

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

**Instructions :**

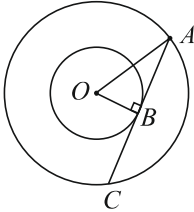
1. The Marking Scheme provides general guidelines to reduce subjectivity in the marking. The answers given in the Marking Scheme are suggested answers. The content is thus indicative. If a student has given any other answer which is different from the one given in the Marking Scheme, but conveys the 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		
<b>1.a</b>	Find the sum of first 30 terms of AP : – 30, – 24, – 18, ..... .	
Sol.	Here $a = -30, d = 6, n = 30$ $S_{30} = \frac{30}{2}[-60 + 29 \times 6]$ $= 1710$ <p style="text-align: center;"><b>Or</b></p>	1  ½  ½
<b>b.</b>	In an AP if $S_n = n(4n + 1)$ , then find the AP.	
Sol.	$a = S_1 = 1(4 \times 1 + 1) = 5$ $a + (a + d) = S_2 = 2(4 \times 2 + 1) = 18$ $\therefore d = 8$ Hence, AP is 5, 13, 21, ...	½  1  ½
<b>2.</b>	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.	$n \times \frac{1}{3} \cdot \pi \cdot (3.5)^2 (3) = \frac{4}{3} \pi (10.5)^3$ $\Rightarrow n = 126$	1 1												
<b>3.a.</b>	<p>Find the value of m for which the quadratic equation</p> $(m - 1)x^2 + 2(m - 1)x + 1 = 0$ <p>has two real and equal roots.</p>													
Sol.	<p>For real and equal roots</p> $4(m-1)^2 - 4(m-1) = 0$ $\Rightarrow m = 1 \text{ or } m = 2$ $m \neq 1 \Rightarrow m = 2$ <p style="text-align: center;"><b>Or</b></p>	½ 1 ½												
<b>b.</b>	<p>Solve the following quadratic equation for x :</p> $\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$													
Sol.	$\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$ <p>or <math>\sqrt{3}x^2 + 3x + 7x + 7\sqrt{3} = 0</math></p> <p>or <math>(\sqrt{3}x + 7)(x + \sqrt{3}) = 0</math></p> $\Rightarrow x = -\frac{7}{\sqrt{3}}, -\sqrt{3} \text{ or } -\frac{7}{3}\sqrt{3}, -\sqrt{3}$	1 1												
<b>4.</b>	<p>Find the mode of the following frequency distribution :</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Class</th> <th>10 – 20</th> <th>20 – 30</th> <th>30 – 40</th> <th>40 – 50</th> <th>50 – 60</th> </tr> </thead> <tbody> <tr> <td>Frequency</td> <td>15</td> <td>10</td> <td>12</td> <td>17</td> <td>4</td> </tr> </tbody> </table>	Class	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	Frequency	15	10	12	17	4	
Class	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60									
Frequency	15	10	12	17	4									
Sol.	<p>Modal class is 40–50</p> $\text{Mode} = 40 + 10 \times \frac{17 - 12}{34 - 12 - 4}$ $= 42.7 \text{ or } 42\frac{7}{9}$	½ 1 ½												
<b>5.</b>	<p>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.</p>													
Sol.	<p>Let Rehan's present age be x years</p> $\therefore (x - 5)(x + 7) = 2x + 1$ $\Rightarrow x^2 = 36$ $\Rightarrow x = 6$	1 ½ ½												

6. 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  
Here  $OB = 3$  cm,  $OA = 4$  cm  
 $OB \perp AC$   
 $\therefore AB = \sqrt{4^2 - 3^2} = \sqrt{7}$  cm  
Hence  $AC = 2\sqrt{7}$  cm

**SECTION—B**

7. 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

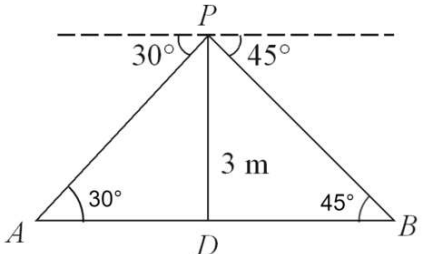
Sol. Median class is 30–40

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

$$\therefore 34.5 = 30 + \frac{10}{10} \left( \frac{34 + x}{2} - 19 \right)$$

$$\Rightarrow x = 13$$

8.	<p>Draw a circle of radius 3 cm. Take two points P and Q on one of its extended diameter each at a distance of 7 cm from its centre. Construct tangents to the circle from these two points P and Q.</p>	
Sol.	Correct Construction. <b>(Out of syllabus)</b>	3
9.a.	<p>The angle of elevation of the top of a building from the foot of the tower is <math>30^\circ</math> and the angle of elevation of the top of the tower from the foot of the building is <math>60^\circ</math>. If the tower is 50 m high, then find the height of the building.</p>	1
Sol.	<p>For correct figure</p> $\tan 30^\circ = \frac{AB}{AX} \quad \text{and} \quad \tan 60^\circ = \frac{50}{AX}$ $\Rightarrow AB = \frac{1}{\sqrt{3}} AX \quad \text{and} \quad AX = \frac{50}{\sqrt{3}}$ $\therefore AB = \frac{1}{\sqrt{3}} \cdot \frac{50}{\sqrt{3}} = \frac{50}{3} \text{ m}$	<p><math>\frac{1}{2} + \frac{1}{2}</math></p> <p>1</p>
<b>OR</b>		
b.	<p>From a point on a bridge across a river, the angles of depression of the banks on opposite sides of the river are <math>30^\circ</math> and <math>45^\circ</math> respectively. If the bridge is at a height of 3 m from the banks, then find the width of the river.</p>	1
Sol.	<p>For correct figure</p>  <p>Here, <math>\frac{PD}{AD} = \tan 30^\circ = \frac{1}{\sqrt{3}} \Rightarrow AD = 3\sqrt{3} \text{ m}</math></p> <p>and <math>\frac{PD}{BD} = \tan 45^\circ = 1 \Rightarrow BD = 3 \text{ m}</math></p> <p>So, <math>AB = AD + BD = (3\sqrt{3} + 3) \text{ m} = 3(\sqrt{3} + 1) \text{ m}</math></p>	<p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p>1</p>

10.

Following is the daily expenditure on lunch by 30 employees of a company :

Daily Expenditure (in Rupees)	Number of Employees
100 – 120	8
120 – 140	3
140 – 160	8
160 – 180	6
180 – 200	5

Find the mean daily expenditure of the employees.

Sol.

Class	$x$	$f$	$d$	$f.d$
100–120	110	8	–40	–320
120–140	130	3	–20	–60
140–160	150	8	0	0
160–180	170	6	20	120
180–200	190	5	40	200
		30		–60

For correct table

$$\text{Mean} = 150 + \frac{-60}{30} = 148$$

Therefore, mean expenditure = Rs. 148

2

1

**SECTION—C**

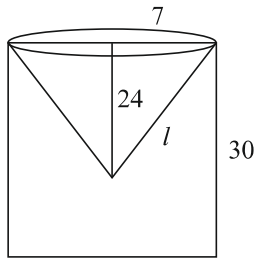
11.  
a.

From a solid cylinder of height 30 cm and radius 7 cm, a conical cavity of height 24 cm and same radius is hollowed out. Find the total surface area of the remaining solid.

Sol.

$$l = \sqrt{576 + 49} = 25 \text{ cm}$$

1



$$\begin{aligned} \text{TSA} &= 2\pi rh + \pi r^2 + \pi rl \\ &= \frac{22}{7} \times 7 [60 + 7 + 25] \\ &= 2024 \text{ cm}^2 \end{aligned}$$

2  
1

Or

- b. Water in a canal, 8 m wide and 6 m deep, is flowing with a speed of 12 km/hour. How much area will it irrigate in one hour, if 0.05 m of standing water is required ?

Sol. Distance covered by water in 1 hr = 12000 m

$$\begin{aligned} \therefore \text{Volume of water flown in 1 hr} \\ &= 8 \times 6 \times 12000 \text{ m}^3 \end{aligned}$$

Hence area of field  $\times 0.05 = 8 \times 6 \times 12000$

$$\Rightarrow \text{Area of field} = 1152 \times 10^4 \text{ m}^2 \text{ or } 11520000 \text{ m}^2$$

$\frac{1}{2}$

$1\frac{1}{2}$

$1\frac{1}{2}$

$\frac{1}{2}$

12.

In Figure 1, a triangle ABC with  $\angle B = 90^\circ$  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.

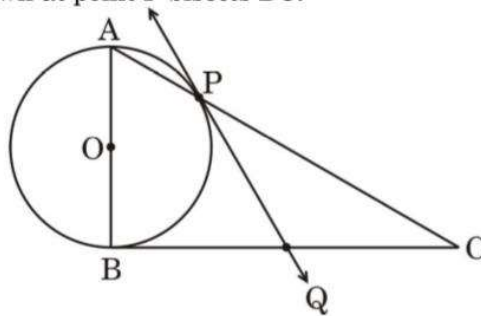
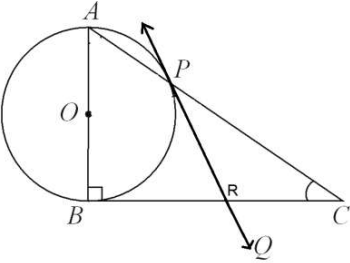





Figure 1

Sol.	 <p> <math>PR=RB</math> (tangents from external point).....(i)            Proving <math>\angle RPC = \angle RCP</math>  <math>\Rightarrow PR=CR</math> .....(ii)            Using equations (i) and (ii)  <math>BR=RC</math>            Hence the tangent drawn at point P bisects BC         </p>	<p>1</p> <p>2</p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>
13.	<p>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.</p> <p>One such pattern is shown below. Observe the pattern and answer the following questions using Arithmetic Progression :</p> <div style="display: flex; justify-content: space-around; align-items: center;">    <span style="margin-left: 20px;">-----</span> </div> <p style="text-align: center;"> <i>Figure 1</i>                      <i>Figure 2</i>                      <i>Figure 3</i> </p> <p>(a) Write the AP for the number of triangles used in the figures. Also, write the <math>n^{\text{th}}</math> term of this AP.</p> <p>(b) Which figure has 61 matchsticks ?</p>	<p><math>\frac{1}{2}</math></p> <p>1</p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>
Sol.	<p>(a) Number of triangles in figures are 4, 6, 8, ...</p> <p>This is an A.P. with <math>a = 4</math>, <math>d = 2</math></p> <p><math>\therefore a_n = 4 + (n-1) \times 2 = 2n + 2</math></p> <p>(b) Number of matchsticks in figures are 12, 19, 26, ...</p>	<p><math>\frac{1}{2}</math></p> <p>1</p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>

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

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

$$\Rightarrow n = 8$$

1

$\frac{1}{2}$

**14. Case Study—2**

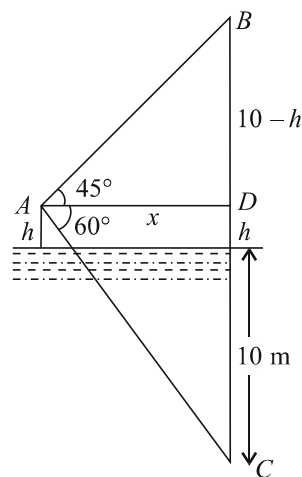
Gadisar Lake is located in the Jaisalmer district of Rajasthan. It was built by the King of Jaisalmer and rebuilt by Gadsingh in 14<sup>th</sup> century. The lake has many Chhatris. One of them is shown below :



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

- draw a well-labelled figure based on the above information;
- find the height ( $h$ ) of the point A above water level.  
(Use  $\sqrt{3} = 1.73$ )

Sol. (a)



Correct Figure

2



	<p>(b) <math>\tan 45^\circ = 1 = \frac{10-h}{x}</math>  <math>\Rightarrow x = 10-h</math> ... (i)</p> <p><math>\tan 60^\circ = \sqrt{3} = \frac{10+h}{x}</math>  <math>\Rightarrow x = \frac{10+h}{\sqrt{3}}</math> ... (ii)</p> <p>Solving (i) and (ii) <math>10(\sqrt{3}-1) = h(\sqrt{3}+1)</math>  <math>\Rightarrow h = \frac{10(\sqrt{3}-1)^2}{2}</math>  <math>= 2.67 \text{ m or } 2.7\text{m}</math></p>	<p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p>1</p>
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