

**Marking Scheme Strictly Confidential**  
**(For Internal and Restricted use only) Secondary School Examination, 2025**  
**SUBJECT NAME MATHEMATICS (BASIC) (Q.P. CODE 430/1/3)**

**General Instructions: -**

|    |  |
|----|--|
| 1  | You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.   |
| 2  | <b>“Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, evaluation done and several other aspects. It’s leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in News Paper/Website etc. may invite action under various rules of the Board and IPC.”</b>   |
| 3  | Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one’s own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. <b>However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and due marks be awarded to them. In class-X, while evaluating two competency-based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, due marks should be awarded.</b> |
| 4  | The Marking scheme carries only suggested value points for the answers.<br>These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.   |
| 5  | The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. If there is any variation, the same should be zero after deliberation and discussion. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.   |
| 6  | Evaluators will mark (✓) wherever answer is correct. For wrong answer CROSS ‘X’ be marked. Evaluators will not put right (✓) while evaluating which gives an impression that answer is correct and no marks are awarded. <b>This is most common mistake which evaluators are committing.</b>   |
| 7  | If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.  |
| 8  | If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.  |
| 9  | If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note <b>“Extra Question”</b> .   |
| 10 | No marks to be deducted for the cumulative effect of an error. It should be penalized only once.   |
| 11 | A full scale of marks _(example 0 to 80/70/60/50/40/30 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.   |

|    |   |
|----|---|
| 12 | Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines). This is in view of the reduced syllabus and number of questions in question paper.  |
| 13 | <p>Ensure that you do not make the following common types of errors committed by the Examiner in the past:-</p> <ul style="list-style-type: none"> <li>Leaving answer or part thereof unassessed in an answer book.</li> <li>Giving more marks for an answer than assigned to it.</li> <li>Wrong totaling of marks awarded on an answer.</li> <li>Wrong transfer of marks from the inside pages of the answer book to the title page.</li> <li>Wrong question wise totaling on the title page.</li> <li>Wrong totaling of marks of the two columns on the title page.</li> <li>Wrong grand total.</li> <li>Marks in words and figures not tallying/not same.</li> <li>Wrong transfer of marks from the answer book to online award list.</li> <li>Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.)</li> <li>Half or a part of answer marked correct and the rest as wrong, but no marks awarded.</li> </ul> |
| 14 | While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0) Marks.  |
| 15 | Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.   |
| 16 | The Examiners should acquaint themselves with the guidelines given in the “ <b>Guidelines for spot Evaluation</b> ” before starting the actual evaluation.  |
| 17 | Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.  |
| 18 | The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.   |

## MARKING SCHEME MATHEMATICS (BASIC)

### SECTION A

*This section has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.  $20 \times 1 = 20$*

1. The ratio of the area of a quadrant of a circle to the area of the same circle is :

- (A) 1 : 2  
(B) 2 : 1  
(C) 1 : 4  
(D) 4 : 1

Answer : (C) 1 : 4

1

2. For which of the following solids is the lateral/curved surface area and total surface area the same ?

- (A) Cube  
(B) Cuboid  
(C) Hemisphere  
(D) Sphere

Answer : (D) Sphere

1

3. The class mark of the median class of the following data is :

|                       |         |         |         |         |         |          |
|-----------------------|---------|---------|---------|---------|---------|----------|
| <i>Class Interval</i> | 10 – 25 | 25 – 40 | 40 – 55 | 55 – 70 | 70 – 85 | 85 – 100 |
| <i>Frequency</i>      | 2       | 3       | 7       | 6       | 6       | 6        |

- (A) 40  
(B) 55  
(C) 47.5  
(D) 62.5

Answer : (D) 62.5

1

4. The following distribution shows the number of runs scored by some batsmen in test matches :

|                          |             |             |             |             |
|--------------------------|-------------|-------------|-------------|-------------|
| <i>Runs Scored</i>       | 3000 – 4000 | 4000 – 5000 | 5000 – 6000 | 6000 – 7000 |
| <i>Number of Batsmen</i> | 5           | 10          | 9           | 8           |

The lower limit of the modal class is :

- (A) 3000  
 (B) 4000  
 (C) 5000  
 (D) 6000

Answer : (B) 4000

1

5. In an experiment of throwing a pair of dice, the probability of not getting a doublet is :

- (A)  $\frac{1}{6}$  (B)  $\frac{5}{6}$   
 (C)  $\frac{1}{5}$  (D)  $\frac{1}{30}$

Answer (B)  $\frac{5}{6}$

1

6. If the HCF of two positive integers a and b is 1, then their LCM is :

- (A) a + b (B) a  
 (C) b (D) ab

Answer : (D) ab

1

7.  $(2 + \sqrt{2})^2$  is :

- (A) a rational number (B) an irrational number  
 (C) an integer (D) a natural number

Answer : (B) an irrational number

1

8. The discriminant of the quadratic equation  $2x^2 - 3x - 5 = 0$  is :

- (A) -31 (B) 49  
 (C) 7 (D)  $\sqrt{-31}$

Answer : (B) 49

1

9. The equation  $x + \frac{1}{x} = 3$  ( $x \neq 0$ ) is expressed as a quadratic equation in the form of  $ax^2 + bx + c = 0$ . The value of  $a - b + c$  is :

- (A) 5 (B) 2  
 (C) 1 (D) -1

Answer : (A) 5

1

10. For a point  $X(a, b)$  where  $(b > a > 0)$ , the value of its [distance from x-axis – distance from y-axis] is :
- (A)  $a - b$  (B)  $b - a$   
 (C)  $a^2 - b^2$  (D)  $b^2 - a^2$

Answer : (B)  $b - a$

1

11. The mid-point of a line segment divides the line segment in the ratio :
- (A)  $1 : 2$  (B)  $2 : 1$   
 (C)  $1 : 1$  (D)  $\frac{1}{2} : 2$

Answer : (C)  $1 : 1$

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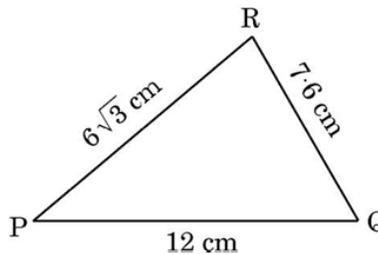
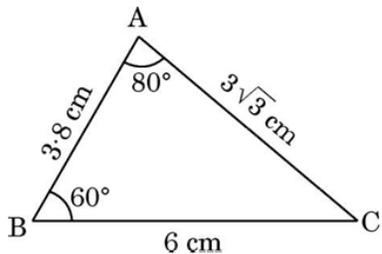
12. Which of the following is **not** the criterion for similarity of triangles ?
- (A) AAA (B) SSS  
 (C) SAS (D) RHS

Answer : None of the given options is correct.

1

Note – One mark to be given to all students who have attempted this question.

13. From the figures given below, which of the following is true about the measure of  $\angle P$  ?

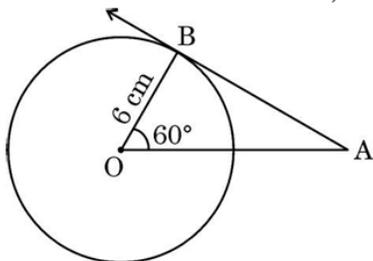


- (A)  $\angle P = 60^\circ$   
 (B)  $\angle P = 80^\circ$   
 (C)  $\angle P = 40^\circ$   
 (D) The measure of  $\angle P$  cannot be determined

Answer : (C)  $\angle P = 40^\circ$

1

14. In the given figure, if AB is a tangent to the circle with centre O such that  $OB = 6$  cm and  $\angle AOB = 60^\circ$ , then the length of OA is :



- (A) 3 cm (B)  $3\sqrt{3}$  cm  
 (C)  $4\sqrt{3}$  cm (D) 12 cm

Answer : (D) 12 cm

1

15. Which of the following statements is *false* ?

- (A)  $\tan 45^\circ = \cot 45^\circ$
- (B)  $\sin 90^\circ = \tan 45^\circ$
- (C)  $\sin 30^\circ = \cos 30^\circ$
- (D)  $\sin 45^\circ = \cos 45^\circ$

Answer : (C)  $\sin 30^\circ = \cos 30^\circ$

1

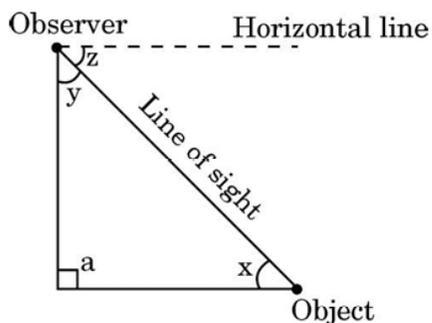
16. The value of  $\left(\frac{1}{\sec^2 A} + \frac{1}{\operatorname{cosec}^2 A}\right)$  is :

- (A) more than 1
- (B) 1
- (C) 0
- (D) - 1

Answer : (B) 1

1

17. In the given figure, which of the following angles represents the angle of depression ?

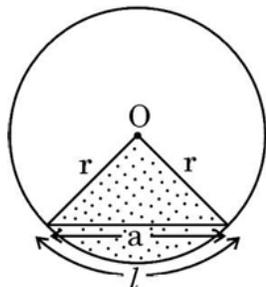


- (A) x
- (B) y
- (C) z
- (D) a

Answer : (C) z

1

18. The perimeter of the shaded region in the given figure is :



- (A)  $l$
- (B)  $l + a$
- (C)  $l + 2r$
- (D)  $l + 2r + a$

Answer : (C)  $l + 2r$

1

Questions number 19 and 20 are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

- (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. *Assertion (A)* : For any two natural numbers a and b, the HCF of a and b is a factor of the LCM of a and b.

*Reason (R)* : HCF of any two natural numbers divides both the numbers.

|   |   |
|---|---|
| Answer : (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). | 1 |
|---|---|

20. *Assertion (A)* : The value of p for which the system of equations  $4x + py + 8 = 0$  and  $2x + 2y + 2 = 0$  is consistent is 4.

*Reason (R)* : The system of equations  $a_1x + b_1y = c_1$  and  $a_2x + b_2y = c_2$  is consistent with infinitely many solutions, if  $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ .

|  |   |
|--|---|
| Answer : (D) Assertion (A) is false, but Reason (R) is true. | 1 |
|--|---|

### SECTION B

*This section has 5 Very Short Answer (VSA) type questions carrying 2 marks each.*  $5 \times 2 = 10$

21. From a circular sheet of radius 70 cm, a quadrant is cut. Find the area of the remaining sheet.

|   |     |
|---|-----|
| <p>Solution : Area of remaining sheet = <math>\pi r^2 - \frac{1}{4} \pi r^2 = \frac{3}{4} \pi r^2</math><br/> <math>= \frac{3}{4} \times \frac{22}{7} \times 70 \times 70 = 11550 \text{ sq. cm}</math></p> | 1+1 |
|---|-----|

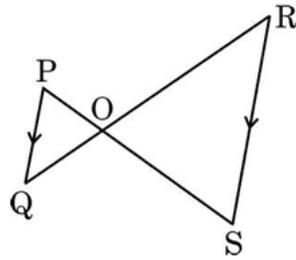
22. Solve for x and y :

$$3x + 5y = 8$$

$$5x - 3y = 2$$

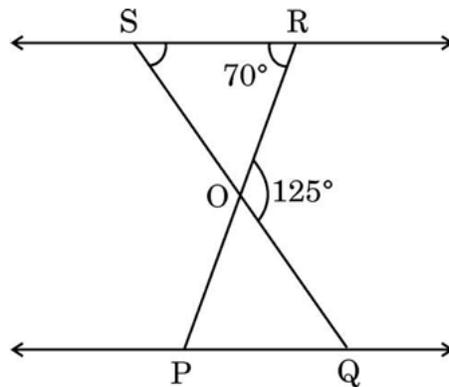
|  |       |
|--|-------|
| Solution : Solving the two equations to get $x = 1, y = 1$ | 1 + 1 |
|--|-------|

23. (a) In the given figure, if  $PQ \parallel RS$ , then prove that  $\Delta POQ \sim \Delta SOR$ .



**OR**

- (b) In the given figure,  $\Delta OSR \sim \Delta OQP$ ,  $\angle ROQ = 125^\circ$  and  $\angle ORS = 70^\circ$ . Find the measures of  $\angle OSR$  and  $\angle OQP$ .



Solution : (a) As  $PQ \parallel RS$

$$\left. \begin{array}{l} \angle P = \angle S \\ \angle Q = \angle R \end{array} \right\} \text{ Alternate interior angles}$$

$\therefore \Delta POQ \sim \Delta SOR$  (by AA similarity criterion)

**OR**

- (b)  $\angle OSR = 125^\circ - 70^\circ = 55^\circ$  [ by exterior angle property]

As  $\Delta OSR \sim \Delta OQP$

$\angle OSR = \angle OQP$  (Corresponding angles of similar triangles)

$\angle OQP = 55^\circ$

1

1

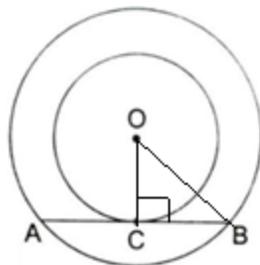
1

$\frac{1}{2}$

$\frac{1}{2}$

24. Two concentric circles are of radii 6 cm and 10 cm. Find the length of the chord of the larger circle which touches the smaller circle.

Solution:



$$\begin{aligned} BC^2 &= OB^2 - OC^2 \\ \Rightarrow BC^2 &= 10^2 - 6^2 = 64 \end{aligned}$$

Correct figure  $\frac{1}{2}$

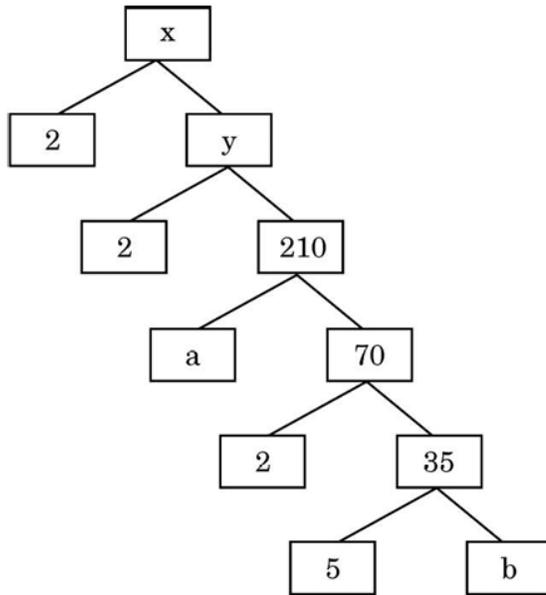
|   |  |
|---|--|
| $\Rightarrow BC = 8 \text{ cm}$<br>$AB = 8 \times 2 = 16 \text{ cm}$  | 1<br>$\frac{1}{2}$   |
| <p><b>25.</b> (a) Find the values of A and B (<math>0 \leq A &lt; 90^\circ</math>, <math>0 \leq B &lt; 90^\circ</math>), if <math>\tan(A + B) = 1</math> and <math>\tan(A - B) = \frac{1}{\sqrt{3}}</math>.</p> <p style="text-align: center;"><b>OR</b></p> <p>(b) Prove that <math>\tan 45^\circ = 1</math> geometrically.</p>  |  |
| <p>Solution: (a) <math>A + B = 45^\circ</math><br/> <math>A - B = 30^\circ</math><br/> Solving and getting <math>A = 37.5^\circ</math> and <math>B = 7.5^\circ</math></p> <p style="text-align: center;"><b>OR</b></p> <p>(b) Consider an isosceles right <math>\Delta ABC</math><br/> Using angle sum property <math>\angle A = \angle C = 45^\circ</math><br/> Clearly, <math>\tan 45^\circ = \frac{AB}{BC} = \frac{x}{x} = 1</math></p>  | $\frac{1}{2}$<br>$\frac{1}{2}$<br>1<br><br>$\frac{1}{2}$<br>$\frac{1}{2}$<br>1 |
| <p><b>SECTION C</b></p> <p><i>This section has 6 Short Answer (SA) type questions carrying 3 marks each. 6×3=18</i></p> <p><b>26.</b> Prove the following trigonometric identity :</p> $(\sin A - \operatorname{cosec} A)(\cos A - \sec A) = \frac{1}{\tan A + \cot A}$   |  |
| <p>Solution: LHS = <math>\left(\sin A - \frac{1}{\sin A}\right)\left(\cos A - \frac{1}{\cos A}\right) = \frac{\sin^2 A - 1}{\sin A} \times \frac{\cos^2 A - 1}{\cos A}</math></p> $= \sin A \cos A = \frac{\sin A \cos A}{\sin^2 A + \cos^2 A}$ $= \frac{1}{\tan A + \cot A} = \text{RHS}$  | 1<br><br>1<br><br>1  |
| <p><b>27.</b> A lot consists of 200 pens of which 180 are good and the rest are defective. A customer will buy a pen if it is not defective. The shopkeeper draws a pen at random and gives it to the customer. What is the probability that the customer will not buy it ? Another lot of 100 pens containing 80 good pens is mixed with the previous lot of 200 pens. The shopkeeper now draws one pen at random from the entire lot and gives it to the customer. What is the probability that the customer will buy the pen ?</p> |  |
| <p>Solution: P (customer will not buy the pen) = <math>\frac{20}{200} = \frac{1}{10}</math><br/> After mixing the two lots</p>  | 1  |

|  |        |
|--|--------|
| Total pens = 200 + 100 = 300<br>Number of good pens = 180 + 80 = 260<br>P (customer will buy the pen) = $\frac{260}{300}$ or $\frac{13}{15}$ | 1<br>1 |
|--|--------|

28. (a) Prove that  $\sqrt{3}$  is an irrational number.

**OR**

(b) The factor tree of a number x is shown below :



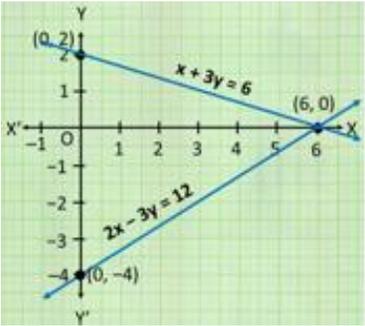
Find the values of x, y, a and b. Hence, write the product of the prime factors of the number x so obtained.

|  |               |
|--|---------------|
| Solution: (a) Let $\sqrt{3}$ be a rational number such that $\sqrt{3} = \frac{p}{q}$ (p and q are co-prime numbers, $q \neq 0$ ) | $\frac{1}{2}$ |
| $\sqrt{3}q = p \Rightarrow 3q^2 = p^2$   |               |
| 3 divides $p^2 \Rightarrow 3$ divides p as well  | 1             |
| Let, $p = 3m$ (for some integer m)   |               |
| $3q^2 = 9m^2 \Rightarrow q^2 = 3m^2$   |               |
| 3 divides $q^2 \Rightarrow 3$ divides q as well  | 1             |
| p and q have a common factor 3, which is a contradiction as p and q are co-prime.  |               |
| $\therefore$ our assumption is wrong   | $\frac{1}{2}$ |
| Hence, $\sqrt{3}$ is an irrational number  |               |
| <b>OR</b>  |               |
| (b) $b = 7$  | $\frac{1}{2}$ |
| $a = 3$  | $\frac{1}{2}$ |
| $y = 420$  | $\frac{1}{2}$ |
| $x = 840$  | $\frac{1}{2}$ |
| $x = 840 = 2^3 \times 3 \times 5 \times 7$   | 1             |

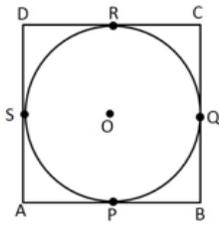
29. Determine a quadratic polynomial, sum and product of whose zeroes are - 10 and 24, respectively. Also, determine the zeroes of the polynomial so obtained.

|           |   |   |
|-----------|---|---|
| Solution: | Required polynomial is $x^2 + 10x + 24$       | 1 |
|           | For zeroes: $x^2 + 10x + 24 = (x + 6)(x + 4)$ | 1 |
|           | Zeroes are $-6, -4$                           | 1 |

|  |  |
|--|--|
| <p><b>30.</b> (a) Solve the following system of equations graphically :</p> $x + 3y = 6; 2x - 3y = 12$ <p style="text-align: center;"><b>OR</b></p> <p>(b) <math>x</math> and <math>y</math> are complementary angles such that <math>x : y = 1 : 2</math>. Express the given information as a system of linear equations in two variables and hence solve it.</p> |  |
|--|--|

|  |  |
|--|--|
| Solution: (a) Correct graph of each equation   | 1+1  |
|  <p>Solution is <math>x = 6, y = 0</math> or <math>(6, 0)</math></p> <p style="text-align: center;"><b>OR</b></p> <p>(b) <math>x + y = 90^\circ</math><br/> <math>2x = y</math><br/> Solving to get <math>x = 30^\circ, y = 60^\circ</math></p> | <p>1</p> <p>1</p> <p>1</p> <p><math>\frac{1}{2} + \frac{1}{2}</math></p> |

|  |  |
|--|--|
| <b>31.</b> Prove that a rectangle circumscribing a circle is a square. |  |
|--|--|

|   |  |
|---|--|
| Solution:   |  |
|  <p>As the length of tangents from an external point to a circle are equal<br/> Thus,<br/> <math>AP = AS</math><br/> <math>BP = BQ</math><br/> <math>DR = DS</math><br/> <math>CR = CQ</math><br/> Adding the above equations,<br/> <math>AB + CD = BC + AD</math><br/> As <math>AB = CD</math> &amp; <math>BC = AD</math> (opp. sides of rectangle)<br/> <math>\Rightarrow AB = AD</math><br/> <math>\therefore ABCD</math> is a square</p> | <p>Correct figure <math>\frac{1}{2}</math></p> <p>1</p> <p>1</p> <p><math>\frac{1}{2}</math></p> |

### SECTION D

This section has 4 Long Answer (LA) type questions carrying 5 marks each.  $4 \times 5 = 20$

32. A life insurance agent found the following data for the distribution of 100 policy holders on the basis of their ages.

| Age (in years) | Number of policy holders |
|----------------|--------------------------|
| 15 – 20        | 2                        |
| 20 – 25        | 4                        |
| 25 – 30        | 18                       |
| 30 – 35        | 21                       |
| 35 – 40        | 33                       |
| 40 – 45        | 11                       |
| 45 – 50        | 3                        |
| 50 – 55        | 6                        |
| 55 – 60        | 2                        |

Find the median age of the policy holders.

Solution:

| CI      | $f_i$ | Cf  |
|---------|-------|-----|
| 15 – 20 | 2     | 2   |
| 20 – 25 | 4     | 6   |
| 25 – 30 | 18    | 24  |
| 30 – 35 | 21    | 45  |
| 35 – 40 | 33    | 78  |
| 40 – 45 | 11    | 89  |
| 45 – 50 | 3     | 92  |
| 50 – 55 | 6     | 98  |
| 55 – 60 | 2     | 100 |

$$\frac{N}{2} = 50 \quad \therefore \text{median class : } 35 - 40$$

$$\text{Median} = 35 + \frac{50 - 45}{33} \times 5$$

$$= 35.76$$

Thus, the median age of the policy holders is 35.76 years.

Correct  
table  
2

2

1

33. (a) The difference of the squares of two positive numbers is 180. The square of the smaller number is 8 times the greater number. Find the two numbers.

**OR**

- (b) Find the value(s) of k for which the equation  $2x^2 + kx + 3 = 0$  has real and equal roots. Hence, find the roots of the equations so obtained.

Solution: (a) Let the smaller number be y and greater number be x.

A.T.Q.

$$x^2 - y^2 = 180$$

$$y^2 = 8x$$

$$\Rightarrow x^2 - 8x = 180$$

$$x^2 - 8x - 180 = 0$$

$$(x - 18)(x + 10) = 0$$

$$x = 18, x = -10 \text{ (rejected)}$$

$\therefore$  The numbers are 18 and 12

1

1

1

1

1

**OR**

- (b) For equal roots;  $b^2 - 4ac = 0$

$$k^2 - 24 = 0$$

$$\Rightarrow k = \pm 2\sqrt{6}$$

Equations are

$$2x^2 + 2\sqrt{6}x + 3 = 0;$$

$$2x^2 - 2\sqrt{6}x + 3 = 0$$

$$\text{Roots are } x = -\sqrt{\frac{3}{2}}, -\sqrt{\frac{3}{2}};$$

$$x = \sqrt{\frac{3}{2}}, \sqrt{\frac{3}{2}}$$

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

1 + 1

34. State the converse of "Basic Proportionality Theorem" and use it to prove the following :

Line segment joining mid-points of any two sides of a triangle is parallel to the third side.

Solution: Statement : If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.

Given : In  $\Delta ABC$ , D and E are mid-points of AB and AC respectively

To prove :  $DE \parallel BC$

Proof : As D is the mid-point of AB

$$AD = DB$$

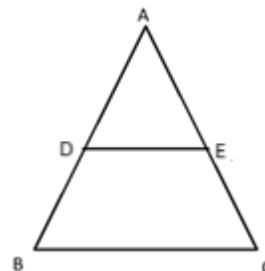
$$\therefore \frac{AD}{DB} = 1$$

Similarly, E is the mid-point of AC

$$\therefore \frac{AE}{EC} = 1$$

$$\therefore \frac{AD}{DB} = \frac{AE}{EC}$$

By converse of BPT,  $DE \parallel BC$



Correct figure. given, to prove  
1

1

1

1

35. (a) A toy is in the form of a cone surmounted on a hemisphere. The cone and hemisphere have the same radii. The height of the conical part of the toy is equal to the diameter of its base. If the radius of the conical part is 5 cm, find the volume of the toy.

**OR**

(b) A cubical block is surmounted by a hemisphere of radius 3.5 cm. What is the smallest possible length of the edge of the cube so that the hemisphere can totally lie on the cube ? Find the total surface area of the solid so formed.

Solution:

(a) Radius =  $r = 5$  cm  
 Height of cone =  $h = 10$  cm  
 Volume of toy = volume of hemisphere + volume of cone  

$$= \frac{2}{3} \pi r^3 + \frac{1}{3} \pi r^2 h$$

$$= \frac{2}{3} \times \frac{22}{7} \times 5 \times 5 \times 5 + \frac{1}{3} \times \frac{22}{7} \times 5 \times 5 \times 10$$

$$= \frac{5500}{21} + \frac{5500}{21}$$

$$= \frac{11000}{21} \text{ cu. cm or } 523.81 \text{ cu. cm}$$

2+2

1

**OR**

(b) Edge of cube =  $a = 3.5 \times 2 = 7$  cm  
 Total surface area of solid  

$$= 6a^2 + 2\pi r^2 - \pi r^2$$

$$= 6a^2 + \pi r^2$$

$$= 6 \times 7 \times 7 + \frac{22}{7} \times 3.5 \times 3.5$$

$$= \frac{665}{2} \text{ sq. cm or } 332.5 \text{ sq. cm}$$

1

1½ + 1½

1

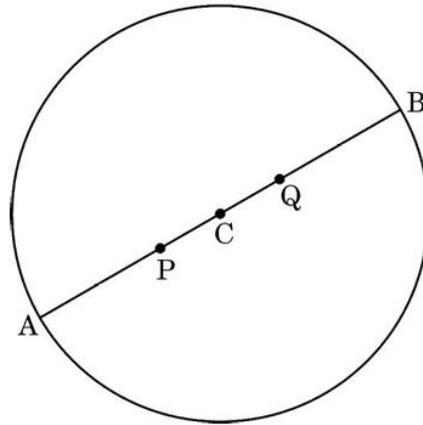
**SECTION E**

*This section has 3 case study based questions carrying 4 marks each.*

*3×4=12*

**Case Study - 1**

36. In a society, there is a circular park having two gates. The gates are placed at points A(10, 20) and B(50, 50), as shown in the figure below. Two fountains are installed at points P and Q on AB such that AP = PQ = QB.



Based on the above information, answer the following questions :

- (i) Find the coordinates of the centre C. 1
- (ii) Find the radius of the circular park. 1
- (iii) (a) Find the coordinates of the point P. 2

**OR**

- (b) Find the distance of the fountain at Q from gate A. 2

|           |  |   |
|-----------|--|---|
| Solution: | <p>(i) Co-ordinates of C are <math>\left(\frac{10 + 50}{2}, \frac{20 + 50}{2}\right) = C(30, 35)</math></p> <p>(ii) Radius = <math>\sqrt{(30 - 10)^2 + (35 - 20)^2} = 25</math></p> <p>(iii) (a) P divides AB in the ratio 1 : 2,<br/>co-ordinates of P are <math>\left(\frac{1 \times 50 + 2 \times 10}{3}, \frac{1 \times 50 + 2 \times 20}{3}\right)</math><br/>i.e. <math>\left(\frac{70}{3}, 30\right)</math></p> | <p>1</p> <p>1</p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2} + \frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> |
|           | <p><b>OR</b></p> <p>(b) Distance AB = <math>2 \times 25 = 50</math></p> <p>AQ = <math>\frac{2}{3}AB = \frac{2}{3} \times 50</math></p> <p>AQ = <math>\frac{100}{3}</math></p>  | <p><math>\frac{1}{2}</math></p> <p>1</p> <p><math>\frac{1}{2}</math></p>  |

### Case Study - 2

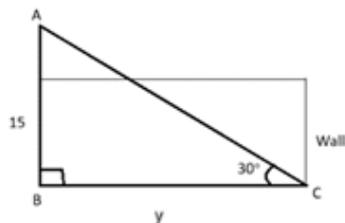
- 37.** An injured bird was found on the roof of a building. The building is 15 m high. A fireman was called to rescue the bird. The fireman used an adjustable ladder to reach the roof. He placed the ladder in such a way that the ladder makes an angle of  $60^\circ$  with the ground in order to reach the roof.



Based on the above information, answer the following questions :

- (i) Find the length of the ladder used by the fireman to reach the roof. 1
- (ii) Find the distance of the point on the ground at which the ladder was fixed from the bottom of the building. 1
- (iii) In order to avoid skidding, the fireman placed the ladder in such a way that the bottom of the ladder touches the base of the wall which is opposite to the building, making an angle of  $30^\circ$  with the ground.
- (a) Draw a neat diagram to represent the above situation and hence find the width of the road between the building and the wall. 2
- OR**
- (b) Find the length of the ladder used by the fireman in this case. 2

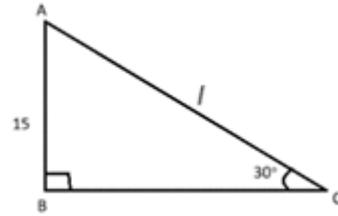
|           |   |   |
|-----------|---|---|
| Solution: | <p>(i) Let the length of the ladder be 'a'</p> $\frac{15}{a} = \sin 60^\circ$ $a = \frac{30}{\sqrt{3}} \text{ or } 10\sqrt{3}$ <p>Thus the length of the ladder is <math>\frac{30}{\sqrt{3}}</math> m or <math>10\sqrt{3}</math> m</p> <p>(ii) Let the distance of the point on the ground be 'x'</p> $\frac{15}{x} = \tan 60^\circ$ $x = \frac{15}{\sqrt{3}} \text{ or } 5\sqrt{3}$ <p>Thus, the distance of the point on the ground is <math>\frac{15}{\sqrt{3}}</math> m or <math>5\sqrt{3}</math> m</p> <p>(iii) (a) Let the width of the road be y</p> | <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> |
|           | <p>(iii) (a) Let the width of the road be y</p>   | <p>Correct figure 1</p>   |
|           | <p><math display="block">\frac{15}{y} = \tan 30^\circ</math> <math display="block">y = 15\sqrt{3}</math></p>  | <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> |



Thus, the width of the road is  $15\sqrt{3}$  m.

**OR**

(b) Let the length of the ladder be  $l$ .



$$\frac{15}{l} = \sin 30^\circ$$

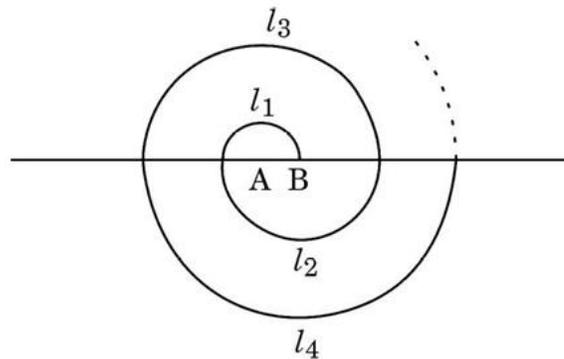
$$l = 30$$

Thus, the length of the ladder is 30 m.

1  
1

**Case Study – 3**

38. In a garden, saplings of rose flowers were planted at equal intervals to form a spiral pattern. The spiral is made up of successive semicircles, with centres alternatively at A and B, starting with centre at A, of radii 50 cm, 100 cm, 150 cm, ..... as shown in the figure given below. Spiral 1 has 10 flowers, Spiral 2 has 20 flowers, Spiral 3 has 30 flowers and so on.



Based on the above information, answer the following questions :

- (i) What is the radius of the 13<sup>th</sup> spiral ? 1
- (ii) If the radius of the n<sup>th</sup> spiral is 500 cm, find the value of n. 1
- (iii) (a) Find the total number of saplings till the 11<sup>th</sup> spiral. 2

**OR**

- (b) Till which spiral, will there be a total of 450 saplings ? 2

|               |  |             |
|---------------|--|-------------|
| Solution: (i) | $a_{13} = 650$ cm  | 1           |
| (ii)          | $a_n = 500$<br>$50 + (n - 1)50 = 500$<br>$n = 10$  | 1           |
| (iii) (a)     | $a = 10, d = 10$<br>$S_{11} = \frac{11}{2} [20 + 10 \times 10]$<br>$= 660$                 | 1½<br>½     |
|               | <b>OR</b>  |             |
| (b)           | $a = 10, d = 10$<br>$450 = \frac{n}{2} [20 + (n - 1) 10]$<br>$n^2 + n - 90 = 0$<br>$n = 9$ | 1<br>½<br>½ |