CBSE SAMPLE PAPER - 04

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 π =22/7 wherever required if not stated.

Section A

1. On simplification $(3+\sqrt{3})(3-\sqrt{3})$ gives **[1]**

   a) 0 b) $-2\sqrt{3}$

   c) 16 d) 6

2. If (4, 19) is a solution of the equation y = ax + 3, then a = **[1]**

   a) 4 b) 6

   c) 3 d) 5

3. A point whose abscissa is -3 and ordinate 2 lies in **[1]**

   a) second quadrant b) fourth quadrant

   c) first quadrant d) third quadrant

4. In a bar graph if 1 cm represents 30 km, then the length of bar needed to represent 75 km is **[1]**

   a) 3.5 cm b) 2.5 cm

   c) 2 cm d) 3 cm

5. If a linear equation has solutions (1, 2), (-1, -16) and (0, -7), then it is of the form **[1]**

   a) y = 9x - 7 b) 9x - y + 7 = 0

   c) x - 9y = 7 d) x = 9y - 7

6. Euclid's which axiom illustrates the statement that when x + y = 15, then x + y + z = 15 + z? **[1]**

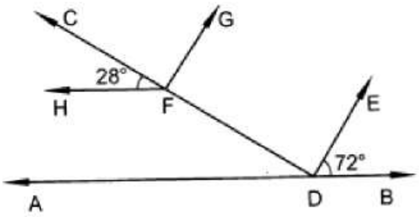
a) Third

b) Second,

c) Fourth

d) First

7. In Fig. if AB|| HF and DE || FG, then the measure of $\angle FDE$ is **[1]**



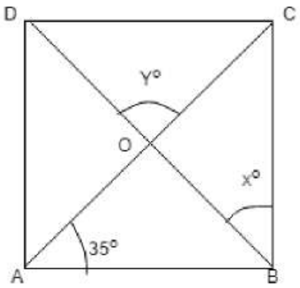
a) 90°

b) 80°

c) 100°

d) 108°

8. In the figure, ABCD is a Rectangle. Find the values of x and y? **[1]**



a) x = 55° and y = 110°

b) x = 100° and y = 100°

c) x = 50° and y = 100°

d) x = 60° and y = 120°

9. If x + 1 is a factor of the polynomial $2x^2 + kx$, then k = **[1]**

a) -3

b) 4

c) -2

d) 2

10. Which of the following is a linear equation in two variables? **[1]**

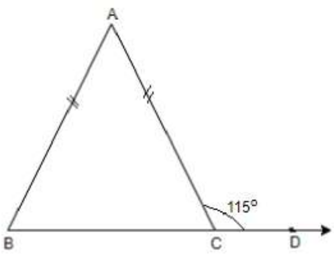
a) 2x – 5y = 0

b) x + 5 = 8

c) $x^2 = 5x + 3$

d) $5x = y^2 + 3$

11. In figure, AB = AC and $\angle ACD = 115^o$. Find $\angle A$? **[1]**



a) None of these

b) 50^0

c) 115°

d) 60°

12. In a quadrilateral ABCD, ∠A + ∠C is 2 times ∠B + ∠D. If ∠A = 140^o and ∠D = 60^o, then ZB = **[1]**

a) 80^o

b) 120^o

c) 60^o

d) None of these

13. In a circle, the major arc is 3 times the minor arc. The corresponding central angles and the degree measures of **[1]**

two arcs are

a) 90^o and 90^o

b) 270^o and 90^o

c) 90^o and 27^o

d) 60^o and 210^o

14. If $x^{-2} = 64$, then $x^{\frac{1}{3}} + x^0 =$ **[1]**

a) $\frac{2}{3}$

b) 3

c) $\frac{3}{2}$

d) 2

15. If $x^2 + \frac{1}{x^2} = 38$, then the value of $x - \frac{1}{x}$ is **[1]**

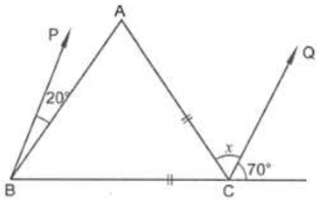
a) 3

b) 4

c) 5

d) 6

16. In Figure, if BP||CQ and AC = BC, then the measure of x is **[1]**



a) 30°

b) 20°

c) 25°

d) 35°

17. If p(x) = x + 4 then p(x) + p(-x) = ? **[1]**

a) 2x

b) 8

c) 4

d) 0

18. The slant height of a cone is increased by 10%. If the radius remains the same, the curved surface area is increased by **[1]**

a) 10%

b) 21%

c) 12.1%

d) 20%

19. **Assertion (A):** The side of an equilateral triangle is 6 cm then the height of the triangle is 9 cm. **[1]**
Reason (R): The height of an equilateral triangle is $\frac{\sqrt{3}}{2}$a.

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):** There are infinite number of lines which passes through (2, 14). **[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. Find the area of a triangle two side of the triangle are 18 cm, and 12 cm. and the perimeter is 40 cm. **[2]**

22. Factorise: $6x^2 + 7x - 3$ **[2]**

23. The hollow sphere, in which the circus motorcyclist performs his stunts, has a diameter of 7 m. Find the area available to the motorcyclist for riding. **[2]**

24. If a + b + c = 0, then write the value of $\frac{a^2}{bc}+\frac{b^2}{ca}+\frac{c^2}{ab}$. **[2]**

OR

Factorise: $125x^3 + 27y^3 + 8z^3 - 90xyz$.

25. Express x in terms of y for the linear equation $\frac{2}{3}x + 4y = -7$. **[2]**

OR

Find whether the given equation have x = 2, y = 1 as a solution:

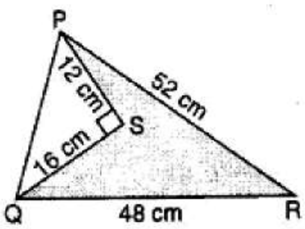
5x + 3y = 14

Section C

26. Express in the form of $\frac{p}{q}$:$0.\overline{38}+1.\overline{27}$ **[3]**

27. Without actually calculating the cubes, find the value of $(-12)^3+(7)^3+(5)^3$ **[3]**

28. Find the area of the shaded region in figure. **[3]**



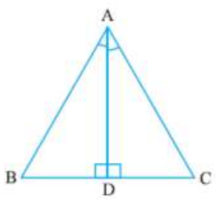
OR

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.

29. Find four solutions for the following equation :12x + 5y = 0 **[3]**

30. AD is an altitude of an isosceles triangle ABC in which AB = AC. Show that: **[3]**

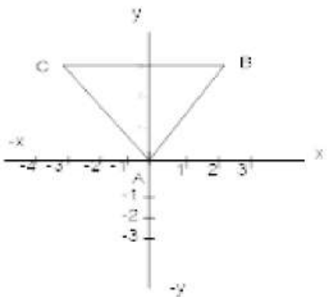
i. AD bisects BC.
ii. AD bisects $\angle$A



OR

If the altitudes from two vertices of a triangle to the opposite sides are equal, prove that the triangle is isosceles.

31. In fig find the vertices' co-ordinates of $\triangle$ABC **[3]**



Section D

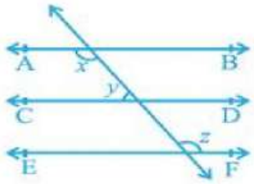
32. Simplify: $\frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}}-\frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}}-\frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}}$. **[5]**

OR

Visualise 2.665 on the number line, using successive magnification.

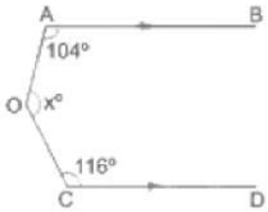
33. In a line segment AB point C is called a mid-point of line segment AB, prove that every line segment has one and only one mid-point. **[5]**

34. In the given figure, if AB || CD, CD || EF and y: z = 3: 7, find x. **[5]**



OR

In the given figure, AB || CD and $\angle AOC = x^\circ$. If $\angle OAB = 104^\circ$ and $\angle OCD = 116^\circ$, find the value of x.



35. The following table shows the number of illiterate persons in the age group (10-58 years) in a town: **[5]**

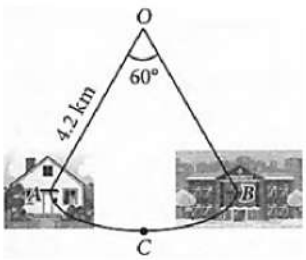
Age group (in years)	10-16	17-23	24-30	31-37	38-44	45-51	52-58
Number of illiterate persons	175	325	100	150	250	400	525

Draw a histogram to represent the above data.

Section E

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

Govind has his home located at A and his college located at B. Govind drives his motorbike three days in a week and rides his bicycle in the remaining 3 days, to go to his college and back to home. AOB is a sector of a circle with centre O, central angle 60° and radius 4.2 km. Path AOB is the route for driving by motorbike and path ACB is for bicycle only.



(i) Find the total distance travelled by Govind through the motorbike in a week to go to college.

(ii) Find the total distance travelled by Govind through the bicycle in a week to go to college.

(iii) Find the area of sector AOB.

OR

If the cost of fuel for the motorbike is ₹20 per km, then find the total cost of fuel used in a week in going to college.

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

Once four friends Rahul, Arun, Ajay and Vijay went for a picnic at a hill station. Due to peak season, they did not get a proper hotel in the city. The weather was fine so they decided to make a conical tent at a park. They were carrying 300 m² cloth with them. As shown in the figure they made the tent with height 10 m and diameter

14 m. The remaining cloth was used for the floor.

(i) How much Cloth was used for the floor?

(ii) What was the volume of the tent?

OR

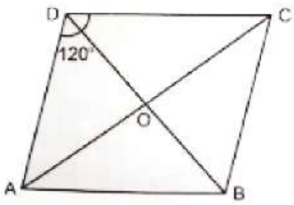
What was the total surface area of the tent?

(iii) What was the area of the floor?

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

Tarun and Samay are two friends live in small town. The area near their houses and school is in the shape of Rhombus. Usually, they go to school by Bicycle.

ABCD is an area in the shape of rhombus in which $\angle ADC = 120^{o}$. Samay and Tarun lived at D and C and their school located at O.



(i) Find the measure of $\angle DCB$.

(ii) Calculate measure of $\angle CDO$ and $\angle DCO$.

OR

Find the measure of $\angle BAC$.

(iii) Who can reach school early?

Solution

CBSE SAMPLE PAPER - 04

Class 09 - Mathematics

Section A

1. **(d)** 6
   Explanation: We know that,
   $(a + b)(a - b) = a^2 - b^2$
   So, here
   $(3 + \sqrt{3})(3 - \sqrt{3}) = 3^2 - (\sqrt{3})^2$
   $\Rightarrow 9 - 3 = 6$
2. **(a)** 4
   Explanation: Given, (4, 19) is a solution of the equation $y=ax+3$
   =19 = 4a + 3
   = a = 4
3. **(a)** second quadrant
   Explanation: As we know that abscissa is negative in second and third coordinate and ordinate is positive in first and second coordinate. Therefore the given point (-3, 2) lies in second coordinate.
4. **(b)** 2.5 cm
   Explanation: 1 cm = 30 km
   So for 75 km
   $\frac{75}{30}$ = 2.5 cm
5. **(a)** y = 9x - 7
   Explanation: Since all the given co- ordinate (1, 2), (-1, -16) and (0, -7) satisfy the given line y = 9x - 7
   For point (1, 2)
   y = 9x - 7
   2 = 9(1) - 7
   2 = 9 - 7
   2 = 2
   Hence (2, 1) is a solution.
   For point (-1, -16)
   y = 9x - 7
   -16 = 9(-1) - 7
   -16 = -9 - 7
   -16 = -16
   Hence (-1, -16) is a solution.
   For point (0,-7)
   y = 9x - 7
   -7 = 9(0) -7
   -7 = -7
   Hence (0, -7) is a solution.
6. **(b)** Second
   Explanation: Second axiom states that if equals be added to equals, then wholes are equal.
7. **(b)** 80°
   Explanation: Given that,
   AB ∥ HF and CD cuts them
   $\angle HFC = \angle FDA$ (Corresponding angle)
   $\angle FDA = 28^o$
   $\angle FDA + \angle FDE + \angle EDB = 180^o$ (Linear pair)
   $28^o + \angle FDE + 72^o = 180^o$
   $\angle FDE = 80^o$

8. **(a)** $x = 55°$ and $y = 110°$

Explanation: ABCD is a rectangle

The diagonals of a rectangle are congruent and bisect each other. Therefore, in $\triangle AOB$, we have:

OA = OB

$\angle OAB = \angle OBA = 35°$

$x = 90° - 35° = 55°$ and $\angle AOB = 180° - (35° + 35°) = 110°$

$y = \angle AOB = 110°$ [Vertically opposite angles]

Hence, $x = 55°$ and $y = 110°$

9. **(d)** 2

Explanation: If $p(x) = x + 1$ is a factor of $2x^2 + kx$, then

$p(-1) = 0$

$\Rightarrow 2(-1)^2 + k(-1) = 0$

$\Rightarrow 2 - k = 0$

$\Rightarrow k = 2$

10. **(a)** $2x - 5y = 0$

Explanation: In linear equation power of variable x and y should be 1 and here, the given linear equation has two variable x and y.

11. **(b)** 50^0

Explanation: $C = 180^0 - 115^0 = 65^0$ AB = AC And hence $\angle B = \angle C = 65^0$

Then $A = 180^0 - 2 \times 65^0 = 50^0$

12. **(c)** 60^0

Explanation: Given,

ABCD is a parallelogram

$\angle A + \angle C = 2(\angle B + \angle D)$

$\angle A = 40^0$

$\because \angle A + \angle B + \angle C + \angle D = 360^0$ [angle sum property of quadrilateral]

$\Rightarrow \angle A + \angle C + \angle B + \angle D = 360^0$

$\Rightarrow 2(\angle B + \angle D) + \angle B + \angle D = 360^0$

$\Rightarrow 3(\angle B + \angle D) = 360^0$

$\Rightarrow \angle B + \angle D = \frac{360°}{3} = 120^0$

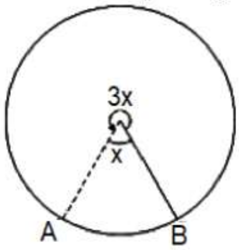
$\because \angle D = 60^0$ [given]

$\therefore \angle B = 120^0 - 60^0 = 60^0$

13. **(b)** 270^0 and 90^0

Explanation: We are given the major arc is 3 times the minor arc. We are asked to find the corresponding central angle.

See the corresponding figure.



We know that the angle formed by the circumference at the centre is 360^0.

Since the circumference of the circle is divided into two parts such that the angle formed by major and minor arcs at the centre are 3x and x respectively.

So $3x + x = 360$

$4x = 360$

$x = 90$

So $m\widehat{AB} = 90^0$ and $m\widehat{AB} = 3x = 270^0$

the degree measures of two arcs are 90^0 and 270^0

14. **(c)** $\frac{3}{2}$

Explanation: $x^{-2} = 64$

$\Rightarrow x^{-2} = 8^2$

$\Rightarrow \left(\frac{1}{x}\right)^2 = (8)^2$

$\therefore \frac{1}{x} = 8 \Rightarrow x = \frac{1}{8}$

$x^{\frac{1}{3}} + x^0 = \left(\frac{1}{8}\right)^{\frac{1}{3}} + 1$

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

$= \frac{1}{2} + 1 = \frac{3}{2}$

15. **(d)** 6

Explanation: $\left(x - \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} - 2 \times x \times \frac{1}{x}$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 = 38 - 2$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 = 36$

$\Rightarrow x - \frac{1}{x} = \pm 6$

16. **(a)** 30°

Explanation: $\angle$PBC = $\angle$QCD (Corresponding angles, OP || CQ and BC is transverse)

$\Rightarrow \angle$PBC = 70°

Now, $\angle$PBA + $\angle$ABC = $\angle$PBC

$\Rightarrow 20^\circ + \angle ABC = 70^\circ$

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

In $\triangle$ABC,

$\angle$ABC + $\angle$BAC + $\angle$ACB = 180° ...(i)

Now, $\angle$ABC + $\angle$BAC = 50° (isosceles $\triangle$)

And, $\angle$ACB = 180° - (70° + x)

From (i),

50° + 50° + 180° - (70° + x) = 180°

Hence x = 30°

17. **(b)** 8

Explanation: Let: p(x) = (x + 4)

$\therefore$ p(-x) = (x + 4)

= -x + 4

Thus, we have: p(x) + p(-x) = {(x + 4) + (-x + 4)}

= 4 + 4

= 8

18. **(a)** 10%

Explanation: The formula of the curved surface area of a cone with base radius 'r' and slant height '' is given as

Curved Surface Area $= \pi r l$

Now, it is said that the slant height has increase by 10%. So the new slant height '1.1 l'

So,now

New Curved Surface Area = 1.1 $\pi r l$

We see that the percentage increase of the Curved Surface Area is 10%

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

Explanation: The height of the triangle,

h = $\frac{\sqrt{3}}{2}$a

9 = $\frac{\sqrt{3}}{2}$a

a = $\frac{9\times 2}{\sqrt{3}} = \frac{18}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

= $\frac{18\sqrt{3}}{3} = 6\sqrt{3}$ cm

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

Explanation: Through a point infinite lines can be drawn. Through (2, 14) infinite number of lines can be drawn. Also a line has infinite points on it hence a linear equation representing a line has infinite solutions.

Section B

21. Perimeter = 40cm

Let$a = 18cm, b = 12cm, c = ?$

So, a+b+c=40 cm

18+12+C=40

C=(40-30) cm =10cm

$\therefore$ S=$\frac{18+12+10}{2}$ =20 cm

$\therefore$ area of triangle= $\sqrt{20(20-18)(20-12)(20-10)}$

=$\sqrt{20 \times 2 \times 8 \times 10}$ sq cm

=56.56 sq cm

22. In order to factorise $6x^2 + 7x - 3$, we have to find two numbers p and q such that p + q = 7 and pq = -18.

Clearly, 9 + (-2) = 7 and 9 × (-2) = -18.

So, we write the middle term 7x as 9x + (-2x), i.e., 9x - 2x.

$\therefore 6x^2 + 7x - 3 = 6x^2 + 9x - 2x - 3$

= 3x(2x + 3) - 1(2x + 3)

= (2x + 3)(3x - 1)

23. We are given,

The diameter of the sphere = 7 m

Therefore, the radius is 3.5 m

So, the riding space available for the motorcyclist is the surface area of the 'sphere' which is given by

$4\pi r^2 = 4 \times \frac{22}{7} \times 3.5 \times 3.5 m^2$

= 154 m^2

24. Given: $\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab}$

Taking LCM we have,

$\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab} = \frac{a^3+b^3+c^3}{abc}$ ....(1)

We know, $a^3 + b^3 + c^3 - 3abc = (a + b + c)[a^2 + b^2 + c^2 - ab - bc - ca)]$

Since, a + b + c = 0 (given), therefore, we have,

$a^3 + b^3 + c^3 = 3abc$

Now, from (1),

$\Rightarrow \frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab} = \frac{3abc}{abc} = 3$

OR

$125x^3 + 27y^3 + 8z^3 - 90xyz$

$= 5^3x^3 + 3^3y^3 + 2^3z^3 - 90xyz$

$= (5x)^3 + (3y)^3 + (2z)^3 - 3 \times 5x \times 3y \times 2x$

$= (5x + 3y + 2z)[(5x)^2 + (3y)^2 + (2z)^2 - (5x)(3y) - (3y)(2z) - (2z)(5x)]$

$= (5x + 3y + 2z)(25x^2 + 9y^2 + 4z^2 - 15xy - 6yz - 10zx)$

25. According to the question, given equation is $\frac{2}{3}x + 4y = -7$

$\Rightarrow \frac{2}{3}x = -7 - 4y$

$\Rightarrow 2x = 3(-7 - 4y)$

$\Rightarrow x = \frac{-21-12y}{2}$

OR

5x+3y=14

For x = 2, y = 1

L.H.S. = 5x + 3y = 5(2) + 3(1)

= 10 + 3 = 13

$\neq$ R.H.S.

$\therefore$ x = 2, y = 1 is not a solution of 5x + 3y = 14

Section C

26. Let x =$0.\overline{38}$

i.e. x = 0.3838.... ....(i)

Multiply eq. (i) by 100 we get,

$\Rightarrow$ 100x = 38.3838.... ....(ii)

On subtracting eq. (i) from (ii), we get

100x - x = 38.3838... - 0.3838...

99x = 38

$\Rightarrow x = \frac{38}{99}$

Let y = $1.\overline{27}$

i.e. y = 1.2727….(iii)

Multiply eq. (i) by 100 we get,

$\Rightarrow$ 100y = 127.2727…(iv)

On subtracting (iii) from (iv), we get

100y-y = 127.2727.... - 1.2727....

99y = 126

$\Rightarrow y = \frac{126}{99}$

$\therefore x + y = 0.\overline{38} + 1.\overline{27}$

$= \frac{38}{99} + \frac{126}{99}$

$= \frac{38+126}{99}$

$= \frac{164}{99}$

27. $(-12)^3 + (7)^3 + (5)^3$

Let a = −12, b = 7 and c = 5

We know that, if $a + b + c = 0, then, a^3 + b^3 + c^3 = 3abc$

Here, a+b+c=−12+7+5=0

$\therefore\ (-12)^3 + (7)^3 + (5)^3 = 3(-12)(7)(5)$

= - 1260

28. In right triangle PSQ,

$PQ^2 = PS^2 + QS^2$ ...[By Pythagoras theorem]

$= (12)^2 + (16)^2$

= 144 + 256 = 400

$\Rightarrow$ PQ = $\sqrt{400}$ = 20 cm

Now, for ΔPQR

a = 20 cm, b = 48 cm, c = 52 cm

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

$= \frac{20+48+52}{2}$ = 60 cm

$\therefore$ Area of ΔPQR

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

$= \sqrt{60(60-20)(60-48)(60-52)}$

$= \sqrt{60(40)(12)(8)}$

$= \sqrt{(6\times 10)(4\times 10)(6\times 2)(8)}$

= 6 $\times$ 10 $\times$ 8 = 480 cm^2

Area of Δ PSQ =$\frac{1}{2}$ $\times$ Base $\times$ Altitude

= $\frac{1}{2}$ $\times$ 16 $\times$ 12 = 96 cm^2

$\therefore$ Area of the shaded portion

= Area of ΔPQR - Area of ΔPSQ

= 480 - 96 = 384 cm^2

OR

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.

29. 12x + 5y = 0

$\Rightarrow$ 5y = –12x

$\Rightarrow y = \frac{-12}{5}x$

Put x = 0, then $y = \frac{-12}{5}(0) = 0$

Put x = 5, then $y = \frac{-12}{5}(5) = -12$

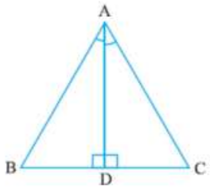
Put x = 10, then $y = \frac{-12}{5}(10) = -24$

Put x = 15, then $y = \frac{-12}{5}(15) = -36$

$\therefore$ (0, 0), (5, –12), (10, –24) and (15, –36) are the four solutions of the equation 12x + 5y = 0

30. In $\triangle$ABD and $\triangle$ACD, AB = AC [Given]

$\angle$ADB = $\angle$ADC = 90° [AD $\perp$ BC]



AD = AD [Common]

$\therefore \triangle ABD \cong \triangle ACD$ [RHS rule of congruency]

$\Rightarrow$ BD = DC [By C.P.C.T.]

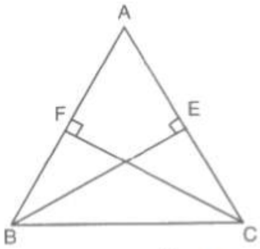
$\Rightarrow$ AD bisects BC

Also $\angle BAD$$\angle$BAD = $\angle CAD$$\angle$CAD [By C.P.C.T.]

$\Rightarrow$AD bisects $\angle$A

OR

Given:- A $\triangle$ABC in which altitudes BE and CF from B and C respectively on AC and AB are equal.



To Prove:- In $\triangle$ABE and $\triangle$ACF, we have

$\angle AEB = \angle AFC$ [Each equal to 90°]

$\angle BAE = \angle CAF$ [common angle]

and, BE = CF

So, by AAS criterion of congruence, we obtain

$\Delta ABE \cong \Delta ACF$

$\Rightarrow$ AB = AC

Hence, triangle ABC is isosceles.

31. (A) (0, 0) (B) (2, 3) (c) (-2, 3)

Section D

32. $\frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}}$

$= \frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} \times \frac{\sqrt{10}-\sqrt{3}}{\sqrt{10}-\sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}} \times \frac{\sqrt{6}-\sqrt{5}}{\sqrt{6}-\sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}} \times \frac{\sqrt{15}-3\sqrt{2}}{\sqrt{15}-3\sqrt{2}}$

$= \frac{7\sqrt{3}(\sqrt{10}-\sqrt{3})}{10-3} - \frac{2\sqrt{5}(\sqrt{6}-\sqrt{5})}{6-5} - \frac{3\sqrt{2}(\sqrt{15}-3\sqrt{2})}{15-18}$

$= \sqrt{3}(\sqrt{10} - \sqrt{3}) - 2\sqrt{5}(\sqrt{6} - \sqrt{5}) + \sqrt{2}(\sqrt{15} - 3\sqrt{2})$

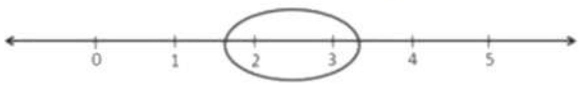
$= \sqrt{30} - 3 - 2\sqrt{30} + 10 + \sqrt{30} - 6$

$= 2\sqrt{30} - 9 - 2\sqrt{30} + 10 = 1$

OR

The following steps for successive magnification to visualise 2.665 are:

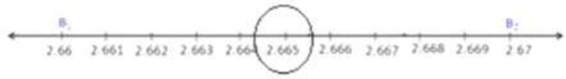
i. We observe that 2.665 lies between 2 and 3 on the number line.



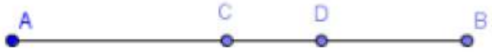
ii. Divide this portion into 10 equal parts and mark each point of division. The first mark to the right of 2 will represent 2.1, the next 2.2 and soon. Again we observe that 2.665 lies between 2.6 and 2.7.

iii. Again divide this portion into 10 equal parts and represent 2.61, the number 2.62, and soon. We observe 2.665 lies between 2.66 and 2.67.

iv. Again divide this portion into 10 equal parts and represent 2.661, then next 2.662, and so on.
Clearly, fifth point will represent 2.665



33. We need to prove that every line segment has one and only one mid-point. Let us consider the given below line segment AB and assume that C and D are the mid-points of the line segment AB



If C is the mid-point of line segment AB, then
AC = CB.
An axiom of the Euclid says that “If equals are added to equals, the wholes are equal.”
AC + AC = CB + AC....(i)
From the figure, we can conclude that CB + AC will coincide with AB.
An axiom of the Euclid says that “Things which coincide with one another are equal to one another.” AC + AC = AB....(ii)
An axiom of the Euclid says that “Things which are equal to the same thing are equal to one another.”
Let us compare equations (i) and (ii), to get
AC + AC = AB, or 2AC = AB.(iii)
If D is the mid-point of line segment AB, then
AD = DB.
An axiom of the Euclid says that “If equals are added to equals, the wholes are equal.”
AD + AD = DB + AD....(iv)
From the figure, we can conclude that DB + AD will coincide with AB.
An axiom of the Euclid says that “Things which coincide with one another are equal to one another.”
AD + AD = AB....(v)
An axiom of the Euclid says that “Things which are equal to the same thing are equal to one another.”
Let us compare equations (iv) and (v), to get
AD + AD = AB, or
2AD = AB....(vi)
An axiom of the Euclid says that “Things which are equal to the same thing are equal to one another.” Let us compare equations (iii) and (vi), to get
2AC = 2AD.
An axiom of the Euclid says that “Things which are halves of the same things are equal to one another.” AC = AD.
Therefore, we can conclude that the assumption that we made previously is false and a line segment has one and only one mid-point.

34. We are given that $AB \parallel CD, CD \parallel EF$ and $y : z = 3 : 7$
We need to find the value of x in the figure given below.
We know that lines parallel to the same line are also parallel to each other.
We can conclude that $AB \parallel EF$
Let $y = 3a$ and $z = 7a$
We know that angles on the same side of a transversal are supplementary.
$\therefore x + y = 180^\circ$
$x = z$ Alternate interior angles
$z + y = 180^\circ$
or $7a + 3a = 180^\circ$
$\Rightarrow 10a = 180^\circ$
$a = 18^\circ$.
$z = 7a = 126^\circ$
$y = 3a = 54^\circ$.
Now, as $x = z$

=> $x = 126^{\circ}$.

Therefore, we can conclude that $x = 126^{\circ}$

OR

Through O draw OE || AB || CD

Then, $\angle AOE + \angle COE = x^{\circ}$

Now, AB || OE and AO is the transversal

$\therefore \angle OAB + \angle AOE = 180^{\circ}$

$\Rightarrow 104^{\circ} + \angle AOE = 180^{\circ}$

$\Rightarrow \angle AOE = (180 - 104)^{\circ} = 76^{\circ}$ .....(1)

Again, CD || OE and OC is the transversal

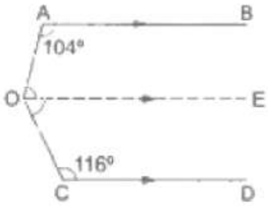
$\therefore \angle COE + \angle OCD = 180^{\circ}$

$\Rightarrow \angle COE + 116^{\circ} = 180^{\circ}$

$\Rightarrow \angle COE = (180^{\circ} - 116^{\circ}) = 64^{\circ}$ ....(2)

$\therefore \angle AOC = \angle AOE + \angle COE = (76^{0} + 64^{0}) = 140^{0}$ [from (1) and (2)]

Hence, $x^{\circ} = 140^{0}$



35. Given frequency distribution is as below:

Age group (in years)	10-16	17-23	24-30	31-37	38-44	45-51	52-58
Number of illiterate persons	175	325	100	150	250	400	525

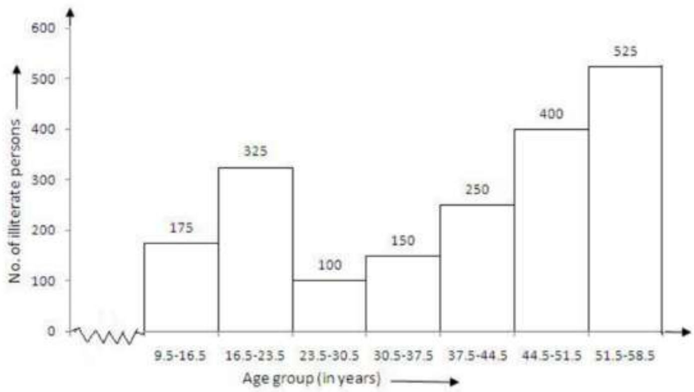
Clearly the given frequency distribution is in inclusive form, that is there is a gap between the upper limit of a class and the lower limit of the next class.

Therefore, we need to convert the frequency distribution in exclusive form, as shown below:

Age group(in years)	9.5-16.5	16.5-23.5	23.5-30.5	30.5-37.5	37.5-44.4	44.5-51.5	51.5-58.5
No of Illiterate persons	175	325	100	150	250	400	525

To draw the required histogram , take class intervals, that is age group, along x-axis and frequencies, that is number of illiterate persons along y-axis and draw rectangles . So , we get the required histogram.

Since the scale on X-axis starts at 9.5, a kink(break) is indicated near the origin to show that the graph is drawn to scale beginning at 9.5.

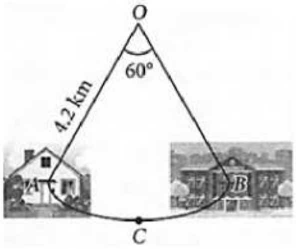


Section E

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

Govind has his home located at A and his college located at B. Govind drives his motorbike three days in a week and rides his bicycle in the remaining 3 days, to go to his college and back to home. AOB is a sector of a circle with centre O, central angle 60° and radius

4.2 km. Path AOB is the route for driving by motorbike and path ACB is for bicycle only.



(i) In a week, Govind drives his motorbike 3 days to go to college.

$\therefore$ Total distance travelled by Govind through motorbike = $2 \times 4.2 \times 6$ = 50.4 km

(ii) In a week Govind rides his bicycle 3 days to go to college.

$\therefore$ Total distance travelled by Govind through bicycle

= Length of arc $\widehat{ACB} \times 6$

= $\frac{\theta}{360^\circ} \times 2\pi r \times 6 = \frac{60^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times 4.2 \times 6$ = 26.4 km

(iii)Area of sector AOB = $\frac{\theta}{360^\circ} \times \pi r^2$

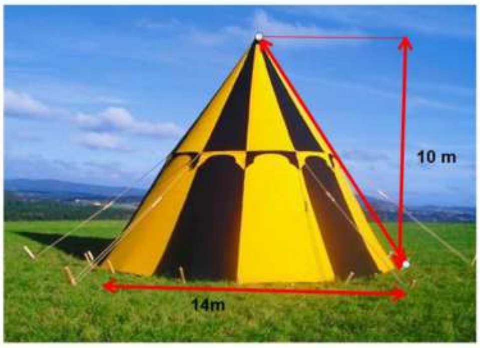
= $\frac{60^\circ}{360^\circ} \times \frac{22}{7} \times (4.2)^2$ = 9.24 km^2

OR

Total cost of fuel used for a week = ₹(20 $\times$ 50.4) = ₹1008

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

Once four friends Rahul, Arun, Ajay and Vijay went for a picnic at a hill station. Due to peak season, they did not get a proper hotel in the city. The weather was fine so they decided to make a conical tent at a park. They were carrying 300 m² cloth with them. As shown in the figure they made the tent with height 10 m and diameter 14 m. The remaining cloth was used for the floor.



(i) Height of the tent h = 10 m

Radius r = 7 cm

Thus Latent height l = $\sqrt{r^2+h^2}$ = $\sqrt{7^2+10^2} = \sqrt{149}$ = 12.20 m

Curved surface of tent = $\pi r l = \frac{22}{7} \times 7 \times 12.2$ = 268.4 m^2

Thus the length of the cloth used in the tent = 268.4 m^2

The remaining cloth = 300 - 268.4 = 31.6 m^2

Hence the cloth used for the floor = 31.6 m^2

(ii) Height of the tent h = 10 m

Radius r = 7 cm

Thus the volume of the tent = $\frac{1}{3}\pi r^2 h$

= $\frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 10$

= 513.3 m^3

OR

Radius of the floor r = 7 m

Latent height of the tent l = 12.2 m

Thus total surface area of the tent = $\pi r(r+l)$

= $\frac{22}{7} \times 7(7+12.2)$

= 22 $\times$ 19.2

= 422.4 m^2

(iii) Radius of the floor = 7 m

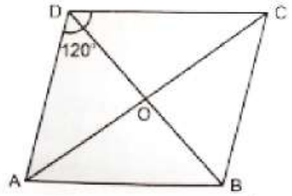
Area of the floor = $\pi r^2 = \frac{22}{7} \times 7 \times 7$

= 154 m^2

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

Tarun and Samay are two friends live in small town. The area near their houses and school is in the shape of Rhombus. Usually, they go to school by Bicycle.

ABCD is an area in the shape of rhombus in which $\angle ADC = 120^o$. Samay and Tarun lived at D and C and their school located at O.



(i) ABCD is a rhombus and adjacent angles of a rhombus are supplementary.

Thus, $\angle CDA + \angle DCB = 180^o$

$\Rightarrow 120^o + \angle DCB = 180^o$

$\Rightarrow \angle DCB = 180^o - 120^o = 60^o$

(ii) Diagonal of a rhombus bisects the angles is passing from.

So, $\angle CDO = \frac{1}{2} \angle CDA$

$= \frac{1}{2} (120)^o = 60^o$

$\angle ADC + \angle DCB = 180^o$

$120^o + \angle DCB = 180^o$

$\Rightarrow \angle DCB = 180^o - 120^o = 60^o$

$\angle DCO = \frac{1}{2} \angle DCB$

$= \frac{1}{2} (60^o) = 30^o$

Measure of $\angle CDO = 60^o$ and $\angle DCO = 30^o$

OR

Since, ABCD is a rhombus. So, AB||CD and AC is a transversal.

Thus, $\angle BAC = \angle DCA = 30^o$ (alternate interior angles)

(iii) $\angle CDO = 60^o$ and $\angle DCO = 30^o$

Since, $\angle CDO > \angle DCO$

$\Rightarrow$ CO > DO (side opposite to greater angle is greater.)

$\Rightarrow$ Samay will reach school early.