

Marking Scheme
Strictly Confidential
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Secondary School Examination, 2024
MATHEMATICS PAPER CODE 30/3/3

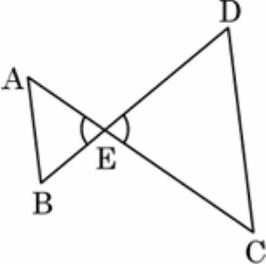
General Instructions: -

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	“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. 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.
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 totalled up and written on the left-hand margin and encircled. This may be followed strictly.
8	If a question does not have any parts, marks must be awarded on the left-hand margin and encircled. This may also be followed strictly.

9	<u>In Q1-Q20, if a candidate attempts the question more than once (without cancelling the previous attempt), marks shall be awarded for the first attempt only and the other answer scored out with a note “Extra Question”.</u>
10	<u>In Q21-Q38, 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”.</u>
11	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
12	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.
13	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.
14	Ensure that you do not make the following common types of errors committed by the Examiner in the past:- <ul style="list-style-type: none"> ● Leaving answer or part thereof unassessed in an answer book. ● Giving more marks for an answer than assigned to it. ● Wrong totalling of marks awarded to an answer. ● Wrong transfer of marks from the inside pages of the answer book to the title page. ● Wrong question wise totalling on the title page. ● Wrong totalling of marks of the two columns on the title page. ● Wrong grand total. ● Marks in words and figures not tallying/not same. ● Wrong transfer of marks from the answer book to online award list. ● 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.) ● Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
15	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.
16	Any un assessed 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.
17	The Examiners should acquaint themselves with the guidelines given in the “ Guidelines for spot Evaluation ” before starting the actual evaluation.
18	Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totalled and written in figures and words.
19	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.

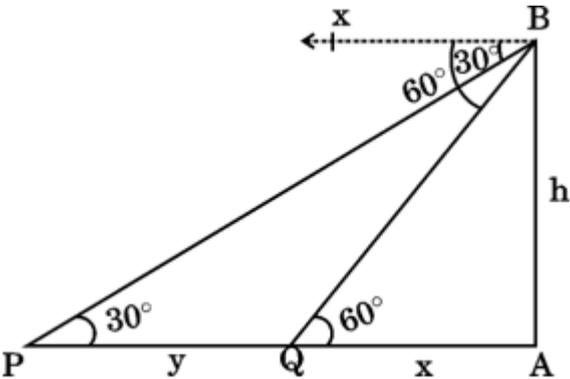
	<p>Directions : Questions number 19 and 20 are Assertion and Reason based questions carrying 1 mark each. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below :</p> <p>(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).</p> <p>(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).</p> <p>(C) Assertion (A) is true, but Reason (R) is false.</p> <p>(D) Assertion (A) is false, but Reason (R) is true.</p>	
19.	<p>Assertion (A) : The point which divides the line segment joining the points A (1, 2) and B(-1, 1) internally in the ratio 1 : 2 is $\left(\frac{-1}{3}, \frac{5}{3}\right)$</p> <p>Reason (R) : The coordinates of the point which divides the line segment joining the points A (x_1, y_1) and B(x_2, y_2) in the ratio $m_1 : m_2$ are $\left(\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}\right)$</p>	
Sol.	(D) Assertion (A) is false , but Reason(R) is true.	1
20.	<p>Assertion (A) : In a cricket match, a batsman hits a boundary 9 times out of 45 balls he plays. The probability that in a given ball, he does not hit the boundary is $\frac{4}{5}$.</p> <p>Reason (R) : $P(E) + P(\text{not } E) = 1$</p>	
Sol.	(A) Both Assertion (A) and Reason(R) are true and Reason (R) is the correct explanation of the Assertion (A).	1
	<p>SECTION B</p> <p>This section consists of 5 questions of 2 marks each.</p>	

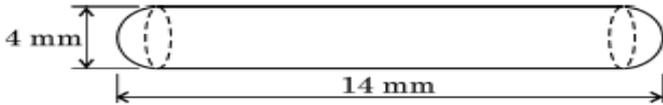
21(a).	If $2x + y = 13$ and $4x - y = 17$, find the value of $(x - y)$.	
Sol.	$2x + y = 13$ ---- (i) $4x - y = 17$ ---- (ii) Solving (i) and (ii) $x = 5$ & $y = 3$ $x - y = 2$	$1\frac{1}{2}$ $\frac{1}{2}$
	OR	
21(b).	Sum of two numbers is 105 and their difference is 45. Find the numbers.	
Sol.	Let the numbers be x, y ($x > y$) $x + y = 105$ (i) $x - y = 45$ (ii) on solving (i) and (ii) $\Rightarrow x = 75$ & $y = 30$ \therefore Numbers are 75, 30	$\frac{1}{2}$ $\frac{1}{2}$ 1
22.	Evaluate : $\frac{5 \tan 60^\circ}{(\sin^2 60^\circ + \cos^2 60^\circ) \tan 30^\circ}$	
Sol.	$\frac{5 \tan 60^\circ}{(\sin^2 60^\circ + \cos^2 60^\circ) \tan 30^\circ}$ $\frac{5 \times \sqrt{3}}{\left[\left(\frac{\sqrt{3}}{2} \right)^2 + \left(\frac{1}{2} \right)^2 \right] \times \frac{1}{\sqrt{3}}}$ $= 15$	$1\frac{1}{2}$ $\frac{1}{2}$

23.	<p>In the given figure, $\frac{EA}{EC} = \frac{EB}{ED}$, prove that $\triangle EAB \sim \triangle ECD$</p> 	
Sol.	<p>In $\triangle EAB$ and $\triangle ECD$</p> $\frac{EA}{EC} = \frac{EB}{ED}$ $\angle AEB = \angle CED$ $\triangle EAB \sim \triangle ECD$	<p>1</p> <p>1</p>
24.	<p>One card is drawn at random from a well shuffled deck of 52 cards. Find the probability that the card drawn</p> <p>(i) is queen of hearts;</p> <p>(ii) is not a jack.</p>	
Sol.	<p>Total outcomes = 52</p> <p>(i) $P(\text{card is queen of hearts}) = \frac{1}{52}$</p> <p>(ii) $P(\text{not a jack}) = \frac{48}{52}$ or $\frac{12}{13}$</p>	<p>1</p> <p>1</p>
25(a).	<p>Find a relation between x and y such that the point $P(x, y)$ is equidistant from the points $A(7, 1)$ and $B(3, 5)$.</p>	
Sol.	<p>$PA = PB$</p> $\Rightarrow PA^2 = PB^2$ $(x - 7)^2 + (y - 1)^2 = (x - 3)^2 + (y - 5)^2$ $\Rightarrow -8x + 8y + 16 = 0 \text{ or } x - y - 2 = 0$	<p>1</p> <p>1</p>
	OR	

25(b).	Points A(-1, y) and B(5, 7) lie on a circle with centre O(2, -3y) such that AB is a diameter of the circle. Find the value of y. Also, find the radius of the circle.	
Sol.	Centre O(2,-3y) is the mid point of AB $\therefore \frac{y+7}{2} = -3y$ $\Rightarrow y = -1$ Radius = OB = $\sqrt{(5-2)^2 + (7-3)^2} = 5$	$\frac{1}{2}$ $\frac{1}{2}$ 1
SECTION C		
This section consists of 6 questions of 3 marks each.		
26(a).	Find the ratio in which the line segment joining the points (5, 3) and (-1, 6) is divided by Y-axis.	
Sol.	Let the line segment divides y-axis at (0,y). Let the required ratio be k : 1 $\therefore 0 = \frac{(-1)k+5(1)}{k+1}$ $\Rightarrow k = 5$ Hence ratio is 5:1	$\frac{1}{2}$ 1 1 $\frac{1}{2}$
OR		
26(b).	P(-2, 5) and Q(3, 2) are two points. Find the coordinates of the point R on line segment PQ such that PR = 2QR.	
Sol.	Let coordinates of R be (x,y) . PR:RQ=2:1 $x = \frac{2(3)+1(-2)}{2+1} = \frac{4}{3}$ $y = \frac{2(2)+1(5)}{2+1} = 3$	$\frac{1}{2}$ 1 1

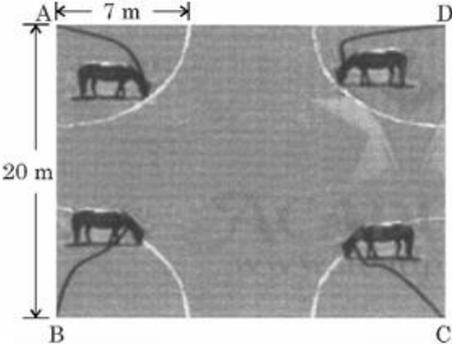
Sol.	<p>Let a be the first term and d be the common difference.</p> $\frac{a + 9d}{a + 29d} = \frac{1}{3}$ $\Rightarrow a = d \quad \dots\dots\dots(i)$ $\frac{6}{2}(2a + 5d) = 42$ $\Rightarrow 2a + 5d = 14 \quad \dots\dots\dots(ii)$ <p>Solving (i) and (ii)</p> $a = 2 \text{ and } d = 2$	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p>
28.	<p>Solve the following system of linear equations graphically :</p> $x - y + 1 = 0$ $x + y = 5$	
Sol.	<p style="text-align: right;">Correct graph</p> <p style="text-align: right;">Solution is $x = 2$, $y = 3$</p>	<p>2</p> <p>1</p>
29.	<p>Find the zeroes of the quadratic polynomial $x^2 - 15$ and verify the relationship between the zeroes and the coefficients of the polynomial.</p>	
Sol.	<p>Let $P(x) = x^2 - 15$</p>	

	$= \left(\frac{1 - \sin^2 \theta}{\sin \theta} \right) \left(\frac{1 - \cos^2 \theta}{\cos \theta} \right) \left(\frac{\sin^2 \theta + \cos^2 \theta}{\cos \theta \sin \theta} \right)$ $= \frac{\cos^2 \theta}{\sin \theta} \times \frac{\sin^2 \theta}{\cos \theta} \times \frac{1}{\cos \theta \sin \theta}$ $= 1 = \text{R.H.S}$	<p>1/2</p> <p>1</p> <p>1/2</p>
	SECTION D	
	This section consists of 4 questions of 5 marks each.	
32.	A man on a cliff observes a boat at an angle of depression of 30° which is approaching the shore to the point immediately beneath the observer with a uniform speed. Six minutes later, the angle of depression of the boat is found to be 60° . Find the time taken by the boat from here to reach the shore.	
Sol.	<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;">Correct fig.</div> </div> <p>In ΔQAB</p> $\tan 60^\circ = \sqrt{3} = \frac{h}{x}$ $h = \sqrt{3}x \dots \dots \dots (i)$ <p>In ΔPAB</p> $\tan 30^\circ = \frac{1}{\sqrt{3}} = \frac{h}{y+x}$ $y + x = \sqrt{3}h \dots \dots \dots (ii)$ <p>solving (i) and (ii)</p> $y = 2x$ <p>Time taken by the boat from Q to A = $\frac{1}{2} \times 6 = 3$ min.</p>	<p>1</p> <p>1</p> <p>1/2</p> <p>1</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p>

33(a).	A solid iron pole consists of a solid cylinder of height 200 cm and base diameter 28 cm, which is surmounted by another cylinder of height 50 cm and radius 7 cm. Find the mass of the pole, given that 1 cm ³ of iron has approximately 8 g mass.	
Sol.	<p>Radius of lower cylinder = 14 cm</p> <p>Volume of pole = $\frac{22}{7} \times 14 \times 14 \times 200 + \frac{22}{7} \times 7 \times 7 \times 50$</p> <p style="text-align: center;">= 130900 cm³</p> <p>Mass of the pole = 8 × 130900</p> <p style="text-align: center;">= 1047200 gm or 1047.2 kg</p>	<p>½</p> <p>1+1</p> <p>1</p> <p>1</p> <p>½</p>
OR		
33(b).	<p>A medicine capsule is in the shape of a cylinder with two hemispheres stuck to each of its ends. The length of the entire capsule is 14 mm and the diameter of the capsule is 4 mm, find its surface area. Also, find its volume.</p> 	
Sol.	<p>Radius of hemisphere = radius of cylinder = 2 mm</p> <p>Length of cylindrical part = 14 – 4 = 10 mm.</p> <p>Surface area of the capsule = CSA of cylinder + 2 (CSA of hemisphere)</p> <p style="text-align: center;">= $2 \times \frac{22}{7} \times 2 \times 10 + 2 \times 2 \times \frac{22}{7} \times 2 \times 2$</p> <p style="text-align: center;">= 176 mm²</p> <p>Volume of the capsule = volume of cylinder + 2 (volume of hemisphere)</p> <p style="text-align: center;">= $\frac{22}{7} \times 2 \times 2 \times 10 + 2 \times \frac{2}{3} \times \frac{22}{7} \times 2 \times 2 \times 2$</p> <p style="text-align: center;">= $\frac{3344}{21}$ mm³ or 159.24 mm³</p>	<p>½</p> <p>½</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
34(a).	In a flight of 2800 km, an aircraft was slowed down due to bad weather. Its average speed is reduced by 100 km/h and by doing so, the time of flight is increased by 30 minutes. Find the original duration of the flight.	

Sol.	<p>Let original speed of aircraft be x km/hr.</p> <p>A.T.Q.</p> $\frac{2800}{x-100} - \frac{2800}{x} = \frac{1}{2}$ $\Rightarrow x^2 - 100x - 560000 = 0$ $\Rightarrow (x - 800)(x + 700) = 0$ <p>$x \neq -700$ So, $x = 800$</p> <p>Original Duration = $\frac{2800}{800} = \frac{7}{2}$ hrs or 3 hrs 30 min.</p>	<p>2</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>1</p>
OR		
34(b).	<p>The denominator of a fraction is one more than twice the numerator.</p> <p>If the sum of the fraction and its reciprocal is $2\frac{16}{21}$, find the fraction.</p>	
Sol.	<p>Let numerator be x,</p> <p>then denominator be $(2x + 1)$</p> <p>Fraction = $\frac{x}{2x+1}$</p> <p>A.T.Q.</p> $\frac{x}{2x+1} + \frac{2x+1}{x} = \frac{58}{21}$ $\Rightarrow 11x^2 - 26x - 21 = 0$ $\Rightarrow (x - 3)(11x + 7) = 0$ <p>$x \neq -\frac{7}{11}$ So, $x = 3$</p> <p>\therefore Fraction = $\frac{3}{7}$</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$1\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>

	(ii)	(a)								
	Age (in years)	14.5-19.5	19.5-24.5	24.5-29.5	29.5-34.5	34.5-39.5	39.5-44.5	44.5-49.5	49.5-54.5	
	Number of participants	62	132	96	37	13	11	10	4	
	cf	62	194	290	327	340	351	361	365	
	Correct table									1
	$\frac{n}{2} = \frac{365}{2} = 182.5$									½
	median class=19.5-24.5									½
	OR									
	(ii)	(b) 62+132+96+37+13+11+10=361								2
	(iii)	3median= mode + 2 mean								1
37.	<p>Teaching Mathematics through activities is a powerful approach that enhances students' understanding and engagement. Keeping this in mind, Ms. Mukta planned a prime number game for class 5 students. She announces the number 2 in her class and asked the first student to multiply it by a prime number and then pass it to second student. Second student also multiplied it by a prime number and passed it to third student. In this way by multiplying to a prime number, the last student got 173250.</p> <p>Now, Mukta asked some questions as given below to the students :</p> <p>(i) What is the least prime number used by students ?</p> <p>(ii) (a) How many students are in the class ?</p> <p style="text-align: center;">OR</p> <p>(b) What is the highest prime number used by students ?</p> <p>(iii) Which prime number has been used maximum times ?</p>									

Sol.	$173250 = 2 \times 5^3 \times 3^2 \times 7 \times 11$ (i) 3 (ii) (a) $173250 = 2 \times 5^3 \times 3^2 \times 7 \times 11$ Number of students in the class = $3 + 2 + 1 + 1 = 7$ OR (ii) (b) $173250 = 2 \times 5^3 \times 3^2 \times 7 \times 11$ Highest prime number used by students = 11 (iii) 5	1 1 1 1 1 1
38.	<p>A stable owner has four horses. He usually tie these horses with 7 m long rope to pegs at each corner of a square shaped grass field of 20 m length, to graze in his farm. But tying with rope sometimes results in injuries to his horses, so he decided to build fence around the area so that each horse can graze.</p>  <p>Based on the above, answer the following questions :</p> (i) Find the area of the square shaped grass field. (ii) (a) Find the area of the total field in which these horses can graze. OR (b) If the length of the rope of each horse is increased from 7 m to 10 m, find the area grazed by one horse. (Use $\pi = 3.14$) (iii) What is area of the field that is left ungrazed, if the length of the rope of each horse is 7 cm ?	
Sol.	(i) Area of square shaped grass field = 400 m^2 (ii) (a) area of total field that horses can graze = $4 \times \frac{1}{4} \times \frac{22}{7} \times 7 \times 7$ $= 154 \text{ m}^2$ OR	1 1 1

	<p>(ii) (b) area grazed by one horse = $\frac{1}{4} \times 3.14 \times 10 \times 10$ $= 78.5 \text{ m}^2$</p> <p>(iii) Area of the field left ungrazed = area of square field - area of field in which horses can graze.</p> <p>Area of field in which horses can graze = $4 \times \frac{1}{4} \times \frac{22}{7} \times 7 \times 7$ $= 154 \text{ cm}^2$</p> <p>Area of the field left ungrazed = $400 - 0.0154 = 399.9846 \text{ m}^2$.</p>	<p>1</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
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