

**COMPREHENSIVE ASSESSMENT FEEDBACK**  
**PRE-BOARD EXAMINATION (2023-24)**  
**CLASS: X**  
**SUBJECT: MATHEMATICS (BASIC) (241)**

1.

**Sol.** We know that  $\text{LCM}(a, b) \times \text{HCF}(a, b) = a \times b$

$$\text{LCM}(96, 104) \times 8 = 96 \times 104$$

$$\text{LCM}(96, 104) = 1248$$

- (a) 96 is not a multiple of 104. So  $\text{LCM} = 96$  is not possible. Hence (a) is incorrect option.  
 (b) 404 is neither a multiple of 96 nor 104. So  $\text{LCM} = 104$  is not possible. Hence (b) is incorrect option.  
 (c) We know that  $\text{LCM}(a, b) \times \text{HCF}(a, b) = a \times b$ . So,  $\text{LCM}$  is 1248. Hence **(c) is the correct option.**  
 (d) 2496 is a multiple of both 96 and 104. But it is not the least common multiple of 96 and 104. So, 2496 is not  $\text{LCM}$ . Hence (d) is incorrect option.

**Suggestive Measures – While solving such type of questions students should know that**

- **LCM is the multiple of both numbers not only one of them.**
- **Smallest number divisible by both the numbers is their LCM.**

2.

**Sol.** We know that the product of the zeroes of the polynomial  $ax^2 + bx + c$  is  $\frac{\text{constant term}}{\text{coefficient of } x^2} = \frac{c}{a}$ .

- (a) In this question the constant term is  $(-c)$  not 'c'. So (a)  $\frac{c}{a}$  cannot be the solution.  
 (b) The constant term is  $(-c)$  and coefficient of  $x^2$  is 'a'. So **(b)  $\frac{-c}{a}$  is the solution**  
 (c) 'b' is the coefficient of  $x$  not constant term. So (c)  $\frac{b}{a}$  cannot be the solution.  
 (d)  $(-b)$  is the coefficient of  $x$  not constant term. So (d)  $\frac{-b}{a}$  cannot be the solution.

**Suggestive Measures – While solving such type of questions students should :**

- **know the relation between coefficients of  $x^2$ ,  $x$  and constant term**
- **know formula for the sum and product of zeroes of a polynomial**
- **have the clarity of signs like + or – while finding product or sum of zeroes as  $\frac{-b}{a}$  and  $\frac{c}{a}$  respectively**

3.

**Sol.** For polynomial  $3x^2 - 6x + 1$ ,  $b^2 = (-6)^2 = 36$  and  $4ac = 12$

(a)  $b^2 - 4ac = 36 - 12 = 24$ . So **(a) 24 is the correct option.**

(b) Here  $36 > 12$  i.e.  $b^2 > 4ac$ . Since discriminant cannot be negative, so (b)  $-24$  cannot be the correct option.

(c)  $b^2 = 36$  and  $4ac = 12$ . Their difference cannot be more than these numbers. So (c) 48 cannot be the correct option.

(d) Since discriminant cannot be negative, so (d)  $-48$  cannot be the correct option.

**Suggestive Measures – While solving such type of questions students should know the following conditions related to nature of roots**

- Discriminant (D) =  $b^2 - 4ac = 0$  for equal roots.
- Discriminant (D) =  $b^2 - 4ac \geq 0$  for real roots.
- Discriminant (D) =  $b^2 - 4ac \leq$  for imaginary roots.

**4.**

**Sol.** For a pair of linear equations  $a_1x + b_1y + c_1 = 0$ ,  $a_2x + b_2y + c_2 = 0$

Here  $\frac{a_1}{a_2} = \frac{2}{6} = \frac{1}{3}$ ,  $\frac{b_1}{b_2} = \frac{3}{-9} = \frac{-1}{3}$ ,  $\frac{c_1}{c_2} = \frac{-7}{15}$

(a) Condition for No solution is  $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ . This condition is not fulfilled. Hence option (a) is not possible.

(b) Condition for infinitely many solutions is  $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ . This condition is not fulfilled.

Hence option (b) is not possible.

(c) There is no condition for two solutions. Hence option (c) is not possible.

(d) Condition for only one solution (unique solution) is  $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ . This condition is fulfilled as  $\frac{a_1}{a_2} = \frac{1}{3}$  and  $\frac{b_1}{b_2} = -\frac{1}{3}$ . Hence **correct option is (d)**.

**Suggestive Measures – While solving such type of questions students should know the**

- Condition for unique solution,  $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
- Condition infinitely many solutions,  $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$
- Condition for No solutions,  $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

**5.**

**Sol.** HCF of two numbers is their highest common factor. Any two prime numbers have only 1 as their common factor. Hence **correct option is (a) 1**.

**Suggestive Measures - While solving such type of questions students should know that**

- Any prime number have only 1 and the number itself as its factors.
- HCF is the highest common factor of the numbers.

**6.**

**Sol.** Distance formula between two points Q ( $x_1, y_1$ ) and P ( $x_2, y_2$ ) is:

$$\text{Distance PQ} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} .$$

Let P be (4, -3) and Q be (0, 0). Then  $x_2 = 4, y_2 = -3, x_1 = 0$  and  $y_1 = 0$ .

$$\text{Thus Distance PQ} = \sqrt{(4 - 0)^2 + (-3 - 0)^2} = \sqrt{25} = 5 \text{ units}$$

Option (a) is incorrect since  $\text{PQ} \neq 5$  units

Option (b) is incorrect since  $PQ \neq 5$  units

**Option (c) is correct since  $PQ = 5$  units**

Option (d) is incorrect since  $PQ \neq 5$  units

**Suggestive Measures – While solving such type of questions students should**

- know the distance formula
- perform accurate calculations using the correct values

7.

**Sol.** Here  $a = 15$ ,  $d = 12 - 15 = -3$ ,  $n = 20$

$$20^{\text{th}} \text{ term} = a + (n - 1)d = 15 - 57 = -42$$

Option (a) Not correct since  $(-45)$  is the  $21^{\text{st}}$  term.

Option (b) not correct. The terms are decreasing, so the answer cannot be positive.

Option (c) not correct. The terms are decreasing, so the answer cannot be positive.

**Option (d) is correct since  $20^{\text{th}}$  term is  $-42$ .**

**Suggestive Measures – While solving such type of questions students should**

- Correctly identify first term, common difference, number of terms
- understand that since terms are decreasing, so answer can be negative

8.

**Sol.** Here  $a = 7$ ,  $13^{\text{th}}$  term =  $35 \Rightarrow n = 13 \Rightarrow 7 + 12d = 35 \Rightarrow d = \frac{7}{3}$

**Option (a) is correct since  $d = \frac{7}{3}$ .**

Option (b) is not correct since numerator is 3 and denominator is 7, which is reciprocal of the correct answer.

Option (c) is not correct.

Option (d) is not correct.

**Suggestive Measures – While solving such type of questions students should:**

- Correctly identify first term, common difference, number of terms
- Do proper calculation using correct formula

9.

**Sol:** Since  $DE \parallel BC \Rightarrow \frac{AD}{DB} = \frac{AE}{EC} \Rightarrow AE = 1 \text{ cm}$

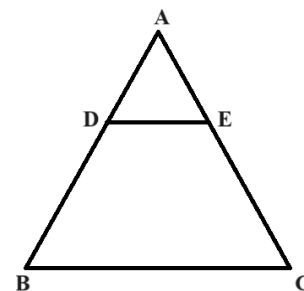
$$\text{Hence } AC = AE + EC = 4 \text{ cm}$$

Option (a) is not correct since  $AC \neq AD$

**Option (b) is correct since  $AC = 4\text{cm}$**

Option (c) is not correct since  $AC \neq EC$

Option (d) is not correct since  $AC \neq EC - AE$



**Suggestive Measures – While solving such type of questions students should:**

- Correctly apply BPT theorem
- Attentively note down what is asked in the question

10.

**Sol:** Since  $\Delta ABC \sim \Delta DEF \Rightarrow \angle B = \angle E \Rightarrow \angle C = 50^\circ$

Option (a) is not correct since  $\angle C \neq \angle A$

**Option (b) is correct since  $\angle C = 50^\circ$**

Option (c) is not correct since  $\angle C \neq \angle E$

Option (d) is not correct since  $\angle C \neq \angle A + \angle B$

**Suggestive Measures – While solving such type of questions students should:**

- Equate angles using concept of similarity of two triangles
- Find missing angle using angle sum property

11.

**Sol:**  $\sin 30^\circ = \frac{1}{2}$  and  $\cos 60^\circ = \frac{1}{2} \Rightarrow \sin 30^\circ \cos 60^\circ = \frac{1}{4}$

**Option (a) correct since  $\sin 30^\circ \cos 60^\circ = \frac{1}{4}$**

Option (b) is not correct since  $\sin 60^\circ = \frac{\sqrt{3}}{2}$

Option (c) is not correct since  $\cos 30^\circ \sin 30^\circ = \frac{\sqrt{3}}{4}$

Option (d) is not correct since  $\cos 0^\circ = 1$

**Suggestive Measures – While solving such type of questions students should**

- Find correct values of trigonometric ratios at certain angles
- Do proper calculation using correct formula

12.

**Sol:** Tangents can be drawn from a point outside the circle. There are numerous points outside the circle, so infinitely many tangents can be drawn to the circle.

Option (a) and (c) are incorrect since 1 and 3 are finite numbers.

Option (b) is not correct since it indicates the maximum number of tangents drawn from a single point outside the circle.

**Option (d) is correct**

**Suggestive Measures – While solving such type of questions students should**

- Attentively note down what is asked in the question
- Keep in mind about the theorems based on tangents

13.

**Sol:** PQ is tree, AB is stick. BR is shadow of stick, QR is shadow of tree.

In  $\Delta PQR$  and  $\Delta ABR$ ,

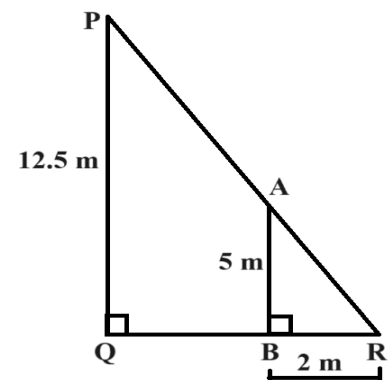
$\angle PQR = \angle ABR$  (each  $90^\circ$ )

$\angle PRQ = \angle ARB$  (common)

$\therefore \Delta PQR \sim \Delta ABR$  (AA Similarity)

$\frac{PQ}{AB} = \frac{QR}{BR}$  (CPCT)

(Corresponding parts of similar triangle are similar)



$$\Rightarrow \frac{12.5}{5} = \frac{QR}{2}$$

$$\Rightarrow \frac{12.5 \times 2}{5} = QR$$

$$\Rightarrow QR = 5$$

Thus, shadow of tree is 5m

Option (a) is incorrect since  $QR \neq 3$

Option (b) is incorrect since  $QR \neq 3.5$

Option (c) is incorrect since  $QR \neq 4.5$

**Option (d) is correct since  $QR = 5$**

**Suggestive Measures – While attempting the question students should :**

- carefully note and draw the figure according to the information given in question
- know the concept of similarity of triangles and its application
- Perform accurate calculations using the correct values in the result of similarity.

**14.**

**Sol:**  $\tan 45^\circ = 1$  and  $\cos 60^\circ = \frac{1}{2}$

$$\therefore (\tan^2 45^\circ - \cos^2 60^\circ) = [(1)^2 - (\frac{1}{2})^2] = 1 - \frac{1}{4} = \frac{4-1}{4} = \frac{3}{4}$$

Option (a) incorrect since required value  $\neq \frac{3}{4}$

Option (b) incorrect since required value  $\neq \frac{3}{4}$

**Option (c) is correct since required value  $= \frac{3}{4}$**

Option (d) incorrect since required value  $\neq \frac{3}{4}$

**Suggestive Measures – While attempting the question students should**

- know correct values of trigonometric ratios at certain angles
- perform accurate calculations using the correct values

**15.**

**Sol:** The tangent at any point of a circle is perpendicular to the radius through the point of contact.

$$\therefore \angle OAP = \angle OBP = 90^\circ$$

Also, the centre lies on the bisector of the angle between the two tangents.

So OP is the bisector of  $\angle APB$ .

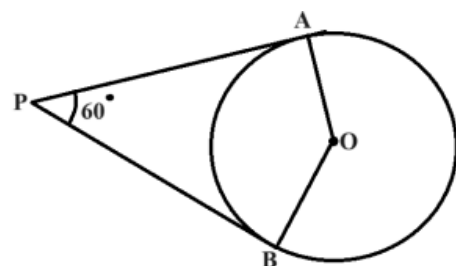
$$\Rightarrow \angle OPA = \angle OPB = \frac{1}{2} \times \angle APB$$

$$= \frac{1}{2} \times \angle 60^\circ = 30^\circ$$

Sum of the angles of a triangle is  $180^\circ$ .

$$\therefore \text{In } \Delta OAP, \angle OAP + \angle OPA + \angle AOP = 180^\circ$$

$$90^\circ + 30^\circ + \angle AOP = 180^\circ$$



$$120^\circ + \angle AOP = 180^\circ$$

$$\angle AOP = 180^\circ - 120^\circ$$

$$\angle AOP = 60^\circ$$

Option (a) is incorrect since  $\angle AOP \neq 60^\circ$

Option (b) is incorrect since  $\angle AOP \neq 60^\circ$

Option (c) is incorrect since  $\angle AOP \neq 60^\circ$

**Option (d) is correct since  $\angle AOP = 60^\circ$**

**Suggestive Measures – While attempting the question students should:**

- carefully note the information given in figure and question
- know the theorems based on tangents and its application

**16.**

**Sol:** The sum of the probabilities of all the elementary events of an experiment is 1.

$$\therefore P(E) + P(\text{not } E) = 1$$

$$0.96 + P(\text{not } E) = 1$$

$$P(\text{not } E) = 1 - 0.96$$

$$P(\text{not } E) = 1.00 - 0.96$$

$$P(\text{not } E) = 0.04$$

Option (a) is incorrect since  $P(\text{not } E) \neq 0.04$

Option (b) is incorrect since  $P(\text{not } E) \neq 0.04$

**Option (c) is correct since  $P(\text{not } E) = 0.04$**

Option (d) is incorrect since  $P(\text{not } E) \neq 0.04$

**Suggestive Measures – While attempting the question students should:**

- carefully note the information given in question
- know the results of Probability
- perform accurate calculations using the correct values

**17.**

**Sol:** The class interval with the maximum frequency is called the modal class.

Here maximum frequency is 8. The class interval corresponding to maximum frequency is 30 – 40.

Option (a) is incorrect since modal class  $\neq 30 - 40$

Option (b) is incorrect since modal class  $\neq 30 - 40$

**Option (c) is correct since modal class = 30 – 40**

Option (d) is incorrect since modal class  $\neq 30 - 40$

**Suggestive Measures – While attempting the question students should:**

- carefully note the information given in question
- have the understanding of mode and modal class

**18.**

**Sol:** Here 'r' = 3 cm and 'h' = 14 cm.

Curved surface area of a cylinder =  $2\pi rh$

$$= 2 \times \frac{22}{7} \times 3 \times 14$$

$$= 2 \times 22 \times 3 \times 2$$

$$= 264$$

Since the given dimensions are in cm, so the area will be measured in square cm (or  $\text{cm}^2$ )

Option (a) is incorrect since  $\text{CSA} \neq 264 \text{ cm}^2$

**Option (b) is correct since  $\text{CSA} = 264 \text{ cm}^2$**

Option (c) is incorrect since  $\text{CSA} \neq 264 \text{ cm}^2$

Option (d) is incorrect since  $\text{CSA} \neq 264 \text{ cm}^2$

**Suggestive Measures – While attempting the question students should:**

- carefully note the information given in question
- apply the correct formula
- perform accurate calculations using the correct values
- use appropriate units with answer

**DIRECTIONS: In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option out of the following:**

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
- (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
- (c) Assertion (A) is true but Reason (R) is false.
- (d) Assertion (A) is false but Reason (R) is true.

**19.**

**Sol.** Among any two consecutive positive integers one is even and the other is odd and vice versa.

- Product of any number with an even number is always even.
- So the product of two consecutive positive integers will also be an even number
- Hence divisible by 2.  
Prime factorisation of  $196 = 2 \times 2 \times 7 \times 7$
- Sum of exponents is  $2 + 2 = 4$ .
- Reason doesn't explain anything about the product of two consecutive positive integers

**So the correct option is (b) - Both Assertion (A) and Reason (R) is true but Reason (R) is not the correct explanation of Assertion (A).**

**Suggestive Measures – While attempting the question students should:**

- Correlate the linkage between the statements given in the assertion and reason.

**20.**

**Sol:** Let  $\alpha$  and  $\beta$  be the zeroes of a quadratic polynomial. Also given that 2 and 3 are the zeroes of a quadratic polynomial. Suppose  $\alpha = 2$  and  $\beta = 3$

- Sum of zeroes i.e.  $(\alpha + \beta) = 2 + 3 = 5$
- Product of zeroes i.e.  $(\alpha \times \beta) = 2 \times 3 = 6$
- Formula for finding a polynomial whose zeroes are known is  $x^2 - (\alpha + \beta)x +$

$$(\alpha \times \beta)$$

- Polynomial obtained  $x^2 - 5x + 6$ . The polynomial obtained is same as given in the Assertion (A).
- Reason (R) justifies the information given in the Assertion (A).

**So the correct option is (a) Both Assertion (A) and Reason (R) is true and Reason (R) is the correct explanation of Assertion (A).**

**Suggestive Measures – While attempting the question students should:**

- Correlate the linkage between the statements given in the assertion and reason.

**21.**

**Sol.**  $(x + 5)(x - 2)$  1  
 Zeroes are  $-5, 2$  1

**Suggestive Measures – While solving such type of questions students should know**

- To Factorise a polynomial by using identities or splitting middle term
- To equate the factors with zero and find zeroes.
- That a quadratic polynomial has maximum two zeroes.

**OR**

**Sol.**  $\alpha \times \frac{2}{\alpha} = 2a$  1  
 $2 = 2a$   
 $\Rightarrow a = 1$  1

**Suggestive Measures – While solving such type of questions students should know**

- that sum of zeroes =  $-\frac{b}{a}$
- that product of zeroes =  $\frac{c}{a}$
- the relation between coefficients of  $x^2$ ,  $x$  and constant

**22.**

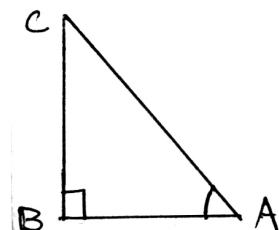
**Sol.** In right triangle ABC, by Pythagoras theorem  $AC = 25$  cm 1  
 $\sin C = \frac{24}{25}$  1

**Suggestive Measures - While solving such type of questions students should know the**

- Pythagoras theorem for finding Base, Height and hypotenuse in a right triangle
- Various Trigonometric ratios

**OR**

**Sol.**  $\cot A = \frac{8}{15} = \frac{AB}{BC}$   
 Let  $AB = 8x$ ,  $BC = 15x$ , then by Pythagoras theorem  
 $AC = 17x$





$$\sin C = \frac{15}{17}$$

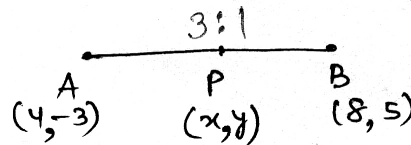
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**Suggestive Measures - While solving such type of questions students should know the**

- Pythagoras theorem for finding Base, Height and hypotenuse in a right triangle
- Various Trigonometric ratios

23.

Sol. Let point be P (x, y).



By section formula

$$x = \frac{3 \times 8 + 1 \times 4}{3 + 1}, \quad y = \frac{3 \times 5 + 1 \times (-3)}{3 + 1}$$

1

$$\Rightarrow x = 7, \quad y = 3$$

required point is (7, 3)

1

**Suggestive Measures – While solving such type of questions students should**

- Identify correct values of  $x_1, x_2, y_1, y_2$  etc.
- Do proper calculation using correct formula

24.

Sol.

Marks Obtained	Number of students ( $f_i$ )	$x_i$	$f_i x_i$
0 – 10	2	5	10
10 – 20	3	15	45
20 – 30	8	25	200
30 – 40	5	35	175
40 – 50	2	45	90
Total	20		520

Correct table

1

$$\frac{\sum f_i x_i}{\sum f_i} = \frac{520}{20} = 26$$

1

**Suggestive Measures – While solving such type of questions students should**

- Apply correct formula
- Do proper calculation to find answer

25.

Sol. In  $\Delta ADC$ ,  $GF \parallel CD$ ,

$$\therefore \frac{AF}{FD} = \frac{AG}{GC} \text{ by BPT ..... (i)}$$

1

In  $\Delta ABC$ ,  $GE \parallel CB$ ,

$$\therefore \frac{AE}{EB} = \frac{AG}{GC} \text{ by BPT ..... (ii)}$$

From (i) and (ii)

$$\frac{AF}{FD} = \frac{AE}{EB}$$

1

**Suggestive Measures – While attempting the question students should:**

- carefully note the information given in question
- apply BPT theorem correctly
- perform accurate calculations using the correct values

26.

**Sol.** We know that

$$1 + \tan^2 A = \sec^2 A \text{ and } 1 + \cot^2 A = \operatorname{cosec}^2 A$$

1

$$\text{LHS} = \frac{1 + \tan^2 A}{1 + \cot^2 A}$$

$$= \frac{\sec^2 A}{\operatorname{cosec}^2 A}$$

$$= \frac{1}{\cos^2 A} = \frac{\sin^2 A}{\frac{1}{\sin^2 A}}$$

1

$$= \tan^2 A$$

$$= \sec^2 A - 1 = \text{RHS}$$

1

**Suggestive Measures – While attempting the question students should:**

- know the basic trigonometric ratios and trigonometric identities
- know relationship between various t-ratios
- perform accurate calculations

27.

**Sol.** Possible outcome = 1, 2, 3, 4, 5 and 6.

(i) Numbers divisible by 3 are 3 and 6

$$P(\text{number divisible by 3}) = \frac{2}{6} = \frac{1}{3}$$

1

(ii) Prime Numbers are 2, 3 and 5.

$$P(\text{prime numbers}) = \frac{3}{6} = \frac{1}{2}$$

1

(iii) A number greater than 5 is 6

$$P(\text{a number greater than 5}) = \frac{1}{6}$$

1

**Suggestive Measures – While attempting the question students should:**

- know the result of probability
- know about prime numbers and divisibility rules
- perform accurate calculations using the correct values

28.

**Sol.** Let the point P (x, 0) be equidistant from the points A (2, -5) and B (-2, 9)

Then PA = PB

Using distance formula,

$$\sqrt{(x-2)^2 + (0+2)^2} = \sqrt{(x+2)^2 + (0-9)^2} \quad 1$$

$$\sqrt{(x)^2 - 4x + 4 + 4} = \sqrt{(x)^2 + 4x + 4 + 81}$$

$$\sqrt{(x)^2 - 4x + 8} = \sqrt{(x)^2 + 4x + 85}$$

Squaring both sides

$$x^2 - 4x + 29 = x^2 + 4x + 85 \quad 1$$

$$-8x = 85 - 29$$

$$-8x = 56$$

$$x = -7$$

The coordinate of point P is (-7, 0)

1

**Suggestive Measures – While attempting the question students should:**

- carefully note the information given in question
- know the distance formula
- perform accurate calculations using the correct values

**OR**

Let A (3, 0), B (6, 4) and C (-1, 3) be the vertices of  $\Delta ABC$ .

Using distance formula,

$$AB = \sqrt{(3-6)^2 + (0-4)^2} = \sqrt{9+16} = \sqrt{25} = 5 \text{ units}$$

$$BC = \sqrt{(6+1)^2 + (4-3)^2} = \sqrt{49+1} = \sqrt{50} = 5\sqrt{2} \text{ units}$$

$$AC = \sqrt{(3+1)^2 + (0-3)^2} = \sqrt{16+9} = \sqrt{25} = 5 \text{ units} \quad 1$$

We have  $AB = AC$  ..... (i)

$$AB^2 = 25, BC^2 = 50, \text{ and } AC^2 = 25$$

$$\text{Thus } AB^2 + AC^2 = 25 + 25 = 50 = BC^2$$

$\therefore$  By converse of Pythagoras theorem

$$AB^2 + AC^2 = BC^2$$

$$\Rightarrow \angle A = 90^\circ \text{ ..... (ii)} \quad 1$$

From (i) and (ii)

ABC is a right angled isosceles triangle. 1

**Suggestive Measures - While attempting the question students should:**

- carefully note the information given in question
- know the distance formula

- have understanding of Pythagoras property
- have understanding of various type of triangles
- perform accurate calculations using the correct values

29.

**Sol.** To prove that  $\sqrt{2}$  is an irrational number, we will use the contradiction method.

Let us assume that  $\sqrt{2}$  is a rational number with p and q as co-prime integers and  $q \neq 0$

$$\Rightarrow \sqrt{2} = p/q \quad \frac{1}{2}$$

On squaring both sides we get,

$$\Rightarrow 2q^2 = p^2$$

$\Rightarrow$  Here,  $2q^2$  is a multiple of 2 and hence it is even. Thus,  $p^2$  is an even number. Therefore, p is also even.

So we can assume that  $p = 2x$  where x is an integer.  $\frac{1}{2}$

By substituting this value of p in  $2q^2 = p^2$ , we get

$$\Rightarrow 2q^2 = (2x)^2$$

$$\Rightarrow 2q^2 = 4x^2$$

$$\Rightarrow q^2 = 2x^2$$

} 1

$\Rightarrow q^2$  is an even number. Therefore, q is also even.

Since p and q both are even numbers, they have 2 as a common multiple which means that p and q are not co-prime numbers as their HCF is 2.  $\frac{1}{2}$

This leads to the contradiction that  $\sqrt{2}$  is a rational number in the form of  $\frac{p}{q}$  with "p and q both co-prime numbers" and  $q \neq 0$ .

Thus,  $\sqrt{2}$  is an irrational number by the contradiction method.  $\frac{1}{2}$

**Suggestive Measures – While solving such type of questions students should know:**

- Difference between rational and irrational numbers
- Representation of rational number in  $\frac{p}{q}$  form
- that if the square of a number is even the number is also even.

30.

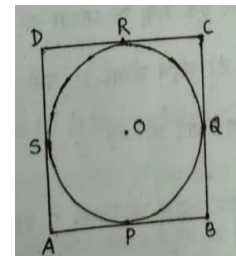
**Sol. Given -** A circle with centre O. A parallelogram ABCD touching the circle at points PQRS

**To prove -** ABCD is a rhombus

**Proof -** ABCD is a parallelogram. So  $AB = CD$ ,  $AD = BC$

Since length of tangents from an external point to a circle are equal

$\frac{1}{2}$   
 $\frac{1}{2}$   
 $\frac{1}{2}$



$$AP = AS \dots\dots\dots (1)$$

$$BP = BQ \dots\dots\dots (2)$$

$$CR = CQ \dots\dots\dots (3)$$

$$DR = DS \dots\dots\dots (4)$$

Adding (1) + (2) + (3) + (4)

$$AP + BP + CR + DR = AS + BQ + CQ + DS$$

$$AB + CD = AD + BC$$

$$\text{But } 2 AB = 2 AD$$

$$AB = AD$$

Hence, ABCD is a Rhombus

1  
1/2  
1/2

**Suggestive Measures – While solving such type of questions students should know that:**

- the length of tangents from an external point to a circle are equal
- If pair of adjacent sides of a parallelogram are equal then it is a rhombus.

**31.**

**Sol.** Let one number be  $x$ .

Then other number =  $(25 - x)$  (assuming one and finding other by subtraction)

According to question,  $x(25 - x) = 156$

$$\Rightarrow x^2 - 25x + 156 = 0$$

$$\Rightarrow (x - 13) (x - 12) = 0$$

We get  $x = 13$  or  $x = 12$

Numbers are 12 and 13

1/2  
1/2  
1/2  
1/2  
1/2  
1/2  
1/2

**Suggestive Measures – While solving such type of questions students should:**

- Frame equation according to the given condition
- Form factors by using middle term splitting/identities.
- Solve the equation and finding unknowns

**OR**

Let two consecutive positive integers be  $x, x + 1$

According to question,  $x^2 + (x + 1)^2 = 421$

$$x^2 + x - 210 = 0$$

$$(x + 15) (x - 14) = 0$$

We get  $x = -15$  which is not possible, so  $x = 14$

Numbers are 14 and 15

1/2  
1/2  
1/2  
1/2  
1/2  
1/2  
1/2

**Suggestive Measures – While solving such type of questions students should:**

- Frame equation according to the given condition
- Form factors by using middle term splitting/identities.

• Solve the equation and finding unknowns

**32.**

<b>Sol.</b>	Drawing correct figure	1
	Writing statement, Given, To Prove and Construction	1
	Steps to prove the theorem	3

**OR**

	Drawing correct figure	1
	Writing statement, Given, To Prove and Construction	1
	Correct proof	3

**Suggestive Measures – Theorems are definite and there is fixed pattern to prove the theorem. So, students should keep in mind the steps to arrive at the proof of the theorem.**

**33.**

<b>Sol.</b>	$a_{11} = 38 \Rightarrow a + 10d = 38 \dots\dots\dots (1)$	$\frac{1}{2}$
	$a_{16} = 73 \Rightarrow a + 15d = 73 \dots\dots\dots (2)$	$\frac{1}{2}$
	Solving (1) and (2) we get	
	$a = -32$ and $d = 7$	$\frac{1}{2} + \frac{1}{2}$
	Now $a_{31} = a + 30d = -32 + (30 \times 7) = 178$	1
	Further $S_{10} = \frac{10}{2} [2 \times (-32) + 9 \times 7]$	1
	$S_{10} = -5$	1

**Suggestive Measures – While solving such type of questions students should:**

- Be aware if question is about terms of AP or sum of terms of AP
- Solve the equation and find unknown

**34.**

<b>Sol.</b>	Height of cone 'h' = $31 - 7 = 24$ cm	
	Slant height 'l' = $\sqrt{7^2 + 24^2} = 25$ cm	1
	Surface area of cone = $\frac{22}{7} \times 7 \times 25 = 550$ cm <sup>2</sup>	1
	Surface area of hemisphere = $2 \times \frac{22}{7} \times 7 \times 7 = 308$ cm <sup>2</sup>	1
	Total surface area of toy = $(550 + 308)$ cm <sup>2</sup> = 858 cm <sup>2</sup>	1
	Cost of painting 100 cm <sup>2</sup> = ₹ 5	
	$\therefore$ Cost of painting toy = ₹ $\frac{5}{100} \times 858 = ₹ 42.90$	1

**Suggestive Measures – While solving such type of questions students should:**

- Draw a figure according to information given in question
- Identify which part of solid will get hidden while combining
- Perform accurate calculations using correct values

35.

Sol. Correct figure

Let AB be the light house and two ships are at C and D.

In right angled triangle ABC

$$\tan 45^\circ = \frac{80}{BD} \Rightarrow BD = 80 \text{ m}$$

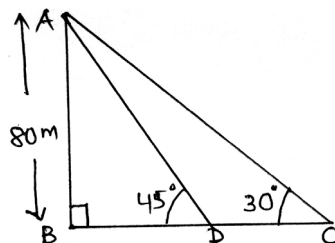
In right angled triangle ABC

$$\tan 30^\circ = \frac{80}{BC} \Rightarrow BC = 80\sqrt{3} \text{ m}$$

$$CD = BC - BD = 80(\sqrt{3} - 1) \text{ m}$$

$$= 80(1.73 - 1) = 58.4 \text{ m}$$

Distance between two ships = 58.4 m



1

1

1

1

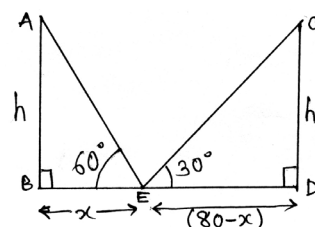
1

**Suggestive Measures – While solving such type of questions students should:**

- Draw figure according to information given in question
- Identify angle of elevation and depression
- Apply correct trigonometric ratios and calculate

OR

Correct figure



1

Let AB and CD be the two poles of height 'h' m each and E is the point on the road.

Let BE = x m then DE = (80 - x) m

In right angled triangle ABE

$$\tan 60^\circ = \frac{h}{x} \Rightarrow h = \sqrt{3}x \quad \dots(1)$$

In right angled triangle CDE

$$\tan 30^\circ = \frac{h}{80 - x} \Rightarrow h = \frac{80 - x}{\sqrt{3}} \quad \dots(2)$$

From (1) and (2) we get x = 20 m

Put x = 20 in (1) we get h = 20√3 m

So height of pole 20 m and distances of the point from the poles are 20 m and 60 m

$\frac{1}{2}$

1

1

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

**Suggestive Measures – While solving such type of questions students should:**

- Draw figure according to information given in question
- Identify angle of elevation and depression
- Apply correct trigonometric ratios and calculate

36.

Sol. (i) For finding number of students eligible for scholarship i.e. 6 students

For finding scholarship ₹ 2000 × 6 = ₹ 12000

$\frac{1}{2}$   
 $\frac{1}{2}$

(ii) For finding modal class i.e. 40 – 60

Upper limit of modal class i.e. 60

$$\begin{aligned} \text{(iii) Mode} &= 40 + \left( \frac{11 - 8}{2 \times 11 - 8 - 4} \right) \times 20 \\ &= 46 \end{aligned}$$

$\frac{1}{2}$   
 $\frac{1}{2}$

1  
1

**Suggestive Measures – While solving such type of questions students should:**

- Identify Modal class, median class
- Identify Upper and lower limits of class
- Know formula of mean, mode, median

**OR**

C.I	$f_1$	c.f.
0 – 20	5	5
20 – 40	8	13
40 – 60	11	24
60 – 80	4	28
80 – 100	2	30

Median class = 40 – 60,  $l = 40$ ,  $f = 11$ , c.f. = 30

$$\begin{aligned} \text{Median} &= 40 + \left( \frac{15 - 13}{11} \right) \times 20 \\ &= 43.6 \text{ marks (approx)} \end{aligned}$$

1  
 $\frac{1}{2}$   
 $\frac{1}{2}$

**Suggestive Measures – While solving such type of questions students should:**

- How to find cumulative frequency (c.f.)
- Identify Upper and lower limits of class
- Know formula of mean, mode, median

**37.**

**Sol. (i)** Let cost of 1 pencil = ₹  $x$  and cost of 1 eraser = ₹  $y$

$$\text{ATQ } 3x + 2y = 19 \quad \text{and} \quad 5x + 3y = 31$$

1

$$\text{(ii) } 3x + 2y = 19 \quad \text{(i) } \times 3$$

$$\text{and } 5x + 3y = 31 \quad \text{(ii) } \times 2$$

$$\text{We get } 9x + 6y = 57$$

$$10x + 6y = 62$$

$$\begin{array}{r} (-) \quad (-) \quad (-) \\ \hline -x \quad = -5 \end{array} \quad \Rightarrow \quad x = 5$$

Cost of one pencil is ₹ 5

1

**(iii)** Putting value of  $x = 5$  in  $3x + 2y = 19$ , we get

$$3(5) + 2y = 19$$



$$2y = 19 - 5 \Rightarrow y = \frac{4}{2} = 2$$

Cost of one eraser = ₹ 2 1

$$\begin{aligned} \text{Now, cost of 2 pencils and 5 erasers} &= 2x + 5y \\ &= 2(5) + 5(2) = 20 \end{aligned}$$

Thus, cost of 2 pencils and 5 erasers = ₹ 20 1

**OR**

Putting value of  $x = 5$  in  $3x + 2y = 19$ , we get

$$3(5) + 2y = 19$$

$$2y = 19 - 5$$

$$y = \frac{4}{2} = 2$$

Cost of one eraser = ₹ 2 1

And Cost of one pencil is ₹ 5

∴ Pencil is expensive than eraser.

$$\text{Difference in their cost} = ₹ (5 - 2) = ₹ 3$$

Thus pencil is expensive by ₹ 3 1

**Suggestive Measures - While attempting the question students should:**

- carefully note the information given in question
- frame equation according to the given information
- solve the equation to find the unknown quantities
- perform accurate calculations using the correct values

**38.**

**Sol. (i)**  $\frac{360^\circ}{6} = 60^\circ$  1

**(ii)** Area of sector AOC =  $\frac{360^\circ}{6} \times \frac{22}{7} \times 35 \times 35 = \frac{3850}{3} \text{ cm}^2$  1

**(iii)** Area of major sector AOC = Area of circle – Area of sector AOC 1

$$\begin{aligned} &= \pi \times (35)^2 - \frac{3850}{3} \\ &= \frac{7700}{3} \text{ cm}^2 \end{aligned}$$
 1

**OR**

Area of 1 design (Area of one segment) = Area of sector – Area of  $\Delta$  DAB 1

$$\begin{aligned} &= \frac{1925}{3} - \frac{1}{2} \times 35 \times 35 \times \sin 60^\circ \\ &= 121 \text{ cm}^2 \text{ (approx.)} \end{aligned}$$
 1

**Suggestive Measures – While solving such type of questions students should:**

- Relate figure to the given condition according to question
- Identify sector/segment in the given figure
- Apply required formula and calculate