iii)

Now, $a + \frac{240}{a} = 34$ [From (i) and (iii)]

$a^2$ - 24a - 10a + 240 = 0

a(a - 24) - 10(a - 24) = 0

a = 10, 24

Now, other sides are 10 cm and 24 cm

$s = \frac{26+10+24}{2} = 30$ cm

Area of triangle = $\sqrt{30(30-26)(30-10)(30-24)}$

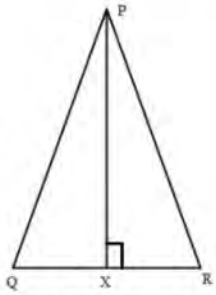
= $\sqrt{30 \times 4 \times 20 \times 6} = 120$ $cm^2$

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

**Explanation:** A is false but R is true.

**Section B**

21.




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

Now,

Area of triangle = 360 $cm^2$

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

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

Now,

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

Also, by Pythagoras theorem for $\triangle$PXQ

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

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

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

$\therefore$ Perimeter = 80 + 41 + 41 = 162 cm

22. According to the question,

$x^3 + 8y^3 + 64z^3 - 24xyz$

$= x^3 + (2y)^3 + (4z)^3 - 3 \times x \times (2y) \times (4z)$

$= (x + 2y + 4z)\left[x^2 + (2y)^2 + (4z)^2 - x \times 2y - 2y \times 4z - x \times 4z\right]$

$= (x + 2y + 4z)\left(x^2 + 4y^2 + 16z^2 - 2xy - 8yz - 4xz\right)$

23. Given that Radius of hemisphere = 9 cm

Therefore Volume of hemisphere = $\frac{2}{3}\pi r^3 = \frac{2}{3}\pi \times 9 \times 9 \times 9$ cm$^3$

Height of cone = 72 cm

Let the radius of the cone be r cm.

Therefore Volume of the cone = $\frac{1}{3}\pi r^2 h = \frac{1}{3}\pi r^2 \times 72$ cm$^3$

the volume of the hemisphere and cone are equal.

Therefore,

$\frac{1}{3}\pi r^2 \times 72 = \frac{2}{3} \times 9 \times 9 \times 9 \times 9$

$r^3 = \frac{2 \times 9 \times 9 \times 9}{72} = \frac{81}{4}$

$r = \sqrt{\frac{81}{4}} = \frac{9}{2}$ = 4.5 cm

The radius of the base of the cone is 4.5 cm.

24. f (z) $= z^2 - 3\sqrt{2}z - 1$

$\Rightarrow f(3\sqrt{2}) = (3\sqrt{2})^2 - 3\sqrt{2}(3\sqrt{2}) - 1 = 9 \times 2 - 9 \times 2 - 1 = -1$

OR

We know,

$x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$

Now, (x+y+z) = 0.2 - 0.3 + 0.1 = 0

$\Rightarrow (x)^3 + (y)^3 + (z)^3 = 3xyz$

= 3(0.2)(-0.3)(0.1)

= - 0.018

25. According to the question, given equation is 3x + 2 = 2x -3

i. 3x + 2 = 2x -3

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

$\Rightarrow$ x = -5

So, on a number line there is only one solution which is x = -5.

ii. In a Cartesian plane there are infinitely many solutions.

OR

According to the question, given equation is 4x - 5y = 15.

Putting x = 0 we get,

0 - 5y =15

$\Rightarrow y = \frac{-15}{5}$.

$\Rightarrow y = -3$

So (0, -3) is a solution of the given equation.

Similarly by putting x = 5, we get

$4 \times 5 - 5y = 15$

$\Rightarrow 20 - 5y = 15$

$\Rightarrow -5y = 15 - 20$

$\Rightarrow -5y = -5$

$\Rightarrow y = \frac{5}{5}$

$\Rightarrow y = 1$

Thus, (5, 1) is also a solution.

**Section C**

26. We have $\frac{4}{(216)^{-\frac{2}{3}}} + \frac{1}{(256)^{-\frac{3}{4}}} + \frac{2}{(243)^{-\frac{1}{5}}}$

$= 4(216)^{\frac{2}{3}} + (256)^{\frac{3}{4}} + 2(243)^{\frac{1}{5}}$

$= 4(6^3)^{\frac{2}{3}} + (4^4)^{\frac{3}{4}} + 2(3^5)^{\frac{1}{5}}$

$= 4 \times 6^{3\times\frac{2}{3}} + 4^{4\times\frac{3}{4}} + 2 \times 3^{5\times\frac{1}{5}}$

$= 4 \times 6^2 + 4^3 + 2 \times 3$

= 144 + 64 + 6 = 214

27. Taking $g(x) = 0$ we have,

$3x - 1 = 0 \Rightarrow \quad x = \frac{1}{3}$

By remainder theorem when f(x) is divided by g(x), the remainder is equal to $f\left(\frac{1}{3}\right)$.

Now, $f(x) = 9x^3 - 3x^2 + 14x - 3$

$f\left(\frac{1}{3}\right) = 9\left(\frac{1}{3}\right)^3 - 3\left(\frac{1}{3}\right)^2 + 14\left(\frac{1}{3}\right) - 3$

$= 9 \times \frac{1}{27} - 3 \times \frac{1}{9} + \frac{14}{3} - 3 = \frac{1}{3} - \frac{1}{3} + \frac{14}{3} - 3$

$f\left(\frac{1}{3}\right) = \frac{5}{3}$

$\therefore$ required remainder $= \frac{5}{3}$

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

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

$\therefore \quad$ 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

Let a = 41m, b = 40m, c = 9m.

$s = \frac{a+b+c}{2} = \frac{41+40+9}{2} = \frac{90}{2}$

s = 45m

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

$= \sqrt{45(45-41)(45-40)(45-9)}$

$= \sqrt{45 \times 4 \times 5 \times 36}$

=180 $m^2$

=1800000 $cm^2$

Number of rose beds= $\frac{\text{Total area}}{\text{Area needed for one rose bed}} = \frac{1800000}{900} = 2000$

29. The value of c for which the linear equation 2x + cy = 8 has equal values of x and y i.e., x = y for its solution is

2x + cy = 8 $\Rightarrow$ 2x + cx = 8 [$\because$ y = x]

$\Rightarrow$ cx = 8 - 2x

$\therefore \ c = \frac{8-2x}{x}, x \neq 0$

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

Adding $\angle$EPD on both sides, we get

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

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

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

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

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

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

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

Hence ,by ASA congruency criteria;

$\Delta DAP \cong \Delta EBP$

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

OR

We are given that $\angle A - \angle B = 33^\circ$ and $\angle B - \angle C = 18^\circ$

$\Rightarrow \angle A = (33^\circ + \angle B)$ and $\angle C = (\angle B - 18^\circ)$

We know that the sum of the angles of a triangle is $180^o$. $\therefore \angle A + \angle B + \angle C = 180^\circ$

$\Rightarrow (33^\circ + \angle B) + \angle B + (\angle B - 18^\circ) = 180^\circ$ [using (i)]

$\Rightarrow 3\angle B = 165^\circ \Rightarrow \angle B = 55^\circ$

$\therefore \angle A = (33^\circ + \angle B) = (33^\circ + 55^\circ) = 88^\circ$

$\therefore \angle C = (\angle B - 18^\circ) = (55^\circ - 18^\circ) = 37^\circ$

$\therefore \angle A = 88^o$, $\angle B = 55^o$ and $\angle C = 37^o$.

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. $a = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

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

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

$= \frac{3+2-2\sqrt{6}}{3-2}$

$= 5 - 2\sqrt{6}$

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

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

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

$= \frac{3+2+2\sqrt{6}}{3-2}$

$= 5 + 2\sqrt{6}$

$a^2 = (5 - 2\sqrt{6})^2 = 25 - 20\sqrt{6} + 24 = 49 - 20\sqrt{6}$

$b^2 = (5 + 2\sqrt{6})^2 = 25 + 20\sqrt{6} + 24 = 49 + 20\sqrt{6}$

So $a^2 + b^2 - 5ab$

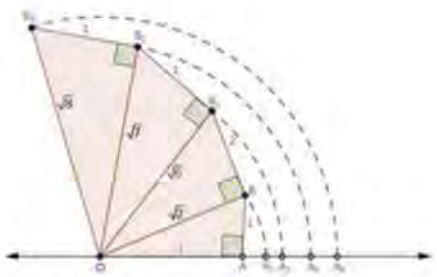
Substituting the values we get

$= (49 - 20\sqrt{6}) + (49 + 20\sqrt{6}) - 5 \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

= 98 - 5

= 93

OR



Draw a number line and mark a point 0, representing zero, on it. Suppose point A represents 1 unit as shown. Then, OA = 1

Draw a $\perp$ AB from A such that AB = O A = 1 unit.

By pythagoras theorem, we have

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

$\Rightarrow OB^2 = 1^2 + 1^2$

$\Rightarrow OB^2 = 1 + 1 = 2$

$\Rightarrow OB = \sqrt{2}$

Now, draw an arc with centre O and radius OB cuts the number line at $A_2$

Clearly, $OA_2 = OB_1$ = Radius of circle = $\sqrt{6}$

Thus, $A_2$ represents $\sqrt{6}$ on the number line.

Now draw a right angle triangle $OB_1\ OB_2$ such that $B_1\ B_2 = 1$

By pythagoras theorem, we have,

$OB_2^2 = OB_1^2 + B_1B_2^2$

$\Rightarrow OB_2^2 = (\sqrt{6})^2 + (1)^2$

$\Rightarrow OB_2 = \sqrt{7}$

Now, draw a circle with centre O and radius $OB_2$ We find that the circle cuts the number line at $A_3$

Clearly, $OA_3 = OB_2$ = Radius of circle = $\sqrt{7}$

Thus, $A_3$ represents $\sqrt{7}$ on the number line.

Now, again draw a right triangle $OB_2\ B_3$ such that $B_2\ B_3 = 1$

By pythagoras theorem, we have,

$OB_3^2 = OB_2^2 + B_2B_3^2$

$\Rightarrow OB_3^2 = (\sqrt{7})^2 + (1)^2$

$\Rightarrow OB_3^2 = 7 + 1 = 8$

$\Rightarrow OB_3 = \sqrt{8}$

Now, draw a circle with centre O and radius $OB_3$. We find that the circle cuts the number line at $A_4$

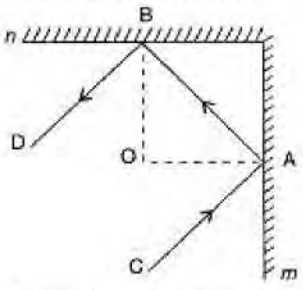
Clearly, $OA_4 = OB_3$ = Radius of circle = $\sqrt{8}$

Thus, $A_4$ represents $\sqrt{8}$ on the number line.

33.
- Six points: A,B,C,D,E,F
- Five line segments: $\overline{EG}, \overline{FH}, \overline{EF}, \overline{GH}, \overline{MN}$
- Four rays: $\overrightarrow{EP}, \overrightarrow{GR}, \overrightarrow{GB}, \overrightarrow{HD}$
- Four lines: = $\overleftrightarrow{AB}, \overleftrightarrow{CD}, \overleftrightarrow{PQ}, \overleftrightarrow{RS}$
- Four collinear points: M,E,G,B

34. At B, draw BO $\perp$ n and at A. draw AO $\perp$ m.

Let BO and AO meet at O.




as, Perpendiculars to two perpendicular lines are also perpendicular.

$\therefore \angle AOB = 90^o$

In $\triangle AOB$, $\angle AOB + \angle OAB + \angle OBA = 180^o$

(as,The sum of the three angles of a triangle is $180^o$ )

$\Rightarrow 90^o + \frac{1}{2}\angle CAB + \frac{1}{2}\angle ABD = 180^o$

( as, By law of reflection, Angle of incidence = Angle of reflection

$\therefore \angle CAO = \angle OAB = \frac{1}{2}\angle CAB$ and $\angle ABO = \angle OBD = \frac{1}{2}\angle ABD$)

$\Rightarrow \frac{1}{2}(\angle CAB + \angle ABD) = 90^o$

$\Rightarrow \angle CAB + \angle ABD = 180^o$

But these angles from a pair of supplementary consecutive interior angles.

∴ Ray CA || Ray BD.

OR

PQ intersect RS at O

$\therefore \angle QOS = \angle POR$ [vert'ically opposite angles]

a = 4b ...(1)

Also,

a + b + 75° = 180° [∵POQ is a straight lines]

∴ a + b = 180° - 75°

= 105°

Using, (1)

4b + b = 105°

5b = 105°

Or

b = = $\frac{105^\circ}{5}$ = 21°

Now a=4b

a = 4 × 21°

a = 84°

Again,∠QOR and ∠QOS

∴ a + 2c = 180°

Using, (2) 84° + 2c = 180°

2c = 180° - 84°

2c = 96°

c = $\frac{96^0}{2}$ = 48°c

Hence,

a = 84°, b = 21° and c = 48°

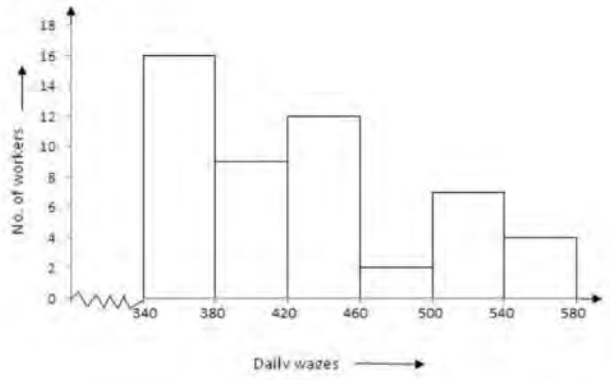
35. Given frequency distribution is as below:

| Daily wages (in ₹) | 340-380 | 380-420 | 420-460 | 460-500 | 500-540 | 540-580 |
|---|---|---|---|---|---|---|
| Number of workers | 16 | 9 | 12 | 2 | 7 | 4 |

Clearly, the given frequency distribution is in the exclusive form.

To draw the required histogram , take class intervals , i.e. daily wages (in ₹) along x-axis and frequencies i.e.no.of workers alongy-axisand draw rectangles . So, we get the requiredhistogram.

Since the scale on X-axis starts at 340, a kink(break) is indicated near the origin to show that the graph is drawn to scale beginning at 340.




**Section E**

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

The principal of a school decided to give badges to students who are chosen for the post of Head boy, Head girl, Prefect and Vice Prefect. Badges are circular in shape with two colour area, red and silver, as shown in figure. The diameter of the region

representing red colour is 22 cm and the silver colour is filled in 10.5 cm wide ring.

(i) Radius of circle representing red region

$= \frac{22}{2}$ = 11 cm [$\because$ Diameter = 22 cm (Given)]

(ii) Area of red region = $\pi r^2$

$= \frac{22}{7} \times 11 \times 11 = 380.28$ cm$^2$

(iii) Radius of circle formed by combining red and silver region = Radius of red region + width of silver sign

= (11 + 10.5) cm = 21.5 cm

OR

Radius of circle formed by combining red and silver region = Radius of red region + width of silver sign

= (11 + 10.5) cm = 21.5 cm

Area of silver region = Area of combined region - Area of red region

$= \frac{22}{7} \times 21.5 \times 21.5$ - 380.28

= 1452.78 - 380.28 = 1072.50 cm$^2$

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

In the Meharali, New DTC bus stop was constructed. The bus stop is barricaded from the remaining part of the road, by using 50 hollow cones. Each hollow cone is made of recycled cardboard.

Each cone has a base diameter of 40 cm and a height of 1 m.

(i) Diameter of cone = 40 cm

$\Rightarrow$ Radius of cone (r) = $\frac{40}{2}$

= 20 cm

$= \frac{20}{100}$ m

= 0.2 m

Height of cone (h) = 1 m

Slant height of cone (l) = $\sqrt{r^2 + h^2}$

$= \sqrt{(0.2)^2 + (1)^2}$

$= \sqrt{1.04}$ m

Curved surface area of cone = $\pi rl$

$= 3.14 \times 0.2 \times \sqrt{1.04}$

= 0.64056 m$^2$

(ii) Radius of base of cone = 20 cm = 0.2 m

Height of cone = 1 m

Volume of each cone = $\frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 0.2 \times 0.2 \times 1$

= 0.042 m$^3$

OR

Cost of 1 m$^2$ cardboard = ₹100

Curved surface area of 50 cones = 0.640 $\times$ 50 = 32 m$^2$

Cost of card board of these 50 cones = 50 $\times$ 32 = ₹1600

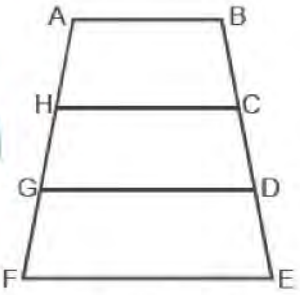
(iii) ∵ Cost of painting $1m^2$ of a cone = ₹12

∴ Cost of painting 0.64056 $m^2$ of a cone = 12 × 0.64056 = ₹7.68672

∴ Cost of painting of 50 such cones = 50 × 7.68672 = ₹384.336

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

Sohan wants to show gratitude towards his teacher by giving her a card made by him. He has three pieces of trapezium pasted one above the other as shown in fig. These pieces are arranged in a way that AB || HC || GD || FE. Also AH = HG = GF and DE = 4 cm. He wants to decorate the card by putting up colored tape on the nonparallel sides of the trapezium.




(i) Trapezium has 1 pair of parallel sides, and parallelogram has 2 pairs of parallel sides.

(ii) In Δ ADC, EG || AB and E is mid-point of AD.

**Property:** The line drawn through the mid-point of one side of a triangle, parallel to another side bisects the third side ... (1)

G is mid-point of BD.

Now EG || AB ||CD

⇒ CD || EG

⇒ CD || GF

In Δ BDC,CD || GF

Again, by property (1)

F is the mid-point of BC

Hence BF = FC

OR

AB || HC

In trapezium ABHC

$\angle A = \angle B = 45^o$

$\angle A + \angle = 180^o$ (Sum of interior angles)

$\angle H = 180^o - 45^o = 135^o$

Similary, $\angle B + \angle C = 180^o$ (Sum of interior angles)

$\angle C = 180^o - 45^o = 135^o$

(iii)We know the property: If given three parallel lines making equal intercepts on any transversal, then they will make equal intercept on the other transversal also.

AB || HC ||GD||FE

⇒ BC = CD = DE

⇒ AF+ BE = AH + HG + GF + BC + CD + DE = 6 + 6 + 6 + 4 + 4 + 4 = 30 cm

Hence tape required to decorate nonparallel sides = 30 cm