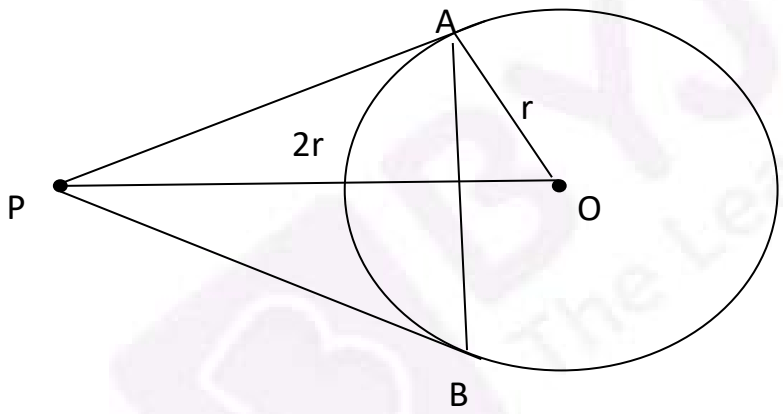
Marking Scheme
Class- X, Session- 2021-22
TERM II
Subject- Mathematics (Standard)

SECTION A

Q.No.	HINTS/SOLUTION	MARKS
1	$a = 6, d = 3$; $a_{25} = 6 + 24(3) = 78$ $a_{15} = 6 + 14(3) = 48$; $a_{25} - a_{15} = 78 - 48 = 30$ **OR** $7(a + 6d) = 5(a + 4d)$ $\Rightarrow 2a + 22d = 0 \Rightarrow a + 11d = 0 \Rightarrow t_{12} = 0$	1 1 1 1
2	$5mx^2 - 6mx + 9 = 0$ $b^2 - 4ac = 0 \Rightarrow (-6m)^2 - 4(5m)(9) = 0$ $\Rightarrow 36m(m - 5) = 0$ $\Rightarrow m = 0, 5$; rejecting m=0, we get m = 5	1 1
3	 let $\angle APO = \theta$ $Sin\theta = \frac{OA}{OP} = \frac{1}{2} \Rightarrow \theta = 30^0$ $\Rightarrow \angle APB = 2\theta = 60^0$ Also $\angle PAB = \angle PBA = 60^0$ $(\because PA = PB)$ $\Rightarrow \triangle APB$ is equilateral	1/2 1/2 1/2 1/2
4	CSA (cone) = $\pi rl = 12320$ $\frac{22}{7} \times 56 \times l = 12320$ $l = 70\ cm$ $h = \sqrt{70^2 - 56^2} = 42$ cm	1/2 1 1/2

5

Modal class is $40-60, l=40, h=20, f_1=?, f_0=10, f_2=6$ — **1/2**

$45 = 40 + 20 \times \left[\frac{f_1 - 10}{2f_1 - 10 - 6}\right]$ — **1/2**

$\Rightarrow \frac{1}{4} = \frac{f_1 - 10}{2f_1 - 16}$

$\Rightarrow 2f_1 - 16 = 4f_1 - 40 \Rightarrow f_1 = 12$ — **1**

6

Let the present age of Ritu be x years

$(x-5)^2 = 5x + 11$ — **1**

$x^2 - 15x + 14 = 0$½

$(x-14)(x-1) = 0 \Rightarrow x = 1 \text{ or } 14$ — **1/2**

x = 14 years (rejecting $x = 1$ as in that case Ritu's age 5 years ago will be –ve) — **1/2**

OR

$9x^2 - 6px + (p^2 - q^2) = 0$

$a = 9, \quad b = -6p, \quad c = p^2 - q^2$ — **1/2**

$D = b^2 - 4ac = (-6p)^2 - 4(9)(p^2 - q^2) = 36q^2$ — **1/2**

$x = \frac{-b \pm \sqrt{D}}{2a} = \frac{6p \pm 6q}{18} = \frac{p+q}{3} \text{ or } \frac{p-q}{3}$ — **1**

SECTION B

7

Distance (in m)	0 - 1	1 – 2	2 - 3	3 - 4	4 - 5
Number of Students	40	80	62	38	30
cf	40	120	182	220	250

$\frac{n}{2} = \frac{250}{2} = 125 \Rightarrow median\ class\ is\ 2-3, l=2, h=1, cf=120, f=62$ — **1**

$median = l + \frac{\frac{n}{2} - cf}{f} \times i$ — **1/2**

$= 2 + \frac{5}{62}$

$= \frac{129}{62} = 2\frac{5}{62} m \text{ or } 2.08m$ — **1**

50% of students jumped below $2\frac{5}{62}$ m and 50% above it. — **1/2**

8

Draw a circle of radius 4cm — **1**

Draw OA and construct $\angle AOB = 120^0$ — **1**

Draw $\angle OAP = \angle OBP = 90^0$

PA and PB are required tangents — **1**

9

Runs Scored	0 - 40	40 - 80	80 - 120	120 - 160	160 - 200	TOTAL
Number of Batsmen (f_i)	12	20	35	30	23	120

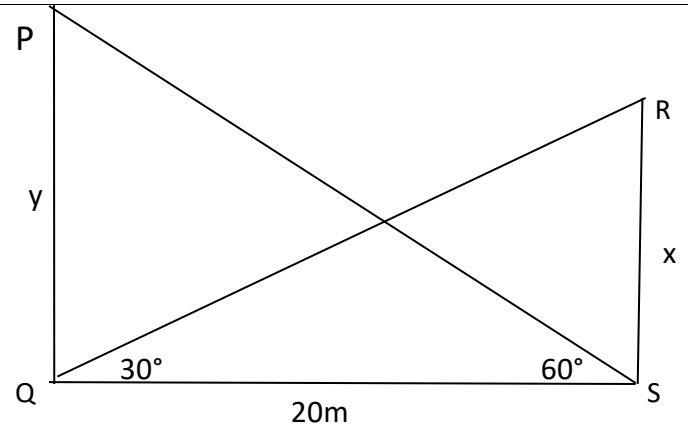
x_i	20	60	100	140	180	
$f_i x_i$	240	1200	3500	4200	4140	13280

$1\frac{1}{2}$

$$mean\ (\bar{x}) = \frac{\sum f_i\, x_i}{\sum f_i} = \frac{13280}{120} = 110.67\ runs$$

$1\frac{1}{2}$

10



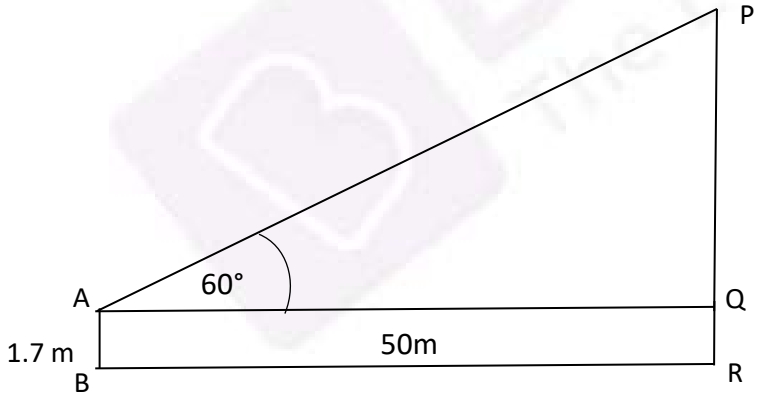
1

$In\ \Delta PQS,\ tan60^0 = \frac{y}{20} \Rightarrow y = 20\sqrt{3}\text{m}$ **1/2**

$In\ \Delta RSQ,\quad tan30^0 = \frac{x}{20} \Rightarrow x = \frac{20}{\sqrt{3}}m$ **1/2**

$y - x = 20\sqrt{3} - \frac{20}{\sqrt{3}} = \frac{40}{\sqrt{3}} = \frac{40\sqrt{3}}{3} = 23.06m$ **1**

OR



1

Let PR be the building and AB be the boy

$In\ \Delta PQR, tan60^0 = \frac{PQ}{50} \Rightarrow PQ = 50\sqrt{3}m$ **1**

Height of the building = $PR = \left(50\sqrt{3} + 1.7\right)m = 88.2m$ **1**

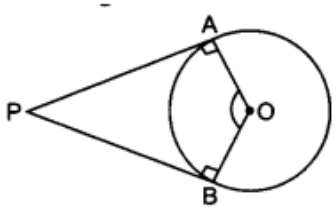
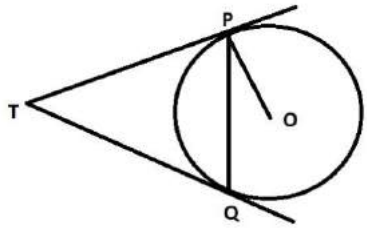
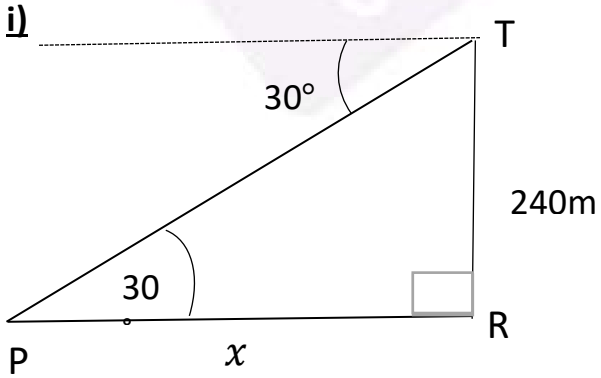
SECTION C

11

Volume of shell = Volume of cylinder

$\Rightarrow \frac{4\pi}{3}[\,5^3 - 3^3] = \pi(7)^2 h$ $1\frac{1}{2}$

$\Rightarrow h = \frac{8}{3} = 2\frac{2}{3}cm$ **1**

	TSA of cylinder is $= 2\pi r(r+h) = 2 \times \frac{22}{7} \times 7 \times \left(7 + \frac{8}{3}\right) = 44 \times \frac{29}{3} = \frac{1276}{3} cm^2 \ or \ 425.33 cm^2$	$1\frac{1}{2}$
12	 $\angle OAP + \angle OBP + \angle APB + \angle AOB = 360^o$ $\Rightarrow 90^0 + 90^0 + \angle APB + \angle AOB = 360^o \ (\because Tangent \ \perp radius)$ $\Rightarrow \angle APB + \angle AOB = 180^0$ **OR**  Let $\angle PTQ = \theta$ TPQ is an isosceles triangle. $\angle TPQ = \angle TQP = \frac{1}{2}(180^o - \theta) = 90° - \frac{\theta}{2}$ $\angle OPT = 90^o$ $\angle OPQ = \angle OPT - \angle TPQ = 90^o - \left(90^o - \frac{\theta}{2}\right) = \frac{\theta}{2}$ $\angle OPQ = \frac{1}{2}\angle PTQ$ $2\angle OPQ = \angle PTQ$	1 $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$ 1
13	**Case Study-1** **i)**  In ΔPTR, $\tan 30^o = \frac{240}{x} \Rightarrow x = 240\sqrt{3}\, m$	1 1

	ii) Distance of boat from tower$= 240\sqrt{3} - 240\left(\sqrt{3} - 1\right) = 240m$ Let the angle of depression = θ $tan\theta = \frac{240}{240} = 1 \Rightarrow \theta = 45^o$	**1** **1**
14	i) 3000, 3005, 3010, …,3900. $a_n = a + (n-1)d$ 3900 = 3000 + (n - 1)5 $\Rightarrow 900 = 5n - 5 \Rightarrow 5n = 905 \Rightarrow n = 181$ Minimum number of days of practice = $n - 1 = 180\ days$ ii) $S_n = \frac{n}{2}(a + l)$ $= \frac{181}{2} \times (3000 + 3900) = 624450$ pushups	**1** **1** **1** **1**