

**INDIAN SCHOOL MUSCAT**  
**FIRST PRE-BOARD EXAMINATION 2023**  
**MATHEMATICS (241)**

CLASS: X

Max.Marks: 80

SET	ABC
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MARKING SCHEME				
SET	QN.NO	VALUE POINTS		MARKS SPLIT UP
		SET - A	SET - B	SET - C
	1	(c) 35	(a) $\pm 0.2$	(b) $128 \text{ cm}^2$
	2	(b) 0	(b) Range	(a) $60^\circ$
	3	(d) 8 cm	(a) 14	(d) $16 : 9$
	4	(c) 9	(b) two	(d) $60^\circ$
	5	(a) 13	(c) $(0, 4)$	(a) $\pm 0.2$
	6	(b) $128 \text{ cm}^2$	(b) $\text{DE} = 12 \text{ cm}$ , $\angle F = 100^\circ$	(b) Range
	7	(a) $60^\circ$	(d) 1	(a) 14
	8	(d) $16 : 9$	(a) $210^\circ$	(b) two
	9	(d) $60^\circ$	(a) $100^\circ$	(c) $(0, 4)$
	10	(a) $\pm 0.2$	(c) 35	(b) $\text{DE} = 12 \text{ cm}$ , $\angle F = 100^\circ$
	11	(b) Range	(b) 0	(a) $100^\circ$
	12	(a) 14	(d) 8 cm	(d) 1
	13	(b) two	(c) 9	(a) $210^\circ$
	14	(c) $(0, 4)$	(a) 13	(c) 35

	<b>15</b>	(b) DE = 12 cm, $\angle F = 100^\circ$	(b) $128 \text{ cm}^2$	(b) 0	
	<b>16</b>	(d) 1	(a) $60^\circ$	(d) 8 cm	
	<b>17</b>	(a) $210^\circ$	(d) $16 : 9$	(c) 9	
	<b>18</b>	(a) $100^\circ$	(d) $60^\circ$	(a) 13	
	<b>19</b>	(b) Both A and R are true and R is not the correct explanation for A	(c) A is true but R is false.	(b) Both A and R are true and R is not the correct explanation for A	
	<b>20</b>	(c) A is true but R is false.	(b) Both A and R are true and R is not the correct explanation for A	(c) A is true but R is false.	
SETA SETB	<b>21</b> 24	$x(x + 5) = (x + 3)(x + 1)$ $x^2 + 5x = x^2 + 3x + x + 3$ $x^2 + 5x - x^2 - 3x - x = 3$ $\therefore x = 3 \text{ cm}$			1
SETC	<b>22</b> 22				1
SETA SETB SETC	<b>22</b> 25 23	<p>It is given that <math>\alpha</math> and <math>\beta</math> are zeros of the polynomial <math>2x^2 - 3x + 1</math>.</p> $\therefore \alpha + \beta = \frac{-(-3)}{2} = \frac{3}{2} \quad \text{and} \quad \alpha\beta = \frac{1}{2}$ <p>Now, new quadratic polynomial whose zeros are <math>3\alpha</math> and <math>3\beta</math> is given by</p> $x^2 - (\text{sum of zeros})x + \text{product of zeros}$ $= x^2 - (3\alpha + 3\beta)x + 3\alpha \times 3\beta = x^2 - 3(\alpha + \beta)x + 9\alpha\beta$ $= x^2 - 3 \times \frac{3}{2}x + 9 \times \frac{1}{2}$ $= x^2 - \frac{9}{2}x + \frac{9}{2}$		<b>1</b>	
SETA SETB SETC	<b>23</b> 21 24	Area of sector $= \frac{\theta}{360} \times \pi r^2 = \frac{60 \times 22 \times 14 \times 14}{360 \times 7} = \frac{308}{3} \text{ cm}^2$			$\frac{1}{2} + 1 + \frac{1}{2}$

SETA SETB SETC	<b>24</b> <b>22</b> <b>25</b>	$\Rightarrow 1 = \frac{2a(-2)}{2}, 2a + 1 = \frac{4 + 3b}{2}$ $\Rightarrow 2 = 2a - 2, 4a + 2 = 4 + 3b$ $\Rightarrow 2a = 2 + 2, 4a - 3b = 4 - 2$ $\Rightarrow a = \frac{4}{2}, 4a - 3b = 2$ $\Rightarrow a = 2, 4a - 3b = 2$ $4(2) - 3b = 2 \Rightarrow -3b = 2 - 8 = -6 \Rightarrow b = \frac{6}{3} = 2$ <p style="text-align: center;"><b>OR</b></p> <p>As that point is on x-axis, its y coordinate will be 0.</p> <p>Let coordinates of this point is <math>(h, 0)</math>.</p> <p>As this point is equidistant from <math>(2, -5)</math> and <math>(-2, 9)</math>. Then,</p> $(h - 2)^2 + (0 - (-5))^2 = (h - (-2))^2 + (0 - (-9))^2$ $\Rightarrow h^2 + 4 - 4h + 25 = h^2 + 4 + 4h + 81$ $\Rightarrow 8h = -56 \Rightarrow h = -7$ <p>So, required point will be <math>(-7, 0)</math>.</p>	<b>1</b>
SETA SETB SETC	<b>25</b> <b>23</b> <b>21</b>	<p>The dimension of the cuboids so formed are length = 18 cm breath = 6 cm and height = 6 cm.</p> <p>Surface area of cuboids = <math>2(l \times b + b \times h + l \times h)</math></p> $= 2 \times [18 \times 6 + 6 \times 6 + 18 \times 6]$ $= 504 \text{ cm}^2$ <p style="text-align: center;"><b>OR</b></p>	<b>1</b>

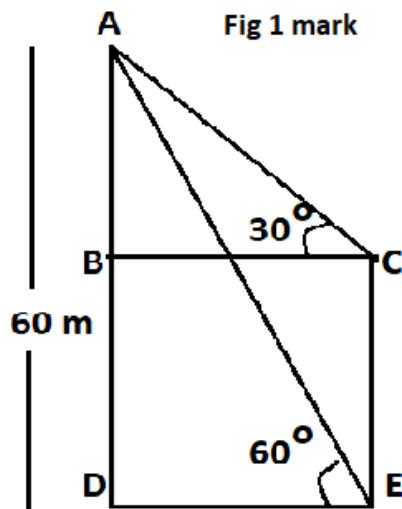
		<p>Let the radius of the hemisphere be <math>r</math> units.</p> <p>Volume of a hemisphere = Surface area of the hemisphere</p> $\Rightarrow \frac{2}{3}\pi r^3 = 3\pi r^2$ $\Rightarrow \frac{2}{3}r = 3$ $\Rightarrow r = \frac{9}{2}$ $\Rightarrow d = 9 \text{ units}$ <p>Hence, diameter of the hemisphere is equal to 9 units.</p>
SETA SETB SETC	26 30 28	<p>Let the original number of persons be <math>x</math>.</p> <p>Each person will get amount = ₹ <math>\frac{9000}{x}</math></p> <p>When 20 persons will increase</p> $\therefore \text{Each person will get} = ₹ \frac{9000}{x+20}$ <p>ATQ,</p> $\frac{9000}{x} - \frac{9000}{x+20} = 160$ $\rightarrow 9000 \left( \frac{1}{x} - \frac{1}{x+20} \right) = 160$ $\Rightarrow 180000 = 160(x^2 + 20x)$ $\Rightarrow x^2 + 20x - 1125 = 0$ <p>OR</p> <p>Given quadratic equation, <math>2x^2 + kx + 2 = 0</math></p> <p>Its discriminant, <math>D = (K)^2 - 4 \times 2 \times 2</math></p> $\therefore D = K^2 - 16$ <p>For roots to be real and equal</p> $D = 0 \Rightarrow K^2 - 16 = 0$ $\Rightarrow K^2 = 16 \Rightarrow K = \pm 4$

	SETA SETB SETC	<b>27</b> 31  <b>29</b>	<p>first term = -11 common difference = 4 <span style="float: right;"><b>1/2</b></span></p> <p>last term <math>45 = -11 + (n - 1)4</math></p> $\Rightarrow 56 = (n - 1)4$ <span style="float: right;"><b>1</b></span>
			$\Rightarrow n = 14 + 1 = 15$ <span style="float: right;"><b>1</b></span>
<b>OR</b>			
			$T_8 = a + 7d = 0$ $\Rightarrow a = -7d$ <span style="float: right;"><b>1</b></span>
			$T_{38} = a + 37d$ $= -7d + 37d$ <span style="float: right;"><b>1</b></span>
			$= 30d$ <span style="float: right;"><b>1</b></span>
			$T_{18} = a + 17d$ $= -7d + 17d$ <span style="float: right;"><b>1/2</b></span>
			$= 10d.$ <span style="float: right;"><b>1/2</b></span>
			<p>Clearly <math>T_{38} = 3(T_{18})</math>. <span style="float: right;"><b>1/2</b></span></p>
	SETA SETB SETC	<b>28</b> 26  <b>30</b>	<p>Let us assume <math>5 + 2\sqrt{3}</math> is rational, then it must be in the form of <math>\frac{p}{q}</math> where <math>p</math> and <math>q</math> are co-prime integers and <math>q \neq 0</math>. <span style="float: right;"><b>1</b></span></p> <p>i.e <math>5 + 2\sqrt{3} = \frac{p}{q}</math> <span style="float: right;"><b>1/2</b></span></p> <p>So <math>\sqrt{3} = \frac{p - 5q}{2q}</math> ... (i) <span style="float: right;"><b>1/2</b></span></p> <p>Since <math>p, q, 5</math> and <math>2</math> are integers and <math>q \neq 0</math>, hence RHS of equation (i) is rational. But LHS of (i) is <math>\sqrt{3}</math> which is irrational. This is not possible. <span style="float: right;"><b>1/2</b></span></p> <p>This contradiction has arisen due to our wrong assumption that <math>5 + 2\sqrt{3}</math> is rational. <span style="float: right;"><b>1/2</b></span></p> <p>So, <math>5 + 2\sqrt{3}</math> is irrational <span style="float: right;"><b>1/2</b></span></p>



SETA  
SETB  
SETC

32  
34  
33



**Fig 1 mark**

in  $\triangle ADE$

$$\tan 60^\circ = \frac{60}{DE} \Rightarrow DE = \frac{60}{\sqrt{3}} = 20\sqrt{3}$$

1

and we can see that, BCDE is a rectangle

$$so, BC = DE \Rightarrow BC = 20\sqrt{3}$$

1

and  $BD = CE \dots\dots\dots(1)$

and in  $\triangle ABC$

$$\tan 30^\circ = \frac{AB}{20\sqrt{3}} \Rightarrow AB = 20\sqrt{3} \times \frac{1}{\sqrt{3}} = 20$$

1

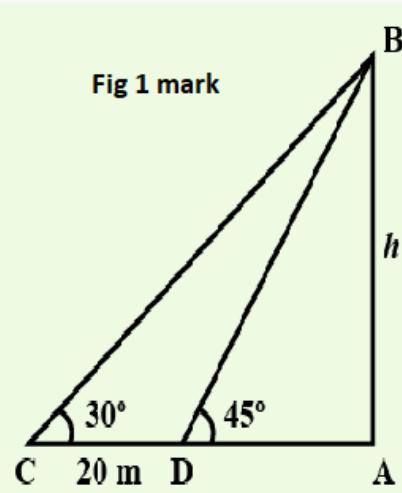
Now, as  $AD = AB + BD \Rightarrow 60 = 20 + BD \Rightarrow BD = 40$

and from (1)

$BD = CE = 40$  (which is the height of the Building)

1

**OR**



**Fig 1 mark**

Let AB be the tower and C and D be the point of observation

Given  $CD = 20$  m And  $\angle BCA = 30^\circ$  and  $\angle BDA = 45^\circ$

Let height of tower is  $h$

In triangle BAD

$$\tan 45^\circ = \frac{AB}{AD} \Rightarrow 1 = \frac{h}{AD} \Rightarrow AD = h$$

2

In triangle BAC

$$\tan 30^\circ = \frac{AB}{AC} \quad (AC = CD + AD)$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{20+h}$$

$$\Rightarrow \sqrt{3}h = 20 + h \Rightarrow \sqrt{3}h - h = 20$$

1

$$\Rightarrow h(1.732 - 1) = 20$$

$$\Rightarrow h = \frac{20}{0.732} = 27.3$$

1

SETA SETB SETC	<b>33</b> <b>35</b> <b>35</b>	<p><math>\therefore TP = TQ \text{ ---(1)}</math></p> <p><math>\therefore \angle TQP = \angle TPQ</math> (angles of equal sides are equal) ---(2)</p> <p>Now, PT is tangent and OP is radius.</p> <p><math>\therefore OP \perp TP</math> (Tangent at any point pf circle is perpendicular to the radius through point of contact)</p> <p><math>\therefore \angle OPT = 90^\circ</math></p> <p>or, <math>\angle OPQ + \angle TPQ = 90^\circ</math></p> <p>or, <math>\angle TPQ = 90^\circ - \angle OPQ</math> ---(3)</p> <p>In <math>\triangle PTQ</math></p> <p><math>\angle TPQ + \angle PQT + \angle QTP = 180^\circ</math> (<math>\therefore</math> Sum of angles triangle is <math>180^\circ</math>)</p> <p>or, <math>90^\circ - \angle OPQ + \angle TPQ + \angle QTP = 180^\circ</math></p> <p>or, <math>2(90^\circ - \angle OPQ) + \angle QTP = 180^\circ</math> [from (2) and (3)]</p> <p>or, <math>180^\circ - 2\angle OPQ + \angle PTQ = 180^\circ</math></p> <p><math>\therefore \angle PTQ = 2\angle OPQ</math></p>																											
SETA SETB SETC	<b>34</b> 32 32	<table border="1" data-bbox="432 1227 1481 1579"> <thead> <tr> <th>Class</th> <th>Frequency</th> <th>Cumulative Frequency</th> </tr> </thead> <tbody> <tr> <td>0–10</td> <td><math>f_1</math></td> <td><math>f_1</math></td> </tr> <tr> <td>10–20</td> <td>5</td> <td><math>5 + f_1</math></td> </tr> <tr> <td>20–30</td> <td>9</td> <td><math>14 + f_1</math></td> </tr> <tr> <td>30–40</td> <td>12</td> <td><math>26 + f_1</math></td> </tr> <tr> <td>40–50</td> <td><math>f_2</math></td> <td><math>26 + f_1 + f_2</math></td> </tr> <tr> <td>50–60</td> <td>3</td> <td><math>29 + f_1 + f_2</math></td> </tr> <tr> <td>60–70</td> <td>2</td> <td><math>31 + f_1 + f_2</math></td> </tr> <tr> <td></td> <td><math>\Sigma f = 40</math></td> <td></td> </tr> </tbody> </table> <p>Median = 32.5 <math>\Rightarrow</math> Median class is 30–40.</p> <p>Now <math>32.5 = 30 + \frac{10}{12}(20 - 14 - f_1) \Rightarrow f_1 = 3</math></p> <p>Also <math>31 + f_1 + f_2 = 40 \Rightarrow f_2 = 6</math></p> <p><b>OR</b></p>	Class	Frequency	Cumulative Frequency	0–10	$f_1$	$f_1$	10–20	5	$5 + f_1$	20–30	9	$14 + f_1$	30–40	12	$26 + f_1$	40–50	$f_2$	$26 + f_1 + f_2$	50–60	3	$29 + f_1 + f_2$	60–70	2	$31 + f_1 + f_2$		$\Sigma f = 40$	
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		$\text{Mean} = (\bar{X}) = a + h \left( \frac{\sum f_i u_i}{\sum f_i} \right)$ $18 = 18 + 2 \left( \frac{k - 8}{40 + k} \right) \Rightarrow k = 8$	1/2																																													
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		Meeting x axis at (6,0)	1/2																																													

SETA SETB SETC	<b>36</b>	(i) 1000, 1100, 1200, ... $\therefore a = 1000, d = 1100 - 1000 = 100$ $\therefore \text{Amount paid by him in 20th installment, } a_{20} = a + 19d$ $= 1000 + 19 \times 100 = ₹2900.$ <b>1</b>
	<b>38</b>	(ii) We have AP 1000, 1100, 1200, ... $\therefore a = 1000, d = 1100 - 1000 = 100$ $\therefore \text{Amount paid by him in 30th installment, } a_{30} = a + 29d$ $= 1000 + 29 \times 100 = ₹3900.$ <b>1</b>
	<b>36</b>	(iii) We have AP 1000, 1100, 1200, ... $\therefore a = 1000, d = 100$ $\therefore \text{Amount paid upto 20th installments}$ $S_n = \frac{n}{2}(2a + (n-1)d)$ $\Rightarrow S_{20} = \frac{20}{2}(2 \times 1000 + 1900) = 10 \times 3900 = ₹39000$ <b>2</b>
		OR
		Amount paid upto 30 installments $= \frac{n}{2}(2a + (n-1)d)$ $= \frac{30}{2}(2 \times 1000 + 29 \times 100)$ $= \frac{30}{2} \times 4900 = 15 \times 4900 = ₹73500$
SETA SETB SETC	<b>37</b>	(i) $\sin \theta = \frac{1}{2} \rightarrow \theta = 30^\circ$ <b>1</b>
	<b>36</b>	(ii) $\frac{1}{\sqrt{3}}$ <b>1</b>
	<b>38</b>	(iii) - 6 OR 7 <b>2</b>
SETA SETB SETC	<b>38</b>	(i) 18 <b>1</b>
	<b>37</b>	(ii) 2/3 <b>1</b>
	<b>37</b>	(iii) 1 OR 2/9 <b>2</b>

\*\*\*\*\*END OF THE ANSWER KEY\*\*\*\*\*