Secondary School Examination
Term–II, 2022

Marking Scheme : MATHEMATICS (Standard) (Subject Code : 041)
[Paper Code : 30/1/3]

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. ''**Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, evaluation done and several other aspects. Its 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 Newspaper/ Website, etc., may invite action under IPC.**''

3. Evaluation is to be done as per instruction 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 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, marks should be awarded.**

4. 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. 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.

5. Evaluators will mark (3) wherever answer is correct. For wrong answer '7' be marked. Evaluators will not put right kind of mark while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing**.

6. 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 in the left-hand margin and encircled. This may be followed strictly.

7. 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.

8. If a student has attempted both option given in question, answer of the question deserving more marks should be retained and the other answer scored out.

9. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.

10. A full scale of marks _____ (example 0–100 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.

11. Every examiner has to necessarily do evaluation work for full working hours, i.e., 8 hours everyday 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).

12. Ensure that you do not make the following common types of errors committed by the Examiner in the past :

- 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 on a reply
- Wrong transfer of marks from the inside pages of the answer book to the title page
- Wrong questionwise 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
- 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 7 for incorrect answer).
- Half or a part of answer marked correct and the rest as wrong, but no marks awarded.

13. While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as (7) and awarded zero (0) Mark.

14. Any unassessed portion, non-carrying over of marks to the title page, or totalling error detected by the candidates 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.

15. The examiners should acquaint themselves with the guidelines given in the guidelines for spot evaluation before starting the actual evaluation.

16. 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.

17. The Board permits candidates to obtain photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges.

MARKING SCHEME
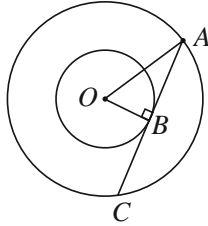Secondary School Examination TERM–II, 2022
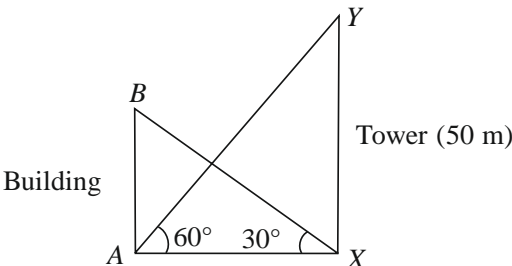# MATHEMATICS (Standard)   (Subject Code–041)
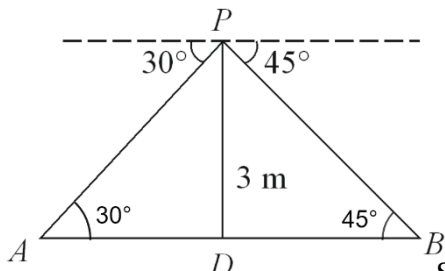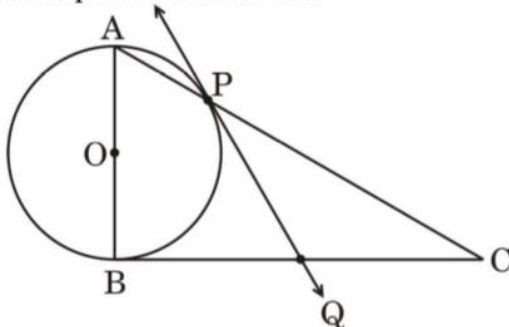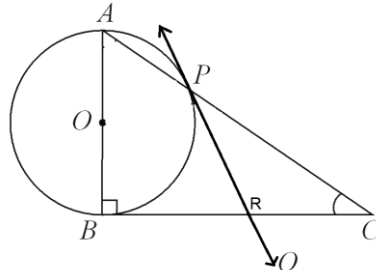## [Paper Code : 30/1/3]

General Instructions:
  1.   The Marking Scheme provides general guidelines to reduce subjectivity in the marking. The answers given in the Marking Scheme are suggested answers. The content is thus indicative. If a student has given any other answer which is different from the one given in the Marking Scheme, but conveys the meaning, such answers should be given full weightage.
  2.   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.
  3.   Alternative methods are accepted. Proportional marks are to be awarded.
  4.   If a candidate has attempted a question twice, answer of the question deserving more marks should be retained and the other answer scored out.
  5.   A full scale of marks - 0 to 40 has to be used. Please do not hesitate to award full marks if the answer deserves it.
  6.   Separate Marking Scheme for all the three sets has been given.
  7.   As per orders of the Hon'ble Supreme Court. The candidates would now be permitted to obtain photocopy of the Answer book on request on payment of the prescribed fee. All 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.
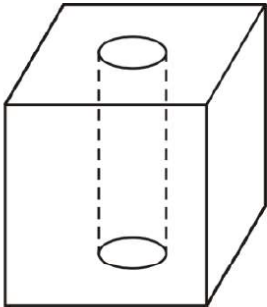
Q. No.	EXPECTED ANSWER / VALUE POINTS	Marks
	SECTION—A	
1.a.	Find the value of m for which the quadratic equation $(m - 1)x^2 + 2(m - 1)x + 1 = 0$ has two real and equal roots.	
Sol.	For real and equal roots	
	$4(m-1)^2 - 4(m-1) = 0$	½
	$\Rightarrow m = 1$ or $m = 2$	1
	$m \neq 1 \Rightarrow m = 2$	½
	Or	
b.	Solve the following quadratic equation for x : $\sqrt{3}\,x^2 + 10x + 7\sqrt{3} = 0$	
Sol.	$\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$	
	$or\ \sqrt{3}x^2 + 3x + 7x + 7\sqrt{3} = 0$	1
	$or\ (\sqrt{3}x+7)(x+\sqrt{3}) = 0$	
	$\Rightarrow\ x = -\frac{7}{\sqrt{3}},\ -\sqrt{3}$ or $-\frac{7}{3}\sqrt{3},\ -\sqrt{3}$	1

2.	The product of Rehan's age (in years) 5 years ago and his age 7 years from now, is one more than twice his present age. Find his present age.	
Sol.	Let Rehan's present age be x years	
	$\therefore\ (x-5)\,(x+7)=2x+1$	1
	$\Rightarrow x^2=36$	½
	$\Rightarrow x=6$	½
3. (a)	Find the sum of the first twelve 2-digit numbers which are multiples of 6.	
Sol.	Here $a=12,\ d=6,\ n=12$	1
	$S_{12}=\dfrac{12}{2}[24+11\times6]$	½
	$=540$	½
	Or	
(b)	In an AP, if $a_2=26$ and $a_{15}=-26$, then write the AP.	
Sol.	$a+d=26\qquad\qquad\ldots$ (i)	½
	$a+14d=-26\qquad\ldots$ (ii)	½
	Solving (i) and (ii) $\quad a=30,\ d=-4$	½
	A.P. is 30, 26, 22, ...	½
4.	A solid metallic sphere of radius 10·5 cm is melted and recast into a number of smaller cones, each of radius 3·5 cm and height 3 cm. Find the number of cones so formed.	
Sol.	$n\times\dfrac{1}{3}.\pi.(3.5)^2(3)=\dfrac{4}{3}\pi(10.5)^3$	1
	$\Rightarrow\ n=126$	1
5.	Two concentric circles are of radii 4 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle.	
Sol.	For correct figure	½

Here $OB=3$ cm, $OA=4$ cm

$OB\perp AC$

$\therefore\ AB=\sqrt{4^2-3^2}=\sqrt{7}$ cm $\qquad$ 1

Hence $AC=2\sqrt{7}$ cm $\qquad$ ½

6.	Find the mode of the following frequency distribution :	

Class	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Frequency	15	10	12	17	4

Sol. Modal class is 40–50   ½

$$\text{Mode} = 40 + 10 \times \frac{17 - 12}{34 - 12 - 4}$$ 1

$$= 42 \cdot 7 \ \text{or} \ 42\frac{7}{9}$$ ½

SECTION—B

7.(a) The angle of elevation of the top of a building from the foot of the tower is 30° and the angle of elevation of the top of the tower from the foot of the building is 60°. If the tower is 50 m high, then find the height of the building.

Sol. For correct figure   1

$$\tan 30° = \frac{AB}{AX} \quad \text{and} \quad \tan 60° = \frac{50}{AX}$$

$$\Rightarrow AB = \frac{1}{\sqrt{3}} AX \quad \text{and} \quad AX = \frac{50}{\sqrt{3}} \ \text{m}$$ ½+½

$$\therefore \ AB = \frac{1}{\sqrt{3}} \cdot \frac{50}{\sqrt{3}} = \frac{50}{3} \ \text{m}$$ 1

OR

b. From a point on a bridge across a river, the angles of depression of the banks on opposite sides of the river are 30° and 45° respectively. If the bridge is at a height of 3 m from the banks, then find the width of the river.

Sol.

For correct figure   1

Here, $\dfrac{PD}{AD} = \tan 30° = \dfrac{1}{\sqrt{3}} \Rightarrow AD = 3\sqrt{3} \ \text{m}$ ½

and $\dfrac{PD}{BD} = \tan 45° = 1 \Rightarrow BD = 3 \ \text{m}$ ½

So, AB $= AD + BD = (3\sqrt{3} + 3) \ \text{m} = 3(\sqrt{3} + 1) \ \text{m}$ 1

8.	Draw a line segment AB = 7 cm. Divide it in the ratio 3 : 2.	
Sol.	Correct construction	3

9.	For what value of x, is the median of the following frequency distribution 34·5 ?	

Class	Frequency
0 – 10	3
10 – 20	5
20 – 30	11
30 – 40	10
40 – 50	x
50 – 60	3
60 – 70	2

Sol. Median class is 30–40   ½

Class	Frequency	c.f.
0–10	3	3
10–20	5	8
20–30	11	19
30–40	10	29
40–50	x	$29 + x$
50–60	3	$32 + x$
60–70	2	$34 + x$

Correct table   1

$$\therefore\ 34\!\cdot\!5 = 30 + \frac{10}{10}\left(\frac{34 + x}{2} - 19\right)$$ 1

$$\Rightarrow x = 13$$ ½

10.	The following table gives the production yield of wheat of farms of a village :

Production Yield (in kg / ha)	50 – 60	60 – 70	70 – 80	80 – 90	90 – 100
Number of Farms	7	12	11	8	2

Find the mean production yield, using assumed mean method.

Sol.

Class	X	f	d = x − 75	f.d
50–60	55	7	−20	−140
60–70	65	12	−10	−120
70–80	75	11	0	0
80–90	85	8	10	80
90–100	95	2	20	40
		40		−140

Correct table 2

$$\bar{x} = 75 - \frac{140}{40} = 71{\cdot}5$$

1

Mean production yield is 71.5 kg/ha

SECTION—C

11.

In Figure 1, a triangle ABC with ∠ B = 90° is shown. Taking AB as diameter, a circle has been drawn intersecting AC at point P. Prove that the tangent drawn at point P bisects BC.

Figure 1

Sol.

PR=RB (tangents from external point)………………(i)   1

Proving ∠ RPC = ∠ RCP   2

⇒   PR =CR   ………………(ii)   ½

	Using equations (i) and (ii) $\qquad$ BR= RC Hence the tangent drawn at point P bisects BC	½

12.(a) In Figure 2, from a solid cube of side 7 cm, a cylinder of radius 2·1 cm and height 7 cm is scooped out. Find the total surface area of the remaining solid.

Figure 2

Sol. Total surface area of cube $= 6 \times (7)^2 - 2 \times \dfrac{22}{7} \times 2{\cdot}1 \times 2{\cdot}1$

$\qquad\qquad\qquad = 266{\cdot}28 \text{ cm}^2$ — 2

Curved surface area of cylinder $= 2 \times \dfrac{22}{7} \times 2{\cdot}1 \times 7$

$\qquad\qquad\qquad = 92{\cdot}4 \text{ cm}^2$ — 1

Therefore surface area of remaining solid

$\qquad\qquad\qquad = 266{\cdot}28 + 92{\cdot}4$

$\qquad\qquad\qquad = 358{\cdot}68 \text{ cm}^2$ — 1

Or

(b) A well of diameter 5 m is dug 24 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 3 m to form an embankment. Find the height of the embankment.

Sol. $r = 2{\cdot}5$ m

Volume of earth dug out $= \pi \times 2{\cdot}5 \times 2{\cdot}5 \times 24 \text{ m}^3$ — 1

Let height of embankment be h

$\therefore$ Volume of earth dug out = Volume of embankment

$\Rightarrow \pi \times (2{\cdot}5)^2 \times 24 = \pi \times h \left[(5{\cdot}5)^2 - (2{\cdot}5)^2 \right]$ — 2

$\qquad \Rightarrow 2{\cdot}5 \times 2{\cdot}5 \times 24 = h \times 8 \times 3$

$\qquad \Rightarrow h = 6{\cdot}25$ m — 1

13. In Mathematics, relations can be expressed in various ways. The matchstick patterns are based on linear relations. Different strategies can be used to calculate the number of matchsticks used in different figures.

One such pattern is shown below. Observe the pattern and answer the following questions using Arithmetic Progression :

Figure 1   Figure 2   Figure 3

(a) Write the AP for the number of triangles used in the figures. Also, write the nth term of this AP.

(b) Which figure has 61 matchsticks ?

Sol. (1) Number of triangles in figures are 4, 6, 8, ...   ½

This is an A.P. with $a = 4,\ d = 2$ 1

$\therefore\ a_n = 4 + (n-1) \times 2 = 2n + 2$ ½

(2) Number of matchsticks in figures are 12, 19, 26, ...   ½

This is an A.P. with $a = 12,\ d = 7$ 1

$\therefore\ 61 = 12 + (n-1) \times 7$

$\Rightarrow\ n = 8$ ½

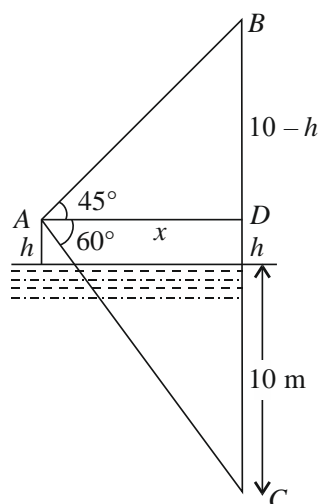| 14.	**Case Study—2**		
	Gadisar Lake is located in the Jaisalmer district of Rajasthan. It was built by the King of Jaisalmer and rebuilt by Gadsi Singh in 14th century. The lake has many Chhatris. One of them is shown below :		

Observe the picture. From a point A h m above from water level, the angle of elevation of top of Chhatri (point B) is 45° and angle of depression of its reflection in water (point C) is 60°. If the height of Chhatri above water level is (approximately) 10 m, then

(a) draw a well-labelled figure based on the above information;

(b) find the height (h) of the point A above water level.
(Use $\sqrt{3} = 1\cdot73$)

Sol. (1)

Correct Figure   2

(2) $\tan 45° = 1 = \dfrac{10-h}{x}$

$\Rightarrow x = 10 - h$ ... (i)

$\tan 60° = \sqrt{3} = \dfrac{10+h}{x}$ ½

$$\Rightarrow x = \frac{10+h}{\sqrt{3}} \qquad \dots \text{ (ii)}$$

Solving (i) and (ii) $\quad 10(\sqrt{3}-1) = h(\sqrt{3}+1)$ $\qquad$ ½

$$\Rightarrow h = \frac{10(\sqrt{3}-1)^2}{2}$$

$$= 2 \cdot 67 \text{ m or } 2.7 \text{m} \qquad 1$$

* * *