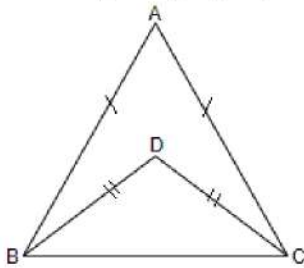


- a) 17  
b) 16  
c) 15  
d) 14

5. If  $8^{x+1} = 64$ , what is the value of  $3^{2x+1}$ ? [1]

- a) 3  
b) 27  
c) 1  
d) 9

6. In the adjoining Figure,  $AB = AC$  and  $BD = CD$ . The ratio  $\angle ABD : \angle ACD$  is [1]



- a) 1 : 1  
b) 1 : 2  
c) 2 : 3  
d) 2 : 1

7. Express  $y$  in terms of  $x$  in the equation  $5y - 3x - 10 = 0$ . [1]

- a)  $y = \frac{3-10x}{5}$   
b)  $y = \frac{3+10x}{5}$   
c)  $y = \frac{3x-10}{5}$   
d)  $y = \frac{3x+10}{5}$

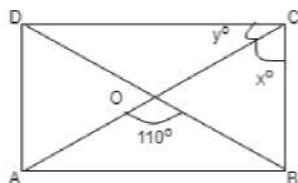
8. The factorisation of  $4x^2 + 8x + 3$  is [1]

- a)  $(2x - 1)(2x - 3)$   
b)  $(2x + 2)(2x + 5)$   
c)  $(x + 1)(x + 3)$   
d)  $(2x + 1)(2x + 3)$

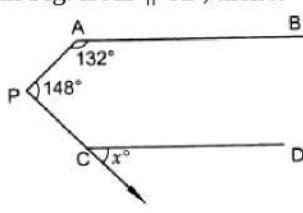
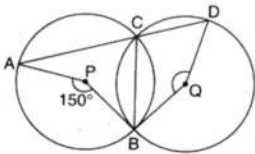
9. The simplest form of  $0.\overline{57}$  is [1]

- a)  $\frac{26}{45}$   
b)  $\frac{57}{99}$   
c)  $\frac{57}{100}$   
d) none of these

10. In the given figure, ABCD is a Rectangle. Find the values of  $x$  and  $y$ ? [1]



- a)  $x = 120^\circ$  and  $y = 120^\circ$   
b)  $x = 50^\circ$  and  $y = 60^\circ$

- c)  $x = 55^\circ$  and  $y = 35^\circ$       d)  $x = 60^\circ$  and  $y = 70^\circ$
11. If  $\frac{3^{2x-8}}{225} = \frac{5^3}{5^x}$ , then  $x =$  [1]  
 a) 4      b) 2  
 c) 5      d) 3
12. The linear equation  $3x - y = x - 1$  has : [1]  
 a) A unique solution      b) Two solutions  
 c) No solution      d) Infinitely many solutions
13. In Fig. if  $AB \parallel CD$ , then  $x =$  [1]
- 
- a)  $100^\circ$       b)  $110^\circ$   
 c)  $105^\circ$       d)  $115^\circ$
14. The value of  $\left[ (81)^{\frac{1}{2}} \right]^{\frac{1}{2}}$  is [1]  
 a) -3      b) 9  
 c)  $\frac{1}{3}$       d) 3
15. In the given figure, P and Q are centers of two circles intersecting at B and C. ACD is a straight line. Then, the measure of  $\angle BQD$  is [1]
- 
- a)  $130^\circ$       b)  $150^\circ$   
 c)  $105^\circ$       d)  $115^\circ$
16. The point whose abscissa is 4 and this point lies on the x-axis is: [1]  
 a) None of these      b) (4, 0)  
 c) (0, 4)      d) (4, 4)
17.  $x = 2, y = 5$  is a solution of the linear equation [1]  
 a)  $5x + y = 7$       b)  $x + y = 7$   
 c)  $5x + 2y = 7$       d)  $x + 2y = 7$
18. If  $a + b + c = 0$ , then  $a^3 + b^3 + c^3$  is equal to [1]  
 a) 1      b)  $3abc$   
 c)  $2abc$       d)  $abc$
19. **Assertion (A):** In  $\triangle ABC$ , median AD is produced to X such that  $AD = DX$ . Then ABXC is a parallelogram. [1]  
**Reason (R):** Diagonals AX and BC bisect each other at right angles.

- 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):** Rational number lying between two rational numbers a and b is  $\frac{a+b}{2}$ . [1]

**Reason (R):** There is one rational number lying between any two rational numbers.

- 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. Why is axiom 5, in the list of Euclid's axioms, considered as a 'universal truth'? [2]

22. If a point 'C' lies between two points A and B such that AC = BC, then prove that AC =  $\frac{1}{2}$  AB. Explain by drawing the figure. [2]

23. Which of the following points lie on the x-axis? [2]

A(1, 1), B(3, 0), C(0, 3), D(0, 0), E(-5, 0), F(0, -1), G(9, 0), H(0, -8).

24. Prove that:  $\frac{1}{3+\sqrt{7}} + \frac{1}{\sqrt{7}+\sqrt{5}} + \frac{1}{\sqrt{5}+\sqrt{3}} + \frac{1}{\sqrt{3}+1} = 1$ . [2]

OR

Simplify:  $\sqrt[4]{81} - 8\sqrt[3]{216} + 15\sqrt[5]{32} + \sqrt{225}$ .

25. A semi-circular sheet of metal of diameter 28 cm is bent to form an open conical cup. Find the capacity of the cup. [2]

OR

A conical pit of top diameter 3.5 cm is 12 m deep. What is its capacity in kilolitres?

### Section C

26. If  $\sqrt{2} = 1.414$  and  $\sqrt{3} = 1.732$ , find the value of  $\frac{5}{\sqrt{2}+\sqrt{3}}$  [3]

27. The investment (in ten crores of rupees) of Life Insurance Corporation of India in different sectors are given below: [3]

| Sectors                                 | Investment<br>(in ten crores of rupees) |
|---|---|
| Central Government Securities           | 45                                      |
| State Government Securities             | 11                                      |
| Securities guaranteed by the Government | 23                                      |
| Private Sectors                         | 18                                      |
| Socially oriented sectors (Plan)        | 46                                      |
| Socially oriented sectors (Non-Plan)    | 11                                      |

Represent the above data with the help of a bar graph.

28. ABC is a triangle right angled at C. A line through the mid-point M of hypotenuse AB and parallels to BC intersects AC at D. Show that : [3]

- D is the mid-point of AC
- MD  $\perp$  AC
- CM = MA =  $\frac{1}{2}$  AB

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

30. The marks obtained (out of 100) by a class of 80 students are given below: [3]

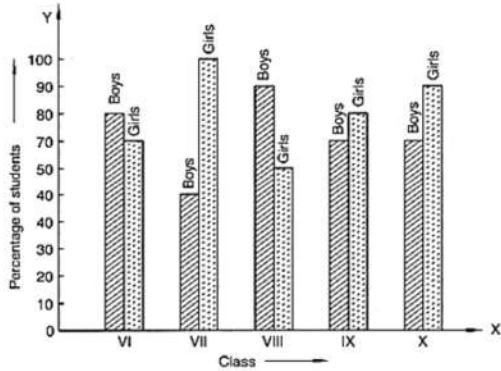
| Marks              | 10-20 | 20-30 | 30-50 | 50-70 | 70-100 |
|--------------------|-------|-------|-------|-------|--------|
| Number of students | 6     | 17    | 15    | 16    | 26     |

Construct a histogram to represent the data above.

OR

The following bar graph shows the results of an annual examination in a secondary school.

Read the bar graph (Figure) and choose the correct alternative in each of the following:



i. The pair of classes in which the results of boys and girls are inversely proportional are:

- a. VI, VIII
- b. VI, IX
- c. VIII, IX
- d. VIII, X

ii. The class having the lowest failure rate of girls is

- a. VII
- b. X
- c. IX
- d. VIII

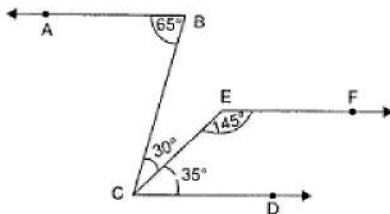
iii. The class having the lowest pass rate of students is

- a. VI
- b. VII
- c. VIII
- d. IX

31. Prove that:  $a^3 + b^3 + c^3 - 3abc = \frac{1}{2}(a + b + c) \{ (a - b)^2 + (b - c)^2 + (c - a)^2 \}$  [3]

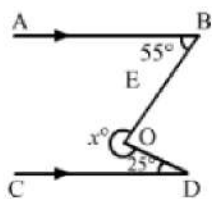
**Section D**

32. In figure,  $\angle ABC = 65^\circ$ ,  $\angle BCE = 30^\circ$ ,  $\angle DCE = 35^\circ$  and  $\angle CFE = 145^\circ$ . Prove that  $AB \parallel EF$ . [5]



OR

In each of the figures given below,  $AB \parallel CD$ . Find the value of  $x^\circ$



33. The volume of a right circular cone is  $9856 \text{ cm}^3$ . If the diameter of the base is 28 cm, find [5]  
 i. height of the cone,  
 ii. slant height of the cone,  
 iii. curved surface area of the cone.

34. The perimeter of a right triangle is 24 cm. If its hypotenuse is 10 cm, find the other two sides. Find its area by using the formula area of a right triangle. Verify your result by using Heron's formula. [5]

OR

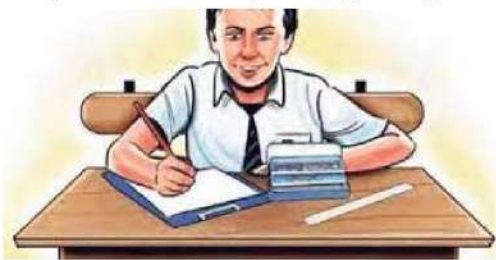
The difference between the sides at right angles in a right-angled triangle is 14 cm. The area of the triangle is  $120 \text{ cm}^2$ . Calculate the perimeter of the triangle.

35. If  $x = 0$  and  $x = -1$  are the zeros of the polynomial  $f(x) = 2x^3 - 3x^2 + ax + b$ , find the value of a and b. [5]

**Section E**

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

Ajay is writing a test which consists of 'True' or 'False' questions. One mark is awarded for every correct answer while  $\frac{1}{4}$  mark is deducted for every wrong answer. Ajay knew answers to some of the questions. Rest of the questions he attempted by guessing.



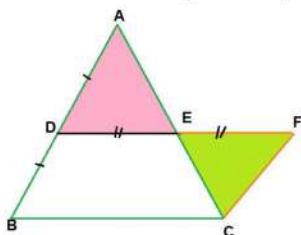
- (i) If he answered 110 questions and got 80 marks and answer to all questions, he attempted by guessing were wrong, then how many questions did he answer correctly?  
 (ii) If he answered 110 questions and got 80 marks and answer to all questions, he attempted by guessing were wrong, then how many questions did he guess?  
 (iii) If answer to all questions he attempted by guessing were wrong and answered 80 correctly, then how many marks he got?

OR

If answer to all questions he attempted by guessing were wrong, then how many questions answered correctly to score 95 marks?

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

Haresh and Deep were trying to prove a theorem. For this they did the following



- i. Draw a triangle ABC

- ii. D and E are found as the mid points of AB and AC
- iii. DE was joined and DE was extended to F so DE = EF
- iv. FC was joined.
  - (i)  $\triangle ADE$  and  $\triangle EFC$  are congruent by which criteria?
  - (ii) Show that  $CF \parallel AB$ .

**OR**

Show that  $DF = BC$  and  $DF \parallel BC$ .

- (iii) Show that  $CF = BD$ .

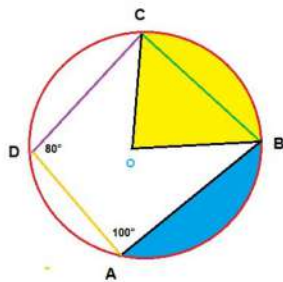
38. **Read the text carefully and answer the questions:**

**[4]**

There was a circular park in Defence colony at Delhi. For fencing purpose poles A, B, C and D were installed at the circumference of the park.

Ram tied wires From A to B, B to C and C to D, and he managed to measure the  $\angle A = 100^\circ$  and  $\angle D = 80^\circ$

Point O in the middle of the park is the center of the circle.



- (i) Name the quadrilateral ABCD.
- (ii) What is the value of  $\angle C$ ?

**OR**

Write any three properties of cyclic quadrilateral?

- (iii) What is the value of  $\angle B$ .

**Solution**

**CBSE SAMPLE PAPER - 09**

**Class 09 - Mathematics**

**Section A**

1. (a) (0, 3)

**Explanation:** Since it meets at y-axis, so , abscissa will be zero and we have ordinate=3 in common so,point will be (0,3)

2. (d) 300 %

**Explanation:** Area of triangle with sides a, b, c (A) =  $\sqrt{s(s-a)(s-b)(s-c)}$

New sides are 2a, 2b and 2c

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

$\Rightarrow s' = 2s$  .....(i)

New area =  $\sqrt{s'(s'-2a)(s'-2b)(s'-2c)}$

=  $\sqrt{2s(2s-2a)(2s-2b)(2s-2c)}$

=  $4\sqrt{s(s-a)(s-b)(s-c)}$

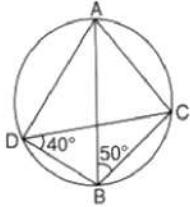
= 4A

Increased area = 4A - A = 3A

% of increased area =  $\frac{3A}{A} \times 100 = 300\%$

3. (a) 90°

**Explanation:**



$\angle BDC = \angle BAC = 40^\circ$

In triangle ABC,

$\angle A + \angle B + \angle C = 180^\circ$  ( angles of a triangle)

$50^\circ + 40^\circ + \angle C = 180^\circ$

$\angle C = 90^\circ$

4. (c) 15

**Explanation:** Add the values corresponding to the height of the bar before 40.

$6 + 3 + 4 + 2 = 15$

5. (b) 27

**Explanation:** Given  $8^{x+1} = 64$

$8^{x+1} = 64$

$8^{x+1} = 8^2$

$\Rightarrow x+1=2$

$\Rightarrow x=2-1$

$\Rightarrow x=1$

Now  $3^{2x+1} = 3^{2(1)+1}$

=  $3^{2+1}$

=  $3^3$

= 27

6. (a) 1 : 1

**Explanation:** In  $\triangle ABC$

$AB = AC$

$\therefore \angle ABC = \angle ACB$ (angles opposite to equal sides of a triangle are equal) .....1



in  $\triangle DBC$ ,

$$DB = DC,$$

$\therefore \angle DBC = \angle DCB$  (angles opposite to equal sides of a triangle are equal) .....2

subtract 2 from 1

$$\angle ABC - \angle DBC = \angle ACB - \angle DCB \text{ (equals subtracted from equals gives equal)}$$

$$= \angle ABD = \angle ACD$$

divide both the sides by  $\angle ACD$

$$\Rightarrow \frac{\angle ABD}{\angle ACD} = 1$$

$$\therefore \angle ABD : \angle ACD = 1 : 1$$

7. (d)  $y = \frac{3x+10}{5}$

**Explanation:**  $5y - 3x - 10 = 0$

$$5y - 3x = 10$$

$$5y = 10 + 3x$$

$$y = \frac{10+3x}{5}$$

8. (d)  $(2x + 1)(2x + 3)$

**Explanation:** Now,  $4x^2 + 8x + 3 = 4x^2 + 6x + 2x + 3$  [by splitting middle term]

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

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

9. (a)  $\frac{26}{45}$

**Explanation:**  $0.5\bar{7} = \frac{57-5}{90}$

$$= \frac{52}{90} = \frac{26}{45}$$

10. (c)  $x = 55^\circ$  and  $y = 35^\circ$

**Explanation:** Given  $\angle AOB = 110^\circ$

$$\Rightarrow \angle DOC = 110^\circ \text{ vertically opposite angles}$$

$\triangle DOC$  we have:

$$DO = OC$$

$$\text{Now, } \angle ODC = \angle OCD = y$$

now in  $\triangle ODC$

$$y + y + 110^\circ = 180^\circ \text{ (angle sum property of triangle)}$$

$$\Rightarrow 2y = 180^\circ - 110^\circ = 70^\circ$$

$$\Rightarrow y = 35^\circ$$

$$\text{Also, } x = 90^\circ - y$$

$$x = 90^\circ - 35^\circ = 55^\circ$$

$$\text{Hence, } x = 55^\circ \text{ and } y = 35^\circ$$

11. (c) 5

**Explanation:**  $\frac{3^{2x-8}}{225} = \frac{5^3}{5^x}$

$$\Rightarrow 3^{2x-8} \times 5^x = 5^3 \times 225$$

$$\Rightarrow \frac{3^{2x}}{3^8} \times 5^x = 5^3 \times 5 \times 5 \times 3 \times 3$$

$$\Rightarrow 3^{2x} \times 5^x = 3^8 \times 3^2 \times 5^5$$

$$\Rightarrow (3^2)^x \times 5^x = 3^{10} \times 5^5$$

$$\Rightarrow 9^x \times 5^x = 9^5 \times 5^5$$

$$\Rightarrow (45)^x = (45)^5$$

Comparing, we get

$$x = 5$$

12. (d) Infinitely many solutions

**Explanation:**  $3x - y = x - 1$

$$y = 3x - x + 1$$

$$y = 2x + 1$$

This is linear equation of two variable. If we take any random value of  $x$  and solve  $y$  corresponding value of  $x$ . We will get infinite many solutions.

13. (a)  $100^\circ$

**Explanation:** Given that,

$AB \parallel CD$

Produce P to Q so that  $PQ \parallel AB \parallel CD$

$$\angle BAP + \angle APQ = 180^\circ \text{ (Interior angle)}$$

$$132^\circ + \angle APQ = 180^\circ$$

$$\angle APQ = 48^\circ \text{ (i)}$$

$$\angle APC = \angle APQ + \angle QPC$$

$$148^\circ = 48^\circ + \angle QPC \text{ [From (i)]}$$

$$\angle QPC = 100^\circ$$

$$\angle QPC + \angle PCD = 180^\circ \text{ (Interior angles)}$$

$$100^\circ + \angle PCD = 180^\circ$$

$$\angle PCD = 80^\circ$$

$$\angle PCD + x = 180^\circ \text{ (Linear pair)}$$

$$80^\circ + x = 180^\circ$$

$$x = 100^\circ$$

14. (d) 3

**Explanation:**  $\left[ (81)^{\frac{1}{2}} \right]^{\frac{1}{2}}$

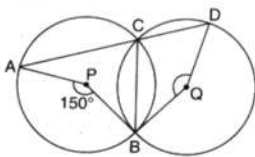
$$= (3^4)^{\frac{1}{2} \times \frac{1}{2}}$$

$$= (3^4)^{\frac{1}{4}}$$

$$= 3$$

15. (b)  $150^\circ$

**Explanation:**



$\angle APB = 150^\circ$ , so,  $\angle ACB = 75^\circ$  {Angle subtended by an arc at centre is twice the angle subtended at any point on circumference}

Now, ACD is straight line, so,  $\angle ACB + \angle DCB = 180^\circ$

$$\angle DCB = 180 - 75 = 105^\circ$$

Now, angle subtended by arc BD on centre is twice of  $\angle DCB = 2 \times 105 = 210^\circ$

$$\text{Now, } \angle BQD = 360^\circ - 210^\circ = 150^\circ$$

16. (b) (4, 0)

**Explanation:** Since the abscissa or x-coordinate of a point is 4 and this point lies on the x-axis. And the ordinate or y-coordinate of a point lying on the x-axis is 0.

Therefore the coordinate of the point is (4, 0).

17. (b)  $x + y = 7$

**Explanation:**  $x = 2$  and  $y = 5$  satisfy the given equation.

18. (b)  $3abc$

**Explanation:** If  $a + b + c = 0$ , then

$$a^3 + b^3 + c^3 - 3abc = 0$$

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

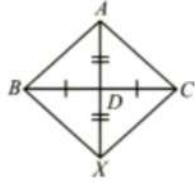
19. (c) A is true but R is false.

**Explanation:**

In quadrilateral ABXC, we have

$$AD = DX \text{ [Given]}$$

$$BD = DC \text{ [Given]}$$



So, diagonals AX and BC bisect each other but not at right angles.

Therefore, ABXC is a parallelogram.

20. (c) A is true but R is false.

**Explanation:** There are infinitely many rational numbers between any two given rational numbers.

### Section B

21. We need to prove that Euclid's fifth axiom is considered as a universal truth.

Euclid's fifth axiom states that "the whole is greater than the part."

The above given axiom is a universal truth. We can apply the fifth axiom not only mathematically but also universally in daily life.

Mathematical proof:

Let us consider a quantity z, which has different parts as a, b, x and y. .

Therefore, we can conclude that z will always be greater than its corresponding parts a, b, x and y.

Universal proof:

We know that Mumbai is located in Maharashtra and Maharashtra is located in India.

In other words, we can conclude that Mumbai is a part of Maharashtra and Maharashtra is a part of India.

Therefore, we can conclude that whole India will be greater than Mumbai or Maharashtra or both.

Therefore, we can conclude that Euclid's fifth axiom is considered as a 'Universal truth'.

22. A C B

Given,  $AC = BC$

$AC + AC = BC + AC \dots$  [AC are added to both the side]

$2AC = AB \dots$  [BC + AC coincides with AB]

$$\therefore AC = \frac{1}{2} AB$$

23. A point lies on x-axis if the y-coordinate is zero. Hence B, D, E and G points lie on the x-axis.

24. LHS

$$\begin{aligned} &= \frac{1}{3+\sqrt{7}} + \frac{1}{\sqrt{7}+\sqrt{5}} + \frac{1}{\sqrt{5}+\sqrt{3}} + \frac{1}{\sqrt{3}+1} \\ &= \frac{1}{3+\sqrt{7}} \times \frac{3-\sqrt{7}}{3-\sqrt{7}} + \frac{1}{\sqrt{7}+\sqrt{5}} \times \frac{\sqrt{7}-\sqrt{5}}{\sqrt{7}-\sqrt{5}} + \frac{1}{\sqrt{5}+\sqrt{3}} \times \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}-\sqrt{3}} + \frac{1}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1} \\ &= \frac{3-\sqrt{7}}{3^2-\sqrt{7}^2} + \frac{\sqrt{7}-\sqrt{5}}{\sqrt{7}^2-\sqrt{5}^2} + \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}^2-\sqrt{3}^2} + \frac{\sqrt{3}-1}{\sqrt{3}^2-1^2} \\ &= \frac{3-\sqrt{7}}{9-7} + \frac{\sqrt{7}-\sqrt{5}}{7-5} + \frac{\sqrt{5}-\sqrt{3}}{5-3} + \frac{\sqrt{3}-1}{3-1} \\ &= \frac{3-\sqrt{7}}{2} + \frac{\sqrt{7}-\sqrt{5}}{2} + \frac{\sqrt{5}-\sqrt{3}}{2} + \frac{\sqrt{3}-1}{2} \\ &= \frac{3-\sqrt{7}+\sqrt{7}-\sqrt{5}+\sqrt{5}-\sqrt{3}+\sqrt{3}-1}{2} \\ &= \frac{2}{2} \\ &= 1 \\ &= \text{RHS} \end{aligned}$$

OR

$$\begin{aligned} &\text{Given, } \sqrt[4]{81} - 8\sqrt[3]{216} + 15\sqrt[5]{32} + \sqrt{225} \\ &= (3^4)^{\frac{1}{4}} - 8(6^3)^{\frac{1}{3}} + 15(2^5)^{\frac{1}{5}} + (15^2)^{\frac{1}{2}} \\ &= 3 - 8 \times 6 + 15 \times 2 + 15 \\ &= 3 - 48 + 30 + 15 \\ &= 48 - 48 \\ &= 0 \end{aligned}$$

25. Diameter of semicircular sheet is 28 cm. It is bent to form an open conical cup. The radius of sheet becomes the slant height of the cup. The circumference of the sheet becomes the circumference of the base of the cone.

$\therefore l = \text{Slant height of conical cup} = 14 \text{ cm.}$

Let  $r$  cm be the radius and  $h$  cm be the height of the conical cup circumference of conical cup of the semicircular sheet

$$\therefore 2\pi r = \pi \times 14 \Rightarrow r = 7 \text{ cm}$$

$$\text{Now, } l^2 = r^2 + h^2 \Rightarrow h = \sqrt{l^2 - r^2}$$

$$= \sqrt{(14)^2 - (7)^2} = \sqrt{196 - 49} = \sqrt{147} = 12.12 \text{ cm}$$

$\therefore$  Capacity of the cup

$$= \frac{1}{3} \pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 12.12$$

$$= 622.16 \text{ cm}^3$$

OR

For conical pit : Diameter = 3.5 cm.

$$\therefore \text{Radius } (r) = \frac{3.5}{2} \text{ m} = 1.75 \text{ m}$$

Depth (h) = 12 m

$$\therefore \text{Capacity of the conical pit} = \frac{1}{3} \pi r^2 h$$

$$\frac{1}{3} \times \frac{22}{7} \times (1.75)^2 \times 12 \text{ m}^3$$

$$= 38.5 \text{ m}^3 = 38.5 \times 1000 \text{ l}$$

$$= 38.5 \text{ kl.}$$

### Section C

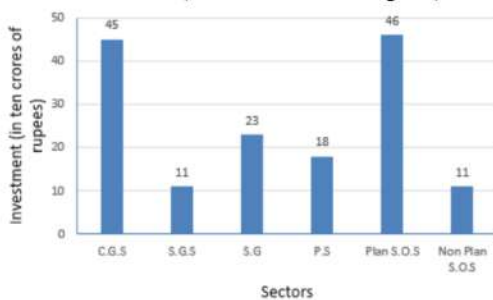
26.  $\frac{5}{\sqrt{2}+\sqrt{3}} \times \frac{\sqrt{2}-\sqrt{3}}{\sqrt{2}-\sqrt{3}}$  (Rationalizing denominator)

$$\frac{5(\sqrt{2}-\sqrt{3})}{(\sqrt{2})^2 - (\sqrt{3})^2} = \frac{5(\sqrt{2}-\sqrt{3})}{2-3}$$

$$= -5 [1.414 - 1.732]$$

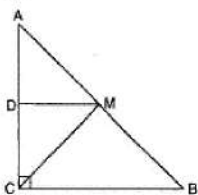
$$= -5 \times -0.318 = 1.59$$

27. The investment (in ten crores of rupees) of Life Insurance Corporation of India in different sectors:-



28. Given: ABC is a triangle right angled at C. A line through the mid-point M of hypotenuse AB and parallels to BC intersects AC at

D.



To Prove :

i. D is the mid-point of AC (ii)  $MD \perp AC$

ii.  $CM = MA = \frac{1}{2} AB$

Proof :

i. In ACB,

As M is the mid-point of AB and  $MD \parallel BC$

$\therefore$  D is the mid-point of AC . . . [By converse of mid-point theorem]

ii. As  $MD \parallel BC$  and AC intersects them

$\angle ADM = \angle ACB$  . . . [Corresponding angles]

But  $\angle ACB = 90^\circ$  . . . [Given]

$\therefore \angle ADM = 90^\circ \Rightarrow MD \perp AC$

iii. Now  $\angle ADM + \angle CDM = 180^\circ$  . . . [Linear pair axiom]

$\angle ADM = \angle CDM = 90^\circ$

In  $\triangle ADM$  and  $\triangle CDM$

$AD = CD \dots$  [As D is the mid-point of AC]

$\angle ADM = \angle CDM \dots$  [Each  $90^\circ$ ]

$DM = DM \dots$  [Common]

$\therefore \triangle ADM \cong \triangle CDM \dots$  [By SAS rule]

$\therefore MA = MC \dots$  [c.p.c.t.]

But M is the mid-point of AB

$\therefore MA = MB = \frac{1}{2} AB$

$\therefore MA = MC = \frac{1}{2} AB$

$\therefore CM = MA = \frac{1}{2} AB$

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

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

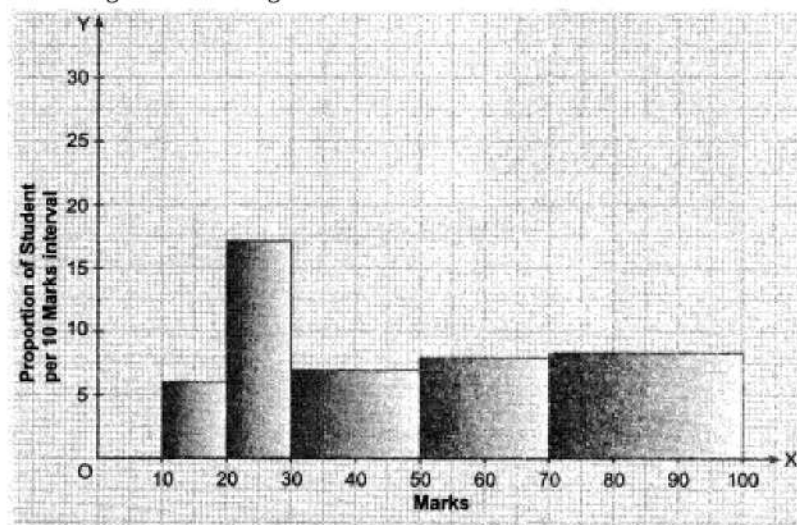
$$\Rightarrow cx = 8 - 2x$$

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

30. In the given frequency distribution, the class intervals are not of equal width.  $\therefore$  we would make modification in the lengths of the rectangle in the histogram so that the areas of the rectangle are proportional to the frequencies.

| Marks    | Frequency | Width of the class | Length of the rectangle          |
|----------|-----------|--------------------|----------------------------------|
| 10 – 20  | 6         | 10                 | $\frac{10}{10} \times 6 = 6$     |
| 20 – 30  | 17        | 10                 | $\frac{10}{10} \times 17 = 17$   |
| 30 – 50  | 15        | 20                 | $\frac{10}{20} \times 15 = 7.5$  |
| 50 – 70  | 16        | 20                 | $\frac{10}{20} \times 16 = 8$    |
| 70 – 100 | 26        | 30                 | $\frac{10}{30} \times 26 = 8.67$ |

The histogram of data is given below:



OR

i. (b) VI, IX

ii. (a) VII

iii. (b) VII

31. We have,

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

$$= (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$$

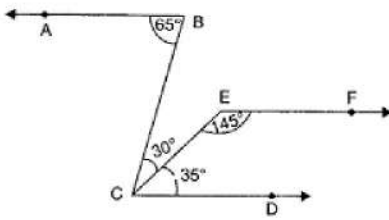
$$= \frac{1}{2}(a + b + c)(2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca)$$

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

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

**Section D**

32.



$$\angle ABC = 65^\circ$$

$$\angle BCD = \angle BCE + \angle ECD = 30^\circ + 35^\circ = 65^\circ$$

$$\therefore \angle ABC = \angle BCD$$

These angles form a pair of equal alternate angles

$$\therefore AB \parallel CD \dots (1)$$

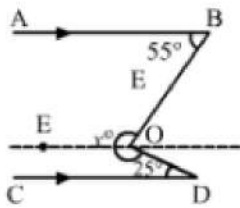
$$\angle FEC + \angle ECD = 145^\circ + 35^\circ = 180^\circ$$

These angles are consecutive interior angles formed on the same side of the transversal.

$$\therefore CD \parallel EF \dots (2)$$

$$AB \parallel EF \dots [\text{From (1) and (2)}]$$

OR



Draw  $EO \parallel AB \parallel CD$

$$\text{Then, } \angle EOB + \angle EOD = x^\circ$$

Now,  $EO \parallel AB$  and  $BO$  is the transversal.

$$\therefore \angle EOB + \angle ABO = 180^\circ \text{ [Consecutive Interior Angles]}$$

$$\Rightarrow \angle EOB + 55^\circ = 180^\circ$$

$$\Rightarrow \angle EOB = 125^\circ$$

Again,  $EO \parallel CD$  and  $DO$  is the transversal.

$$\therefore \angle EOD + \angle CDO = 180^\circ \text{ [Consecutive Interior Angles]}$$

$$\Rightarrow \angle EOD + 25^\circ = 180^\circ$$

$$\Rightarrow \angle EOD = 155^\circ$$

Therefore,

$$x^\circ = \angle EOB + \angle EOD$$

$$x^\circ = (125 + 155)^\circ$$

$$x^\circ = 280^\circ$$

33. i. We have, Volume =  $9856 \text{ cm}^3$  and  $r = 14 \text{ cm}$ .

Let the height of the cone be  $h, \text{cm}$

$$\text{Then, volume of cone} = \frac{1}{3} \pi r^2 h$$

$$\Rightarrow 9856 = \frac{1}{3} \times \frac{22}{7} \times 14 \times 14 \times h$$

$$\Rightarrow h = \left( \frac{9856 \times 3 \times 7}{22 \times 14 \times 14} \right) = 48$$

height of the cone is  $48 \text{ cm}$ .

ii. We have, Volume =  $9856 \text{ cm}^3$  and  $r = 14 \text{ cm}$ .

Let the slant height of the cone be  $l, \text{cm}$ . Then,

$$l^2 = r^2 + h^2$$

$$\Rightarrow l^2 = (14)^2 + (48)^2 = 196 + 2304 = 2500$$

$$\Rightarrow l = \sqrt{2500} = 50$$

$\therefore$  slant height of the cone is  $50 \text{ cm}$

iii. We have, Volume =  $9856 \text{ cm}^3$  and  $r = 14 \text{ cm}$ .

Curved surface area of the cone

$$= \pi r l$$

$$= \left( \frac{22}{7} \times 14 \times 50 \right) \text{ cm}^2 = 2200 \text{ cm}^2$$

$\therefore$  curved surface area of the cone is  $2200 \text{ cm}^2$ .

34. Let  $x$  and  $y$  be the two lines of the right  $\angle$

$\therefore$   $AB = x \text{ cm}$ ,  $BC = y \text{ cm}$  and  $AC = 10 \text{ cm}$

$\therefore$  By the given condition,

Perimeter =  $24 \text{ cm}$

$$x + y + 10 = 24 \text{ cm}$$

$$\text{Or } x + y = 14 \dots \text{(I)}$$

By Pythagoras theorem,

$$x^2 + y^2 = (10)^2 = 100 \dots \text{(II)}$$

$$\text{From (1), } (x + y)^2 = (14)^2$$

$$\text{Or } x^2 + y^2 + 2xy = 196$$

$$\therefore 100 + 2xy = 196 \text{ [From (II)]}$$

$$xy = \frac{96}{2} = 48 \text{ sq cm} \dots \text{(III)}$$

$$\text{Area of } \Delta ABC = \frac{1}{2}xy \text{ sq cm}$$

$$= \frac{1}{2} \times 48 \text{ sq cm}$$

$$= 24 \text{ sq cm} \dots \text{(IV)}$$

Again, we know that

$$(x - y)^2 = (x + y)^2 - 4xy$$

$$= (14)^2 - 4 \times 48 \text{ [From (I) \& (III)]}$$

$$\text{Or } x - y = \pm 2$$

(i) When,  $x - y = 2$  and  $x + y = 14$ , then  $2x = 16$

$$\text{or } x = 8, y = 6$$

(ii) When,  $x - y = -2$  and  $x + y = 14$ , then  $2x = 12$

$$\text{Or } x = 6, y = 8$$

Verification by using Heron's formula:

Sides are  $6 \text{ cm}$ ,  $8 \text{ cm}$  and  $10 \text{ cm}$

$$S = \frac{24}{2} = 12 \text{ cm}$$

$$\text{Area of } \Delta ABC = \sqrt{12(12 - 6)(12 - 8)(12 - 10)} \text{ sq cm}$$

$$= \sqrt{12 \times 6 \times 4 \times 2} \text{ sq cm}$$

$$= 24 \text{ sq cm}$$

Which is same as found in (IV)

Thus, the result is verified.

OR

Given that, the difference between the sides at right angles in a right-angled triangle is  $14 \text{ cm}$ .

Let the sides containing the right angle be  $x \text{ cm}$  and  $(x - 14) \text{ cm}$

$$\text{Then, the area of the triangle} = \left[ \frac{1}{2} \times x \times (x - 14) \right] \text{ cm}^2$$

But, area =  $120 \text{ cm}^2$  (given).

$$\therefore \frac{1}{2} x(x - 14) = 120$$

$$\Rightarrow x^2 - 14x - 240 = 0$$

$$\Rightarrow x^2 - 24x + 10x - 240$$

$$\Rightarrow x(x - 24) + 10(x - 24)$$

$$\Rightarrow (x - 24)(x + 10) = 0$$

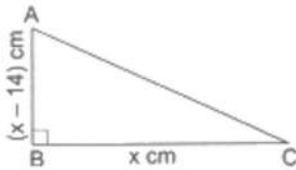
$$\Rightarrow x = 24 \text{ (neglecting } x = -10)$$

$\therefore$  one side =  $24 \text{ cm}$ , other side =  $(24 - 14) \text{ cm} = 10 \text{ cm}$

$$\text{Hypotenuse} = \sqrt{(24)^2 + (10)^2} \text{ cm} = \sqrt{576 + 100} \text{ cm}$$

$$= \sqrt{676} \text{ cm} = 26 \text{ cm}$$

$\therefore$  perimeter of the triangle =  $(24 + 10 + 26)$  cm = 60 cm.



35. We have,  $f(x) = 2x^3 - 3x^2 + ax + b$

Zeros of  $f(x)$  are 0 and -1

Substitute  $x = 0$  in  $f(x)$ , we get,

$$f(0) = 2(0)^3 - 3(0)^2 + a(0) + b$$

$$= 0 - 0 + 0 + b$$

$$= b \dots (1)$$

Substitute  $x = (-1)$  in  $f(x)$ , we have,

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

$$= -2 - 3 - a + b$$

$$= -5 - a + b \dots (2)$$

We need to equate equations 1 and 2 to zero

$$b = 0 \text{ and } -5 - a + b = 0$$

since, the value of  $b$  is zero

substitute  $b = 0$  in equation 2

$$\implies -5 - a = -b$$

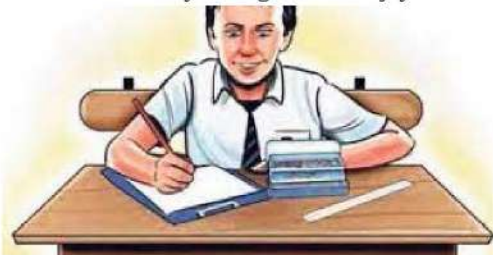
$$\implies -5 - a = 0$$

$$a = -5$$

### Section E

36. Read the text carefully and answer the questions:

Ajay is writing a test which consists of 'True' or 'False' questions. One mark is awarded for every correct answer while  $\frac{1}{4}$  mark is deducted for every wrong answer. Ajay knew answers to some of the questions. Rest of the questions he attempted by guessing.



(i) Let the no of questions whose answer is known to Ajay be  $x$  and number questions attempted by guessing be  $y$ .

$$x + y = 110$$

$$x + 14y = 80 \implies 4x + y = 320 \quad x + y = 110 \dots (1)$$

$$4x + y = 320 \dots (2)$$

Solving (1) and (2)

$$x + y - 4x - y = 110 - 320 = -210$$

$$\implies -3x = -210$$

$$\implies x = 70$$

(ii)  $x + y = 110$

$$x + 14y = 80 \implies 4x + y = 320$$

$$x + y = 110 \dots (1)$$

$$4x + y = 320 \dots (2)$$

Solving (1) and (2)

$$x + y - 4x - y = 110 - 320 = -210$$

$$\implies -3x = -210$$

$$\implies x = 70$$

Put  $x = 70$  in (1)

$$70 + y = 110$$

$$\implies y = 40$$

40 question he answered by guessing.



(iii)  $70 - 40 \times \frac{1}{4} = 70 - 10 = 60$  marks

He scored 60 marks.

OR

$$x - \frac{1}{4}(110 - x) = 95$$

$$\Rightarrow 4x - 110 + x = 380$$

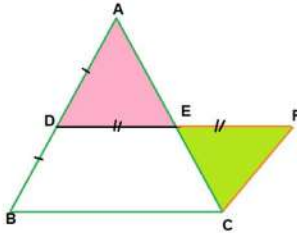
$$\Rightarrow 5x = 380 + 110 = 490$$

$$\Rightarrow x = \frac{490}{5} = 98$$

So he answered 98 correct answers 12 by guessing.

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

Haresh and Deep were trying to prove a theorem. For this they did the following



- i. Draw a triangle ABC
- ii. D and E are found as the mid points of AB and AC
- iii. DE was joined and DE was extended to F so DE = EF
- iv. FC was joined.

(i)  $\triangle ADE$  and  $\triangle CFE$

DE = EF (By construction)

$\angle AED = \angle CEF$  (Vertically opposite angles)

AE = EC (By construction)

By SAS criteria  $\triangle ADE \cong \triangle CFE$

(ii)  $\triangle ADE \cong \triangle CFE$

Corresponding part of congruent triangle are equal

$\angle EFC = \angle EDA$

alternate interior angles are equal

$\Rightarrow AD \parallel FC$

$\Rightarrow CF \parallel AB$

OR

$DE = \frac{BC}{2}$  {line drawn from mid points of 2 sides of  $\triangle$  is parallel and half of third side}

$DE \parallel BC$  and  $DF \parallel BC$

$DF = DE + EF$

$\Rightarrow DF = 2DE$  (BE = EF)

$\Rightarrow DF = BC$

(iii)  $\triangle ADE \cong \triangle CFE$

Corresponding part of congruent triangle are equal.

$CF = AD$

We know that D is mid point AB

$\Rightarrow AD = BD$

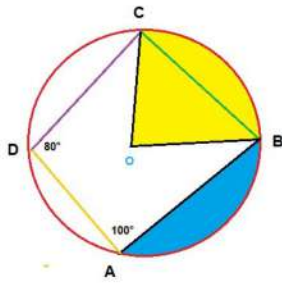
$\Rightarrow CF = BD$

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

There was a circular park in Defence colony at Delhi. For fencing purpose poles A, B, C and D were installed at the circumference of the park.

Ram tied wires From A to B, B to C and C to D, and he managed to measure the  $\angle A = 100^\circ$  and  $\angle D = 80^\circ$

Point O in the middle of the park is the center of the circle.



(i) ABCD is cyclic quadrilateral.

A quadrilateral ABCD is called cyclic if all the four vertices of it lie on a circle.

Here all four vertices A, B, C and D lie on a circle.

(ii) We know that the sum of both pair of opposite angles of a cyclic quadrilateral is  $180^\circ$ .

$$\angle C + \angle A = 180^\circ$$

$$\angle C = 180^\circ - 100^\circ = 80^\circ$$

OR

i. In a cyclic quadrilateral, all the four vertices of the quadrilateral lie on the circumference of the circle.

ii. The four sides of the inscribed quadrilateral are the four chords of the circle.

iii. The sum of a pair of opposite angles is  $180^\circ$  (supplementary). Let  $\angle A$ ,  $\angle B$ ,  $\angle C$ , and  $\angle D$  be the four angles of an inscribed quadrilateral. Then,  $\angle A + \angle C = 180^\circ$  and  $\angle B + \angle D = 180^\circ$ .

(iii) We know that

The sum of both pair of opposite angles of a cyclic quadrilateral is  $180^\circ$ .

$$\angle B + \angle D = 180^\circ$$

$$\angle B = 180^\circ - 80^\circ = 100^\circ$$