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**Secondary School Examination**

**Term–II, 2022**

# Marking Scheme : MATHEMATICS (Standard) (For VI) (Subject Code : 041)

## [ Paper Code : 30/B/5 ]

***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) (For VI) (Subject Code : 041)

**[ Paper Code : 30/B/5 ]**

***General Instructions:***

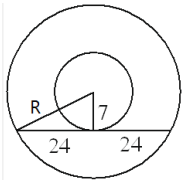
1. The Marking Scheme provides general guidelines to reduce subjectivity in the marking. The answers given in the Marking Scheme are suggested answers. The content is thus indicative. If a student has given any other answer which is different from the one given in the Marking Scheme, but conveys the 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 number of terms in the following AP :<br>5, 11, 17, ....., 203 Given | |
| **Sol.** | AP is 5, 11, 17, · · ·, 203 | |
| | $\Rightarrow a = 5,\ d = 6$ and $a_n = 203$ | 1 |
| | $203 = 5 + (n-1)6$ | ½ |
| | $\Rightarrow n - 1 = \frac{198}{6} = 33 \quad \Rightarrow n = 34$ | ½ |
| | **Or** | |
| **(b)** | Find the sum of the first 20 terms of an AP whose $n^{th}$ term is given as $a_n = 5 - 3n$. | |
| **Sol.** | $a_n = 5 - 3n \Rightarrow a_1 = 2,\ a_2 = -1 \Rightarrow d = -3$ | 1 |
| | $S_{20} = 10[4 + 19(-3)] = -530$ | 1 |
| **2.** | Find the roots of the quadratic equation $9x^2 - 6\sqrt{2}x + 2 = 0$. | |
| **Sol.** | $9x^2 - 6\sqrt{2}x + 2 = 0$ | |

| | | |
|---|---|---|
| | $\Rightarrow 9x^2 - 3\sqrt{2}x - 3\sqrt{2}x + 2 = 0$ | ½ |
| | $\Rightarrow 3x(3x - \sqrt{2}) - \sqrt{2}(3x - \sqrt{2}) = 0$ | |
| | $\Rightarrow (3x - \sqrt{2})(3x - \sqrt{2}) = 0$ | 1 |
| | $\Rightarrow x = \frac{\sqrt{2}}{3}, \frac{\sqrt{2}}{3}$ | ½ |
| **3.** | How many spherical shots each having diameter 3 cm can be made by melting a cuboidal solid of dimensions 18 cm × 22 cm × 6 cm ? | |
| **Sol.** | Volume of one lead shot = $\frac{4}{3} \times \frac{22}{7} \times \left(\frac{3}{2}\right)^3$ cm$^3$ | ½ |
| | $\therefore$ Number of lead shots = $\frac{18 \times 22 \times 6}{\frac{4}{3} \times \frac{22}{7} \times \frac{27}{8}}$ | 1 |
| | $= \frac{18 \times 22 \times 6 \times 3 \times 7 \times 8}{4 \times 22 \times 27}$ | |
| | $= 168$ | ½ |
| **4.** | The mode of the following distribution is 24 and the sum of all frequencies is 50. Find the missing frequencies x and y. | |

| *Class* | *Frequency* |
|---|---|
| 0 – 10 | 4 |
| 10 – 20 | x |
| 20 – 30 | 20 |
| 30 – 40 | y |
| 40 – 50 | 6 |

| | | |
|---|---|---|
| **Sol.** | $30 + x + y = 50 \Rightarrow x + y = 20$ | ½ |
| | Modal group is $20 - 30$, | ½ |
| | $\Rightarrow 24 = 20 + \frac{20 - x}{40 - x - y} \times 10$ | ½ |
| | $4 = \frac{20 - x}{40 - 20} \times 10 \quad \Rightarrow x = 12, \ \therefore y = 8$ | ½ |

| | | |
|---|---|---|
| **5.** | In two concentric circles, a chord of length 48 cm of the larger circle is a tangent to the smaller circle, whose radius is 7 cm. Find the radius of the larger circle. | |
| **Sol.** | Let $R$ be the radius<br>$\Rightarrow R^2 = (7)^2 + (24)^2$<br>$= 49 + 576 = 625$<br>$\Rightarrow R = 25$ cm<br>  | 1<br><br>1 |
| **6.(a)** | The product of two consecutive odd positive integers is 255. Find the integers, by formulating a quadratic equation. | |
| **Sol.** | Let two consecutive odd positive integers be $x$, $x+2$<br>$\therefore\ x(x+2) = 255$<br>$\Rightarrow x^2 + 2x - 255 = 0$<br>$\Rightarrow x^2 + 17x - 15x - 255 = 0$<br>$\Rightarrow (x+17)(x-15) = 0$<br>$\Rightarrow x = 15$<br>$\therefore$ Two consecutive odd positive integers are 15 and 17 | ½<br><br>½<br><br>½<br><br>½ |
| | **Or** | |
| **(b)** | Find the value(s) of k for the quadratic equation, $(k + 3)x^2 + kx + 1 = 0$, to have two real and equal roots. | |
| **Sol.** | $(k + 3)x^2 + kx + 1 = 0$<br>For equal roots, $k^2 - 4(k + 3)1 = 0$<br>$\Rightarrow k^2 - 4k - 12 = 0$<br>$\Rightarrow k = 6, -2$ | <br>1<br>½<br>½ |
| | **SECTION – B** | |
| **7.** | Write the steps of construction for constructing a pair of tangents to a circle of radius 4 cm from a point P, at a distance of 7 cm from its centre O. | |
| **Sol.** | *(i)* Draw a circle of radius 4 cm with centre $O$<br>*(ii)* Take a point $P$ at a distance of 7 cm from $O$<br>*(iii)* Construct a circle with $OP$ as diameter to intersect the first circle at $Q$ and $R$<br>*(iv)* Join $PQ$ and $PR$ to get the tangents | <br><br><br>3 |

**8.(a)** As observed from the top of a lighthouse 60 m high from the sea level, the angles of depression of two ships are 45° and 60°. If one ship is exactly behind the other on the same side of the lighthouse, then find the distance between the two ships. [Use $\sqrt{3}$ = 1·732]

**Sol.**

$\frac{AB}{AC} = \tan 60° = \sqrt{3}$

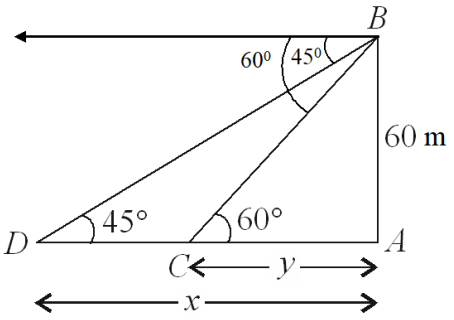
$\Rightarrow AC = y = \frac{60}{\sqrt{3}} = 20\sqrt{3}$ m — 1

$\frac{AB}{AD} = \tan 45° = 1$

$\Rightarrow AD = x = 60$ m — 1

$\therefore CD = 60 - 20\sqrt{3} = 60 - 20 \times 1 \cdot 732$

$= 60 - 34 \cdot 64 = 25 \cdot 36$ m — 1




**(b)** **Or**

A 1·6 m tall boy stands at a distance of 3 m from a lamp-post and casts a shadow of length 4 m on the ground. Find the height of the lamp-post.

**Sol.**

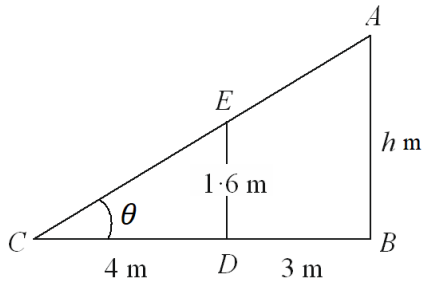
Let the height of lamp post be h m

$\tan \theta = \frac{1.6}{4} = 0.4$ m — 1

Also $\tan \theta = \frac{h}{7}$ — 1

$\therefore \frac{h}{7} = 0.4$

$\Rightarrow$ h = 2.8 m — 1




**9.** The following frequency distribution shows the ages of 50 policyholders. Calculate the median age, if policies are given only to persons having age 18 years onwards, but less than 60 years.

| *Age (in years)* | *Number of Policyholders* |
|---|---|
| Below 20 | 1 |
| Below 30 | 12 |
| Below 40 | 39 |
| Below 50 | 46 |
| Below 60 | 50 |

**Sol.**

| | 18–20 | 20–30 | 30–40 | 40–50 | 50–60 |
|---|---|---|---|---|---|
| *f* | 1 | 11 | 27 | 7 | 4 |
| *c.f.* | 1 | 12 | 39 | 46 | 50 |

Correct table — 1½

Median class = 30–40 ½

Median = $30 + \frac{25-12}{27} \times 10 = 34 \cdot 8$ 1

∴ Median age is 34.8 years

**10.** The table below shows the daily expenditure on food of 50 households of a locality. Find the mean daily expenditure.

| *Daily Expenditure (in ₹)* | *Number of Households* |
|---|---|
| 200 – 250 | 8 |
| 250 – 300 | 10 |
| 300 – 350 | 12 |
| 350 – 400 | 10 |
| 400 – 450 | 10 |

**Sol.**

| | | | | | | |
|---|---|---|---|---|---|---|
| $x_i$ | : | 225 | 275 | 325 | 375 | 425 |
| $f_i$ | : | 8 | 10 | 12 | 10 | 10 = 50 |
| $f_i x_i$ | : | 1800 | 2750 | 3900 | 3750 | 4250 = 16450 |

Correct table 2

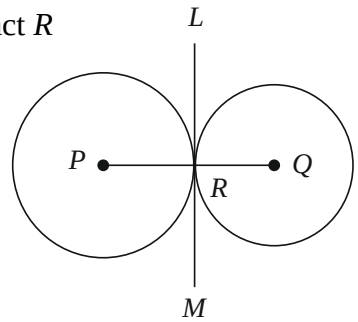
Mean = $\frac{\sum f_i x_i}{\sum f_i} = \frac{16450}{50} = 329$ 1

∴ Mean daily expenditure is ₹ 329

**SECTION – C**

**11.(a)** If two circles touch each other externally, then prove that the point of contact lies on the line joining their centres.

**Sol.** Let $LM$ be the common tangent at the point of contact $R$




$\Rightarrow \angle PRL = 90°$ 1

$\angle QRL = 90°$ 1

$\Rightarrow PRQ = 180°$ 1

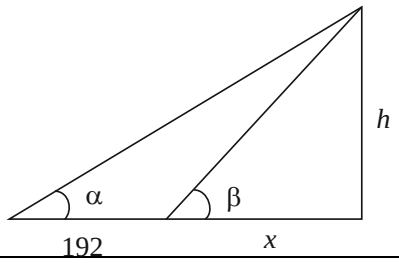
$\Rightarrow R$ lies on $PQ$ 1

**Or**

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

**Sol.** Correct given, to prove, construction 1½

Correct proof 2½

| | | |
|---|---|---|
| **12.** | At a point on the level ground, the angle of elevation of the top of a vertical tower is found to be $\alpha$, such that $\tan\alpha = \frac{5}{12}$. On walking 192 m towards the tower, the angle of elevation $\beta$ is such that $\tan\beta = \frac{3}{4}$. Find the height of the tower. | |
| **Sol.** | $\frac{h}{x+192} = \frac{5}{12}$ …….. (i)<br>and $\frac{h}{x} = \frac{3}{4}$ …….. (ii)<br>Solving equation (i) and (ii), we get<br>$h = 180\ m$<br>  <br> | 1<br>1<br>2 |
| **13.** | While buying an expensive item like a house or a car, it becomes easier for a middle-class person to take a loan from a bank and then repay the loan along with interest in easy instalments.<br>Aman buys a car by taking a loan of ₹ 2,36,000 from the bank and starts repaying the loan in monthly instalments. He pays ₹ 2,000 as the first instalment and then increases the instalment by ₹ 500 every month.<br>(a) Find the amount he pays in the $25^{th}$ instalment.<br>(b) Find the total amount paid by him in first 25 instalments. | |
| **Sol.** | He pays 2000, 2500, 3000, · · · ·<br>It is an A.P. where $a = 2000,\ d = 500$<br>(a) $a_{25} = 2000 + 24 \times 500$ = ₹ 14,000<br>The total amount paid in the $25^{th}$ instalment is ₹ 14,000<br>*(b)* $S_{25} = \frac{25}{2}[2000 + 14000]$<br>= ₹ 2,00,000<br>The total amount paid by him in first 25 instalments is ₹ 2,00,000 | 1<br>1<br>1<br>1<br>1 |

**14.** Conical bottom tanks in which an inverted cone at the bottom is surmounted by a cylinder of same diameter, are very advantageous in industry, specially where getting every last drop from the tank is important.

Vikas designed a conical bottom tank where the height of the conical part is equal to its radius and the height of the cylindrical part is two times of its radius. The tank is closed from the top.

(a) If the radius of the cylindrical part is 3 m, then find the volume of the tank.

(b) Find the ratio of the volume of the cylindrical part to the volume of the conical part.

**Sol.** Let radius = $r$ $\Rightarrow$ Height of cone = $r$

Height of cylinder = $2r$

*(a)* $r$ = 3m

$$V = \pi r^2 \cdot 2r + \frac{1}{3}\pi r^2 \cdot r \qquad 1$$

$$= \frac{7}{3}\pi r^3$$

$$= \frac{7}{3} \times \frac{22}{7} \times 3 \times 3 \times 3 = 198 \text{ m}^3 \text{ or } 63\pi \text{ m}^3 \qquad 1$$

(b)

$$\frac{\text{Volume of cylinder}}{\text{Volume of cone}} = \frac{\pi r^2 \cdot 2r}{\frac{1}{3}\pi r^2 \cdot r} \qquad 1$$

$$= \frac{6}{1} \qquad 1$$

i.e. 6 : 1

* * *