

Marking Scheme Strictly Confidential
(For Internal and Restricted use only) Secondary School Examination, 2025
MATHEMATICS BASIC(241) (Q.P. CODE 430(B)/S)

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	“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.”
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. 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.
4	The Marking scheme carries only suggested value points for the answers. 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. This is most common mistake which evaluators are committing.
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 “Extra Question”.
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> <p>Leaving answer or part thereof unassessed in an answer book. Giving more marks for an answer than assigned to it.</p> <p>Wrong totaling of marks awarded on an answer.</p> <p>Wrong transfer of marks from the inside pages of the answer book to the title page. Wrong question wise totaling on the title page.</p> <p>Wrong totaling of marks of the two columns on the title page. Wrong grand total.</p> <p>Marks in words and figures not tallying/not same.</p> <p>Wrong transfer of marks from the answer book to online award list.</p> <p>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.)</p> <p>Half or a part of answer marked correct and the rest as wrong, but no marks awarded.</p>
14	<p>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.</p>
15	<p>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.</p>
16	<p>The Examiners should acquaint themselves with the guidelines given in the “Guidelines for spot Evaluation” before starting the actual evaluation.</p>
17	<p>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.</p>
18	<p>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.</p>

<p>15. A cylindrical pencil sharpened at one edge is a combination of :</p> <p>(A) two cylinders (B) a hemisphere and a cone (C) a cylinder and a cone (D) a hemisphere and a cylinder</p>	
<p>Ans: (C) a cylinder and a cone</p>	<p>1</p>
<p>16. If the mean of a frequency distribution is 7.5, $\sum f_i x_i = 120 + 3k$ and $\sum f_i = 30$, then k is equal to :</p> <p>(A) 40 (B) 35 (C) 50 (D) 45</p>	
<p>Ans: (B) 35</p>	<p>1</p>
<p>17. The empirical relationship between the three measures of central tendency is :</p> <p>(A) 3 Median = Mode + 2 Mean (B) 2 Median = Mode + 2 Mean (C) 3 Median = Mode + Mean (D) 3 Median = Mode – 2 Mean</p>	
<p>Ans: (A) 3 Median = Mode + 2 Mean</p>	<p>1</p>
<p>18. A bag contains 40 balls out of which some are red, some are blue and the remaining are black. If the probability of drawing a red ball from the bag is $\frac{11}{20}$ and that of blue ball is $\frac{1}{5}$, then the number of black balls in the bag are :</p> <p>(A) 5 (B) 15 (C) 20 (D) 10</p>	
<p>Ans: (D) 10</p>	<p>1</p>

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) : If the HCF of two numbers is 16 and their product is 3072, then their LCM is 162.

Reason (R) : If a and b are two positive integers, then $\text{HCF} \times \text{LCM} = a \times b$.

Ans: (D) Assertion (A) is false, but Reason (R) is true.

1

20. Assertion (A) : If the distance between the points A(2, - 2) and B(10, y) is 10, then the value of y is 4.

Reason (R) : Distance between two points P(x₁, y₁) and Q(x₂, y₂) is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

Ans: (A) Both Assertion (A) and Reason(R) are true and Reason(R) is the correct explanation of Assertion (A).

1

SECTION B

This section has **5** very short answer (VSA) type questions carrying **2** marks each.

$$5 \times 2 = 10$$

21. Using elimination method, solve the following pair of linear equations :

$$\frac{x}{2} + \frac{2y}{3} = -1$$

$$x - \frac{y}{3} = 3$$

Solution:

$$\frac{x}{2} + \frac{2y}{3} = -1$$

$$2(x - \frac{y}{3} = 3)$$

24. (a) If $\sin(A + 2B) = \frac{\sqrt{3}}{2}$ and $\cos(A + 4B) = 0$, $A > B$, then find the value of A and B.

OR

(b) Prove that :

$$(1 + \sin A)(1 - \sin A)(1 + \tan^2 A) = 1$$

Solution: (a)

$$\left. \begin{aligned} A + 2B &= 60^\circ \\ A + 4B &= 90 \end{aligned} \right\}$$

Solving to get $B = 15^\circ$, $A = 30^\circ$

OR

(b) LHS = $(1 + \sin A)(1 - \sin A)(1 + \tan^2 A)$
 $= (1 - \sin^2 A)(\sec^2 A)$
 $= \cos^2 A (\sec^2 A) = 1 = \text{RHS}$

1

1

1

1

25. A wire when bent in the form of an equilateral triangle encloses an area of $121\sqrt{3} \text{ cm}^2$. The same wire is bent into the form of a circle. Find the area enclosed by the circle.

Solution: $\frac{a^2}{4} \sqrt{3} = 121\sqrt{3}$

$$\Rightarrow a = 22 \text{ cm}$$

Length of wire = 66 cm

$$2\pi r = 66 \Rightarrow r = \frac{66 \times 7}{2 \times 22} = \frac{21}{2} = 10.5$$

$$\text{Area} = \pi r^2 = 346.5 \text{ cm}^2$$

1

$\frac{1}{2}$

$\frac{1}{2}$

SECTION C

This section has 6 short answer (SA) type questions carrying 3 marks each.

$$6 \times 3 = 18$$

26. Prove that $\frac{3 + 2\sqrt{5}}{7}$ is an irrational number, where, it is given that $\sqrt{5}$ is an irrational number.

Solution: Let $\frac{3 + 2\sqrt{5}}{7}$ is a rational number, (say) a.

$\frac{1}{2}$

$\Rightarrow \sqrt{5} = \frac{7a-3}{2}$ <p>RHS is rational but LHS is irrational</p> <p>This <i>contradiction</i> has arisen because of wrong assumption.</p> <p>Hence $\frac{3+2\sqrt{5}}{7}$ is irrational</p>	<p>1</p> <p>1</p> <p>$\frac{1}{2}$</p>
<p>27. (a) Find the quadratic polynomial whose zeroes are -3 and 5. Verify the relation between the coefficients and the zeroes of the polynomial.</p> <p style="text-align: center;">OR</p> <p>(b) If α and β are the zeroes of the polynomial $3x^2 - 17x + 24$, then find the value of $\alpha^2 + \beta^2$.</p>	
<p>Solution:</p> <p>(a) Required Polynomial is $(x+3)(x-5)$</p> $f(x) = x^2 - 2x - 15$ <p>Sum of zeroes $= -3 + 5 = 2$, $-\frac{b}{a} = -\frac{(-2)}{1} = 2$</p> <p>Product of zeroes $= (-3)(5) = -15$, $\frac{c}{a} = \frac{-15}{1} = -15$</p> <p>Hence verified.</p> <p style="text-align: center;">OR</p> <p>(b) $\alpha + \beta = \frac{17}{3}$ $\alpha\beta = \frac{24}{3} = 8$</p> $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$ $= \left(\frac{17}{3}\right)^2 - 16$ $= \frac{145}{9}$	<p>1</p> <p>1</p> <p>1</p> <p>$\frac{1}{2} + \frac{1}{2}$</p> <p>1</p> <p>1</p>
<p>28. The sum of a 2-digit number and the number obtained by reversing the digits is 66. If the digits of the number differ by 2, (units digit > tens digit), then find the number.</p>	
<p>Solution:</p> <p>Let units place be x and tens place be y</p> <p>$\therefore x > y$ and the number $= 10y + x$</p> <p>$\therefore (10y + x) + (10x + y) = 66$</p>	<p>$\frac{1}{2}$</p>

<p>LHS $\frac{\tan \theta}{1 - \cot \theta} + \frac{\cot \theta}{1 - \tan \theta}$</p> $= \frac{\tan^2 \theta}{\tan \theta - 1} - \frac{1}{\tan \theta - 1}$ $= \frac{\tan^3 \theta - 1}{\tan \theta (\tan \theta - 1)} = \frac{(\tan \theta - 1)(\tan^2 \theta + \tan \theta + 1)}{\tan \theta (\tan \theta - 1)}$ $= \tan \theta + 1 + \cot \theta$	<p>1</p> <p>1</p> <p>1</p>
<p>31. All jacks, queens and kings are removed from a pack of 52 playing cards. The remaining cards are well shuffled and then a card is drawn at random from these remaining cards. Find the probability that this card is :</p> <p>(i) a black face card</p> <p>(ii) a red card</p> <p>(iii) a black ace card</p>	
<p>Solution:</p> <p>(i) P(a black face card) = 0</p> <p>(ii) P(a red card) = $\frac{20}{40}$ or $\frac{1}{2}$</p> <p>(iii) P(a black ace card) = $\frac{2}{40}$ or $\frac{1}{20}$</p>	<p>1</p> <p>1</p> <p>1</p>
<p style="text-align: center;">SECTION D</p> <p><i>This section has 4 long answer (LA) type questions carrying 5 marks each.</i> $4 \times 5 = 20$</p>	
<p>32. (a) Solve the following quadratic equation for x :</p> $3a^2x^2 + 8abx + 4b^2 = 0; a \neq 0$ <p style="text-align: center;">OR</p> <p>(b) The difference of the squares of two positive numbers is 45. The square of the smaller number is 4 times the greater number. Determine the numbers.</p>	
<p>Solution:</p> <p>(a) $3a^2x^2 + 8abx + 4b^2 = 0$</p> $3a^2x^2 + 6abx + 2abx + 4b^2 = 0$ $3ax(ax + 2b) + 2b(ax + 2b) = 0$ $(ax + 2b)(3ax + 2b) = 0$	<p>1</p> <p>2</p>

$$ax + 2b = 0 \Rightarrow x = \frac{-2b}{a}$$

$$3ax + 2b = 0 \Rightarrow x = \frac{-2b}{3a}$$

OR

(b) Let the two numbers be x and y , ($x > y$)

$$\therefore x^2 - y^2 = 45 \dots\dots(i)$$

$$\text{and } y^2 = 4x \dots\dots(ii)$$

$$\therefore x^2 - 4x - 45 = 0$$

$$(x - 9)(x + 5) = 0$$

$$x = 9 \quad x = -5 \text{ (rejecting)}$$

$$\therefore y = \sqrt{36} = \pm 6 \quad (\text{rejecting } y = -6)$$

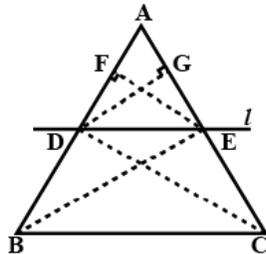
\therefore Numbers are 9 and 6

33. (a) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.

OR

(b) Prove that the lengths of the tangents drawn from an external point to a circle are equal.

Solution: (a)



Given: In ΔABC , $DE \parallel BC$

To Prove: $\frac{AD}{DB} = \frac{AE}{EC}$

Construction: Join BE, DC , Draw $DG \perp AC$ and $EF \perp AB$

$$\text{Proof : } \frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{\frac{1}{2} \times AD \times EF}{\frac{1}{2} \times DB \times EF} \Rightarrow \frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{AD}{DB} \dots\dots(i)$$

1

1

1

1

1

1

1

1½

1

and $\frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle CDE)} = \frac{\frac{1}{2} \times AE \times DG}{\frac{1}{2} \times EC \times DG} \Rightarrow \frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle CDE)} = \frac{AE}{EC} \dots\dots\dots (ii)$

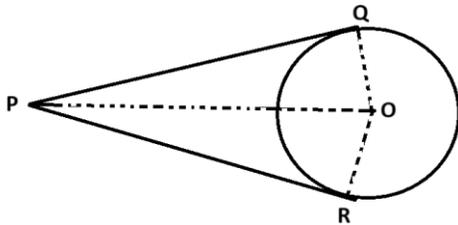
As $\triangle BDE$ and $\triangle CDE$ are on the same base DE and between the same parallels DE and BC .

$\therefore \text{ar}(\triangle BDE) = \text{ar}(\triangle CDE) \dots\dots\dots(iii)$

From (i), (ii) and (iii), we get $\frac{AD}{DB} = \frac{AE}{EC}$

OR

(b) Given: PQ and PR are tangents to a circle with centre O



To prove: $PQ = PR$.

Construction: Join OP , OQ and OR .

Proof :In $\triangle OQP$ and $\triangle ORP$

$\angle OQP = \angle ORP = 90^\circ$

$OQ = OR$ (Radii)

$OP = OP$ (Common side)

$\Rightarrow \triangle OQP \cong \triangle ORP$ [By RHS congruence criterion]

$PQ = PR$ [CPCT]

34. A toy is in the form of a cone of radius 3.5 cm mounted on a hemisphere of the same radius. The total height of the toy is 15.5 cm. Find the surface area of the toy.

Solution:

Height of cone (h) = $15.5 - 3.5 = 12$ cm

Slant height (l) = $\sqrt{12^2 + (3.5)^2} = \sqrt{144 + 12.25} = \sqrt{156.25} = 12.5$ cm

S.A. = $\pi r l + 2\pi r^2$

= $\frac{22}{7} \times \frac{35}{10} (12.5 + 7)$

= $\frac{429}{2} \text{ cm}^2$ or 214.5 cm^2

35. The percentage of marks obtained by 100 students in an examination are given below :

% marks obtained :	30-35	35-40	40-45	45-50	50-55	55-60	60-65
Number of students :	14	16	18	23	18	8	3

Determine the median percentage of marks obtained.

Solution:

CI	30-35	35-40	40-45	45-50	50-55	55-60	60-65
f	14	16	18	23	18	8	3
Cf	14	30	48	71	89	97	100

Median Class 45 – 50

$$\begin{aligned} \text{Median} &= l + \frac{\frac{N}{2} - Cf}{f} \times h \\ &= 45 + \frac{50 - 48}{23} \times 5 \\ &= 45.43 \end{aligned}$$

\therefore Median percentage of marks obtained is 45.43

1½

2½

1

SECTION E

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

$3 \times 4 = 12$

Case Study - 1

36. A park is designed in the form of a circle with centre O. There is a fountain at the centre of the park and the entry gate is at point A on the boundary of the park. Let the coordinates of centre O be $(2a - 1, 7)$ and the coordinates of point A be $(-3, -1)$.

Based on the above information, answer the following questions :

- (i) If $a = 1$, determine the radius of the circular park. 1
- (ii) If the centre of park is on y-axis, then find the value of 'a'. 1
- (iii) (a) If the radius of the circular park is 10 units, then find the possible values of 'a'. 2

OR

- (iii) (b) If B is another point on the boundary of the park such that $OB \perp OA$, and the radius of the circular park is 10 units, then determine the length of the chord AB. 2

Solution:

- (i) $r = \sqrt{80}$ or $4\sqrt{5}$ units 1
- (ii) If centre on y-axis, $2a - 1 = 0 \Rightarrow a = \frac{1}{2}$ 1
- (iii) (a) $(2a - 1 + 3)^2 + (7 + 1)^2 = 100$ 1
- $(2a + 2)^2 = (6)^2$
- $\Rightarrow 2(a + 1) = 6$ or $2(a + 1) = -6$
- $\Rightarrow a = 2$ or -4 $\frac{1}{2} + \frac{1}{2}$

OR

- (a) $AB = \sqrt{OA^2 + OB^2} = \sqrt{100 + 100}$
- $= \sqrt{200}$ or $10\sqrt{2}$ units. 2

Case Study - 2

- 37.** An observer from the top of a 30 m tall lighthouse observes a ship at an angle of depression 30° coming towards the base of the lighthouse along a straight line joining the ship and the base of the lighthouse. The angle of depression changes to 45° after 10 seconds.

Based on the above information, answer the following questions :

- (i) Determine the distance of the ship from the base of the lighthouse, when the angle of depression is 30° . 1
- (ii) Determine the distance of the ship from the base, after 10 seconds from the initial position. 1
- (iii) (a) Find the distance between the two positions of the ship between 30° and 45° . 2

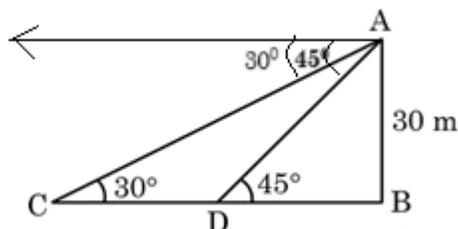
OR

- (iii) (b) Find the speed of the ship between its two positions. 2

Solution:

(i) $\frac{BC}{30} = \cot 30^\circ = \sqrt{3}$

$BC = 30\sqrt{3}$ m



(ii) $\frac{BD}{30} = \cot 45^\circ = 1$

$BD = 30$ m

(iii) (a) $CD = 30\sqrt{3} - 30 = 30(\sqrt{3} - 1)$ m

OR

(b) $CD = 30(\sqrt{3} - 1)$

Speed = $30(\sqrt{3} - 1)/10 = 2.196$ m/s

1

1

2

1

1

Case Study – 3

- 38.** A long passenger train has 72 passengers in the first coach, 68 passengers in the second coach, 64 passengers in the third coach and so on.

Based on the above information, answer the following questions :

- (i) If the number of passengers in the successive coaches form an AP, then find the first term and the common difference of the AP. 1
- (ii) In which coach is the number of passengers 56 ? 1
- (iii) (a) How many passengers are there in total, in the first 10 coaches ? 2

OR

- (iii) (b) How many passengers are there in the 10th coach ? 2

Solution:

(i) $a = 72$ $d = -4$ 1

(ii) $56 = 72 + (n - 1)(-4)$

$\Rightarrow n = 5$ 1

(iii) (a) $S_{10} = 5[144 + (10 - 1)(-4)]$ 1

$= 5 [144 - 36] = 5 \times 108 = 540$ 1

OR

(b) $a_{10} = 72 + 9 \times (-4)$ 1

$= 72 - 36 = 36$ 1