INDIAN SCHOOL MUSCAT

PRE BOARD – TERM 2

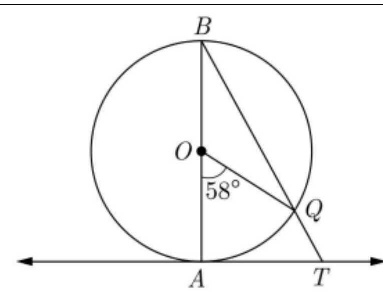
FEBRUARY 2022

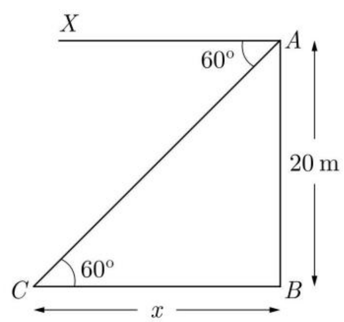
SETs A, B, C

CLASS X

Marking Scheme – MATHEMATICS (041) [THEORY]

Q.NO.	ANSWER	MARKS
1.	We have $(k+1)x^2 - 2(k+1)x + 1 = 0$ Comparing with $Ax^2 + Bx + C = 0$ we get $A = (k+1), B = -2(k+1), C = 1$ If roots are equal, then $D = 0$, i.e. $B^2 = 4AC$ $4(k+1)^2 = 4(k+$ $k^2 + 2k + 1 = k + 1$ $k^2 + k = 0$ $k(k+1) = 0$ $k = 0, -1$ $k = -1$ does not satisfy the equation, thus $k = 0$	½ ½ ½ ½
2.	We have $\sqrt{3x^2+6} = 9$ $3x^2 + 6 = 81$ $3x^2 = 81 - 6 = 75$ $x^2 = \frac{75}{3} = 25$ Thus $x = \pm 5$ Hence 5 is positive root. **(OR)** Let the present age of Veena be x years. So, (x – 5)2 = 5x + 11 ⇒ x^2 + 25 – 10x = 5x + 1 ⇒ x2 – 15x + 14 = 0 ⇒ (x – 14) (x – 1) = 0 ⇒ x = 1 or 14 x = 14 years (rejecting x = 1 as in that case Veena's age 5 years ago will be –ve) So, Veena's present age is 14 years.	½ ½ ½ ½ ½ ½ ½ ½

3.	Let the first term be a, common difference be d and nth term be a_n.	
	$7a_7 = 11a_{11}$	½
	Now $7(a+6d) = 11(a+10d)$	½
	$7a+42d = 11a+110d$	
	$11a-7a = 42d-110d$	
	, $4a = -68d$	
	$4a+68d = 0$	½
	$4(a+17d) = 0$	
	$a+17d = 0$	
	Hence, $a_{18} = 0$	½
	(OR)	
	We have $a_n = 5n-3$	
	Substituting $n = 1$ and 10 we have	
	$a = 2$	½
	$a_{10} = 47$	
	Thus $S_n = \frac{n}{2}(a+a_n)$	½
	$S_{10} = \frac{10}{2}(2+47)$	½
	$= 5 \times 49 = 245$	½
4.	We have $\angle AOQ = 58^\circ$ 	
	Since angle $\angle ABQ$ and $\angle AOQ$ are the angle on the circumference of the circle by the same arc,	
	$\angle ABQ = \frac{1}{2}\angle AOQ$	½
	$= \frac{1}{2} \times 58^\circ = 29^\circ$	
	Here OA is perpendicular to TA because OA is radius and TA is tangent at A.	
	Thus $\angle BAT = 90^\circ$	1
	$\angle ABQ = \angle ABT$	
	Now in ΔBAT,	
	$\angle ATB = 90^\circ - \angle ABT$	
	$= 90^\circ - 29^\circ = 61^\circ$	
	Thus $\angle ATQ = \angle ATB = 61^\circ$	½
5.	Let the edge of single cube be x.	½
	Volume of single cube= Volume of three cubes	
	$x^3 = 3^3 + 4^3 + 5^3$	1
	$= 27 + 64 + 125 = 216$	
	$x = 6$ cm	½

6.	We have $M_d = M + 3$ Now $M_o = 3M_d - 2M$ $= 3(M+3) - 2$ $= 3M + 9 - 2M = M + 9$ Hence mode exceeds mean by 9.	½ ½ ½ ½
7.	2 Concentric circles with centre O. Point P and perpendicular bisector of OP Third circle and Tangents	1 1 1
8.	Let C be the point where the ball is lying. As per given in question we have drawn figure below.  Due to alternate angles we obtain $\angle XAC = \angle ACB = 60^\circ$ In ΔABC, $\tan 60^\circ = \frac{AB}{BC}$ $\sqrt{3} = \frac{20}{x}$ $x = \frac{20}{\sqrt{3}} = 20\left(\frac{\sqrt{3}}{3}\right)$ Hence, distance between ball and foot of tower is 11.53 m.	Fig 1 1 1
9.	Mode is 36 which lies in class 30-40, therefore this is modal class. Here, $f_0 = f$, $f_1 = 16$, $f_2 = 12$, $l = 30$ and $h = 10$ Mode, $M_o = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right)h$ $36 = 30 + \frac{16 - f}{2 \times 16 - f - 12} \times 10$ $6 = \frac{16 - f}{20 - f} \times 10$ $120 - 6f = 160 - 10f$ $4f = 40 \Rightarrow f = 10$	½ 1½ ½ ½

10.

We prepare following cumulative frequency table to find median class.

Marks	No. of students	c.f.
0-10	5	5
10-20	15	20
20-30	30	50
30-40	8	58
40-50	2	60
	$N = 60$	

cf column- 1

We have $N = 60$; $\frac{N}{2} = 30$

Cumulative frequency just greater than $\frac{N}{2}$ is 50 and the corresponding class is 20-30. Thus median class is 20-20.

Now $l = 20,\ f = 30,\ F = 20,\ h = 10$

Median, $$M_d = l + \left(\frac{\frac{N}{2} - F}{f}\right) \times h$$ ½

$$= 20 + \left(\frac{30 - 20}{30}\right) \times 10$$ 1

$$= 20 + \frac{100}{30} = 20 + \frac{10}{3}$$

$$= 20 + 3.33$$ ½

Thus $Md = 23.33$

OR

x_i	f_i	$f_i x_i$
3	5	15
9	4	36
15	1	15
21	6	126
27	4	108
Total	$\sum f_i = 20$	$\sum f_i x_i = 300$

Mid x – ½

$\sum fx$ column – 1½

Mean $$M = \frac{\sum f_i x_i}{\sum f_i} = \frac{300}{20} = 15$$ ½ + ½

11.

Let the radius of circle be x. As per given in question we draw the figure shown below.

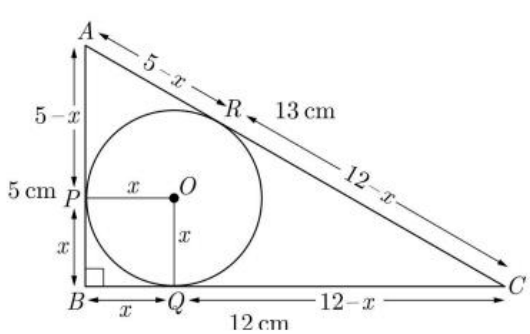
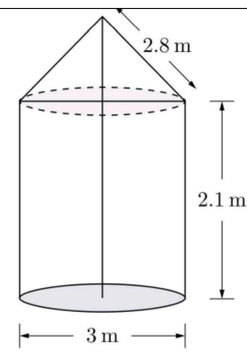
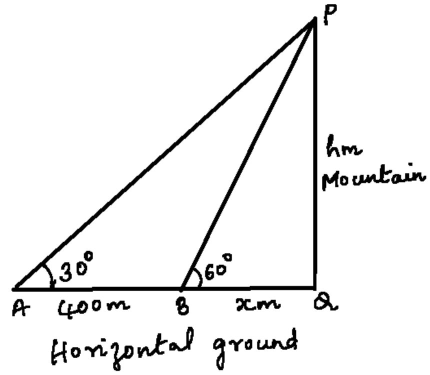
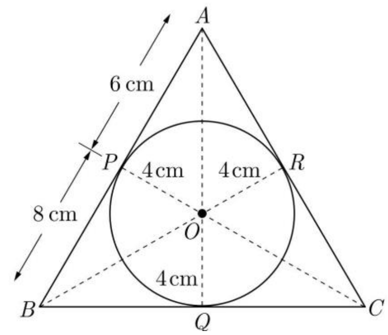
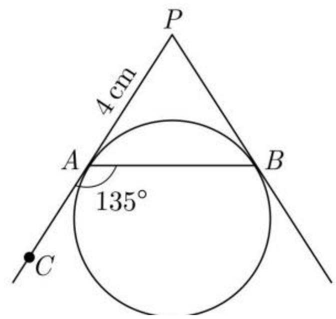


Fig 1

	Since length of tangents from an external point to a circle are equal, At A, $AP = AR = 5 - x$ (1) At B $BP = BQ = x$ (2) At C $CR = CQ = 12 - x$ (3) Here, $AB = 5$ cm, $BC = 12$ cm and $\Delta B = 90^{\circ}$ Now $AC = \sqrt{12^2 + 5^2} = \sqrt{144 + 25}$ $= \sqrt{169} = 13$ cm Now $AC = AR + RC$ $13 = 5 - x + 12 - x$ $2x = 17 - 13 = 4$ $x = \frac{4}{2} = 2$ cm Hence, radius of the circle is 2 cm.	1 1 1
12.	Surface area of tent, $= C.S.A$ of cone $+$ $C.S.A$ of cylinder. $= \pi rl + 2\pi rh = \pi r(l + 2h)$ Thus $\pi r(l + 2h) = \frac{22}{7} \times \frac{3}{2}(2.8 + 2 \times 2.1)$ $= \frac{33}{7} \times 7 = 33 \text{ m}^2$ Total Cost $= 33 \times 500 = 16{,}500 Rs$  	1½ 1 ½ 1
(OR)	Let t be the time in which the level of the water in the tank will rise by 21 cm. Length of water that flows in 1 hour is 15 km or 15000 m. Radius of pipe is $\frac{14}{2} = 7$ cm or 0.07 m. Volume of water in 1 hour, $= \frac{22}{7} \times \left(\frac{7}{100}\right)^2 \times 15000$ $= 231 \text{ m}^3$ Volume of water in time t, $= 231t \text{ m}^3$ This volume of water is equal to the water flowed into the cuboidal pond which is 50 m long, 44 m wide and 0.21 m high. Thus $231t = 50 \times 44 \times 0.21$ $t = \frac{50 \times 44 \times 0.21}{231} = 2$ Hours	½ 1 ½ ½ 1 ½

13.	$\tan 60° = \frac{h}{x} \Rightarrow \sqrt{3}x = h$ $\tan 30° = \frac{h}{400 + x} \Rightarrow \frac{400 + x}{\sqrt{3}} = h$ Solving, x = 200 m (horizontal distance) Height (h) = $200\sqrt{3}$ m		Fig 1 1 ½ ½ 1
14.	(i) 23, 21, 19, … 5 Obviously AP: a = 23, d = -2 and a_n= 5 Solving, n = 10 (ii) a_9 = a + 8d = 7 $a_2 – a_9$ = 21 – 7 = 14		½ ½ 1 1 1
	Set B		
1.	We have $x^2 - 8x + k = 0$ Comparing with $Ax^2 + Bx + C = 0$ we get $A = 1, B = -8, C = k$ Since the given equation has real roots, $B^2 - 4AC > 0$ $(-8)^2 - 4(1)(k) \geq 0$ $64 - 4k \geq 0$ $16 - k \geq 0$ $16 \geq k$ Thus $k \leq 16$ Therefore the largest value of k is 16.		½ ½ ½ ½
5.	Side of the cube, $a = \sqrt[3]{8} = 2$ cm Length of cuboid, $l = 4$ cm Breadth, $b = 2$ cm Height, $h = 2$ cm Surface area of cuboid $= 2(l \times b + b \times h + h \times l)$ $= 2(4 \times 2 + 2 \times 2 + 2 \times 4)$ $= 2 \times 20 = 40\ \text{cm}^2$		1 1

11.	At A, $AP = AR = 6$ cm (1) At B, $BP = BQ = 8$ cm (2) At C, $CR = CQ = x$ (3) Perimeter of ΔABC, $p = AP + PB + BQ + QC + CR + RA$ $= 6 + 8 + 8 + x + x + 6$ $= 28 + 2x$ Now area $\Delta ABC = \frac{1}{2} rp$ $84 = \frac{1}{2} \times 4 \times (28 + 2x)$ $84 = 56 + 4x$ $21 = 14 + x \Rightarrow x = 7$ $AC = AR + RC = 6 + 7 = 13$ cm $BC = BQ + QC = 8 + 7 = 15$ cm  	Fig 1 1 1 ½ ½
14.(ii)	$a_8 = a + 7d = 9$ $a_3 - a_8 = 19 - 9 = 10$	1 1
	Set C	
1.	We have $2x^2 - 4x + 3 = 0$ Comparing the given equation with $ax^2 + bx + c = 0$ we get $a = 2$ $b = -4$, $c = 3$ Now $D = b^2 - 4ac$ $= (-4)^2 - 4(2) \times (3)$ $= -8 < 0$ or $(-\text{ve})$ Hence, the given equation has no real roots. So Ajay is wrong.	½ ½ ½ ½
3.	$a_n = 3n - 5$ $a_{10} = 25$ $\therefore S_{10} = \frac{10}{2}(a_1 + a_{10}) = 5(-2 + 25) = 5 \times 23 = \underline{115}$	1 1
5.	Let the radius of spherical ball be r. Volume of spherical ball = Volume of three balls $\frac{4}{3}\pi r^3 = \frac{4}{3}\pi[3^3 + 4^3 + 5^3$ $r^3 = 27 + 64 + 125 = 216$, $r = 6$ cm	1 ½ ½

6.	$3x^2 + 25 = 100$ $3x^2 = 75$ $x^2 = 25$ $x = \pm 5$ ∴ +ve root is 5	½ ½ ½ ½
11.	$PA = PB = 4$ cm Here $\angle PAB$ and $\angle BAC$ are supplementary angles, $\angle PAB = 180^\circ - 135^\circ = 45^\circ$ Angle $\angle ABP$ and $= \angle PAB = 45^\circ$ opposite angles of equal sides, thus $\angle ABP = \angle PAB = 45^\circ$ In triangle ΔAPB we have $\angle APB$ $= 180^\circ - \angle ABP - \angle BAP$ $= 180^\circ - 45^\circ - 45^\circ = 90^\circ$ Thus ΔAPB is a isosceles right angled triangle Now $AB^2 = AP^2 + BP^2 = 2AP^2$ $= 2 \times 4^2 = 32$ Hence $AB = \sqrt{32} = 4\sqrt{2}$ cm  	1 ½ ½ ½ ½ ½
12.(ii)	$a_9 = a + 8d = 7$ $a_3 - a_9 = 19 - 7 = 12$	1 1
	End of the marking scheme	