Strictly Confidential : (For Internal and Restricted use only)
Secondary School Examination
Term–II, 2022

Marking Scheme : MATHEMATICS (Standard) (Subject Code : 041)

[Paper Code : 30/2/3]

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

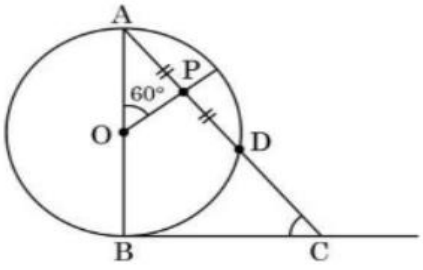
Secondary School Examination Term–II, 2022

MATHEMATICS (Standard) (Subject Code : 041)

[Paper Code : 30/2/3]

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	In Fig. 1, AB is diameter of a circle centered at O. BC is tangent to the circle at B. If OP bisects the chord AD and $\angle AOP = 60°$, then find $m\angle C$.  **Fig. 1**	
Sol	$\because AP = PD \Rightarrow OP \perp AD$	½
	$\therefore \angle OAP = 30°$	½
	Also $\angle ABC = 90°$	½
	$\Rightarrow \angle C = 60°$	½
	Or	

b

Sol

In Fig. 2, XAY is a tangent to the circle centered at O. If ∠ABO = 40°, then find m∠BAY and m∠AOB.

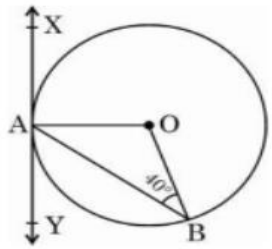


Fig. 2

$OA = OB \Rightarrow \angle OAB = 40°$

$OA \perp AY \Rightarrow \angle BAY = 50°$ ½

$\angle AOB = 180° - 80° = 100°$ ½

1

2.

Sol

If mode of the following frequency distribution is 55, then find the value of x.

Class :	0 – 15	15 – 30	30 – 45	45 – 60	60 – 75	75 – 90
Frequency :	10	7	x	15	10	12

Modal class is 45–60 ½

Therefore, $55 = 45 + 15 \times \dfrac{15 - x}{30 - x - 10}$ 1

$\Rightarrow x = 5$ ½

3.a

Sol

In an A.P. if the sum of third and seventh term is zero, find its 5^{th} term.

$(a + 2d) + (a + 6d) = 0$ 1

$\Rightarrow a = -4d$ ½

Hence $a_5 = 0$ ½

Or

b

Determine the A.P. whose third term is 5 and seventh term is 9.

$a + 2d = 5,\ a + 6d = 9$ ½

Sol	$\Rightarrow a = 3,\ d = 1$ Therefore A.P. is 3, 4, 5, …	1 ½
4. **Sol**	Solve the quadratic equation : $x^2 + 2\sqrt{2}x - 6 = 0$ for x. D=32 $x = \frac{-2\sqrt{2} \pm \sqrt{8+24}}{2}$ $\Rightarrow x = \sqrt{2}, -3\sqrt{2}$	 ½ ½ 1
5. **Sol**	Find the sum of first 20 terms of an A.P. whose n^{th} term is given as $a_n = 5 - 2n$. $a_1 = 5 - 2 = 3$ $a_{20} = 5 - 40 = -35$ $S_{20} = \frac{20}{2}(3 - 35) = -320$	 ½ ½ 1
6. **Sol**	A solid piece of metal in the form of a cuboid of dimensions 11 cm × 7 cm × 7 cm is melted to form 'n' number of solid spheres of radii $\frac{7}{2}$ cm each. Find the value of n. $n \times \frac{4}{3} \times \frac{22}{7} \times \left(\frac{7}{2}\right)^3 = 11 \times (7)^2$ $\Rightarrow n = 3$	 1 1
	SECTION—B	
7.a	The mean of the following frequency distribution is 25. Find the value of f.	

Class :	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency :	5	18	15	f	6

Sol

Class	*x*	*f*	*fx*
0–10	5	5	25
10–20	15	18	270
20–30	25	15	375
30–40	35	f	$35f$
40–50	45	6	270
		$44 + f$	$940 + 35f$

Correct table — 1½

$$\bar{x} = 25 = \frac{940 + 35f}{44 + f}$$ — 1

$$\Rightarrow f = 16$$ — ½

Or

b. Find the mean of the following data using assumed mean method :

Class :	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25
Frequency :	8	7	10	13	12

Sol

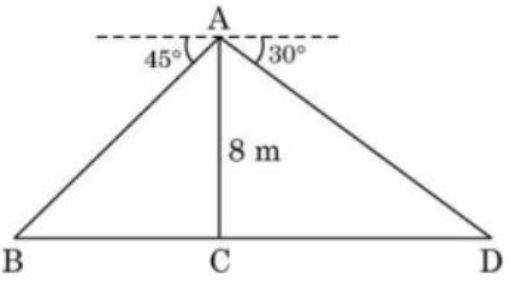
Class	*x*	*f*	$d = x - 12{\cdot}5$	*fd*
0–5	2·5	8	–10	–80
5–10	7·5	7	–5	–35
10–15	12·5	10	0	0
15–20	17·5	13	5	65
20–25	22·5	12	10	120
		50		70

Correct table — 2

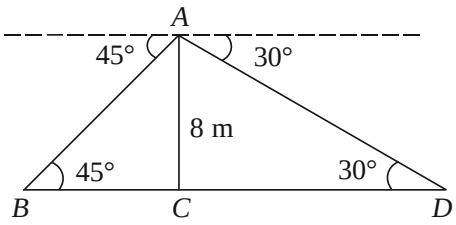
$$\bar{x} = 12 \cdot 5 + \frac{70}{50}$$

$$= 13 \cdot 9$$ 1

8. 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°. If the bridge is at a height of 8 m from the banks, then find the width of the river.



Sol



$$\tan 45° = \frac{8}{BC} = 1$$

$$\Rightarrow BC = 8\ m$$ 1

$$\tan 30° = \frac{1}{\sqrt{3}} = \frac{8}{CD}$$

$$\Rightarrow CD = 8\sqrt{3}\ m$$ 1

Adding equations, BD = $BC + CD = 8(\sqrt{3} + 1)\ m$ 1

9. Heights of 50 students of class X of a school are recorded and following data is obtained :

Height (in cm) :	130-135	135-140	140-145	145-150	150-155	155-160
Number of Students :	4	11	12	7	10	6

Find the median height of the students.

Sol

Class	*f*	*cf*
130–135	4	4
135–140	11	15
140–145	**12**	**27**
145–150	7	34
150–155	10	44
155–160	6	50 = *N*

Correct table 1

Median class is 140–145 ½

$$\text{Median} = 140 + \frac{5}{12}(25-15) \quad 1$$

$$= 144 \cdot 1 \text{ (approx)} \quad ½$$

Hence, Median height is 144.1cm

10. Construct a pair of tangents to a circle of radius 4 cm from a point P lying outside the circle at a distance of 6 cm from the centre.

Sol Correct construction 3

SECTION—C

11.a. A 2-digit number is such that the product of its digits is 24. If 18 is subtracted from the number, the digits interchange their places. Find the number.

Sol Let the unit's digit be y and ten's digit be x

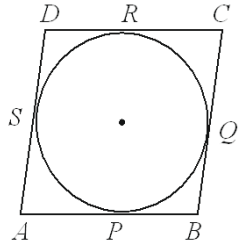
Therefore, the number is $10x + y$

$\therefore xy = 24$ ... ... *(i)* ½

$(10x + y) - 18 = 10y + x \Rightarrow x - y = 2$ ... ... *(ii)* 1

using *(i)* and *(ii)* we get $x^2 - 2x - 24 = 0$ 1

$$\Rightarrow (x-6)(x+4) = 0$$

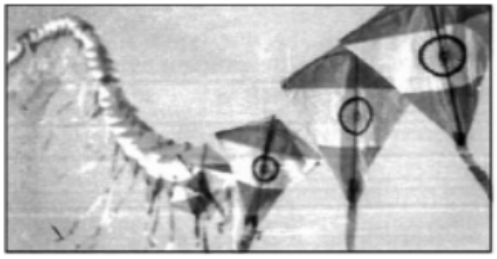
	Therefore, $x = 6$ and $y = 4$	1
	$\therefore$ number is 64.	½
	Or	
b.	The difference of the squares of two numbers is 180. The square of the smaller number is 8 times the greater number. Find the two numbers.	
Sol	Let the two numbers be x and y, x>y	
	$\therefore\ x^2 - y^2 = 180$	½
	$y^2 = 8x$	½
	Thus $x^2 - 8x - 180 = 0$	1
	$\Rightarrow (x-18)(x+10) = 0$	1
	$Therefore, x = 18$ $y = \pm 12$	1
12.	Prove that a parallelogram circumscribing a circle is a rhombus.	
Sol	Correct fig.	½
	 Tangents from an external point are equal in length	
	$\therefore AP = AS, BP = BQ$	
	$CQ = CR, DR = DS$	1
	Hence $AB + CD = BC + AD$	1
	$\therefore ABCD$ is a $\|\|^{gm}$, $\Rightarrow AB = CD$ and $BC = AD$	½
	$\Rightarrow 2AB = 2BC$ *or* $AB = BC$	
	$\therefore ABCD$ is a rhombus	1

13. **Case Study – 1 :**

Kite Festival

Kite festival is celebrated in many countries at different times of the year. In India, every year 14th January is celebrated as International Kite Day. On this day many people visit India and participate in the festival by flying various kinds of kites.

The picture given below, shows three kites flying together.



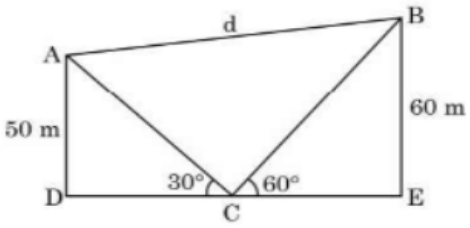


Fig. 5

In Fig. 5, the angles of elevation of two kites (Points A and B) from the hands of a man (Point C) are found to be 30° and 60° respectively. Taking AD = 50 m and BE = 60 m, find

(1) the lengths of strings used (take them straight) for kites A and B as shown in the figure.

(2) the distance 'd' between these two kites

Sol

1. $\sin 60° = \frac{\sqrt{3}}{2} = \frac{60}{BC}$

$\Rightarrow BC = 40\sqrt{3}$ m — 1

$\sin 30° = \frac{1}{2} = \frac{50}{AC}$

$\Rightarrow AC = 100$ m — 1

2. Since DE is a straight line therefore $\angle ACB = 90°$

$\therefore d^2 = AC^2 + BC^2 = (100)^2 + (40\sqrt{3})^2$ — 1½

$\Rightarrow d = \sqrt{14800} or 20\sqrt{37} m$ — ½

14. **Case Study – 2**

A 'circus' is a company of performers who put on shows of acrobats, clowns etc. to entertain people started around 250 years back, in open fields, now generally performed in tents.

One such 'Circus Tent' is shown below.

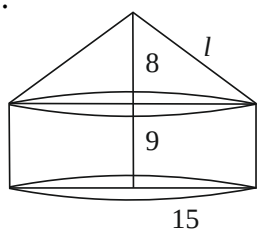
The tent is in the shape of a cylinder surmounted by a conical top. If the height and diameter of cylindrical part are 9 m and 30 m respectively and height of conical part is 8 m with same diameter as that of the cylindrical part, then find

(1) the area of the canvas used in making the tent;

(2) the cost of the canvas bought for the tent at the rate ₹ 200 per sq m, if 30 sq m canvas was wasted during stitching.

Sol

1.



$l = \sqrt{8^2 + 15^2} = 17$ m — 1

Area of canvas used = $\pi rl + 2\pi rh$

$= \pi r(l + 2h)$

$= \frac{22}{7} \times 15(17 + 18)$ — 1½

$= 1650$ m^2 — ½

2. Canvas used = $1650 + 30 = 1680$ m^2 — ½

$\therefore$ cost of canvas used = 200 × 1680

= ₹ 3,36,000 — ½

* * *