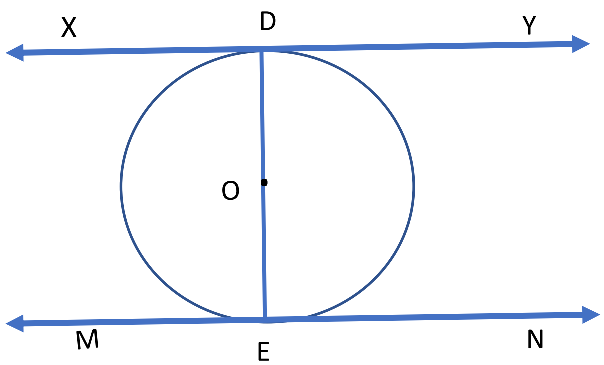
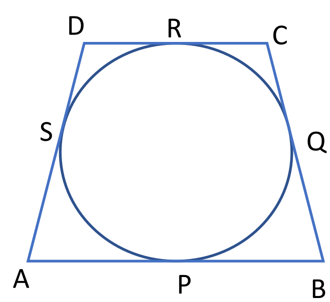
Marking Scheme

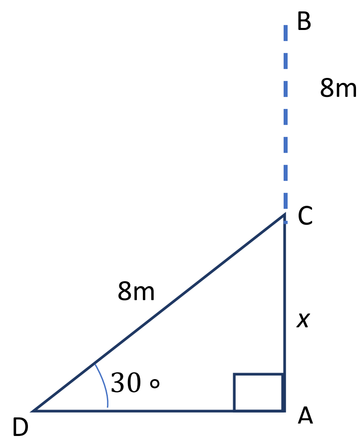
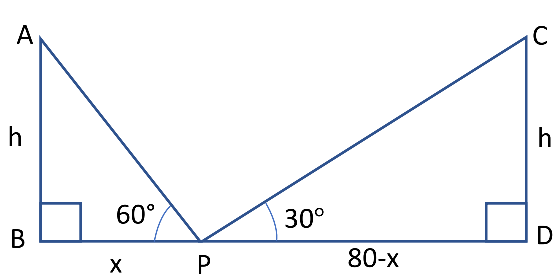
Mathematics –Basic(241)

Class- X Session- 2021-22

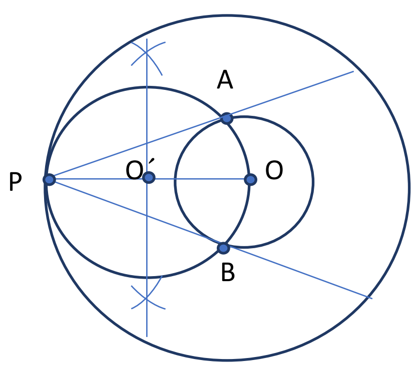
TERM II

<table>
<tr><th>Q.N.</th><th>HINTS/SOLUTION</th><th>Marks</th></tr>
<tr><td>1</td><td>$3x^2 - 7x - 6 = 0$
$\Rightarrow 3x^2 - 9x + 2x - 6 = 0$
$\Rightarrow 3x(x-3) + 2(x-3) = 0$
$\Rightarrow (x-3)(3x+2) = 0$
$\because x = 3, -\frac{2}{3}$
OR
Since the roots are real and equal, $\therefore D = b^2 - 4ac = 0$
$\Rightarrow k^2 - 4\times3\times3 = 0$ $(\because a = 3, b = k, c = 3)$
$\Rightarrow k^2 = 36$
$\Rightarrow k = 6$ or -6</td><td>1/2
1/2
1
1
1/2 +1/2</td></tr>
<tr><td>2</td><td>Let l be the side of the cube and L, B, H be the dimensions of the cuboid
Since $l^3 = 64\ cm^3 \therefore l = 4\ cm$
Total surface area of cuboid is $2[LB + BH + HL]$, Where L=12, B=4 and H=4
=$2(12\times4 + 4\times4 + 4\times12)\ cm^2 = 224cm^2$</td><td>1/2
1/2
1</td></tr>
<tr><td>3</td><td><table><tr><th>Runs scored</th><th>Frequency</th><th>Cumulative Frequency</th></tr><tr><td>0-20</td><td>4</td><td>4</td></tr><tr><td>20-40</td><td>6</td><td>10</td></tr><tr><td>40-60</td><td>5</td><td>15</td></tr><tr><td>60-80</td><td>3</td><td>18</td></tr><tr><td>80-100</td><td>4</td><td>22</td></tr></table>Total frequency (N) = 22
$\frac{N}{2}$ = 11; So 40-60 is the median class.
Median = $l + \frac{\left(\frac{N}{2}\right) - cf}{f} \times h$
= 40 + $\frac{11-10}{5}$ x 20
= 44 runs</td><td>1/2
1/2
1/2
1/2</td></tr>
<tr><td>4</td><td>The common difference is 9 - 4=5
If the first term is 6 and common difference is 5, then new AP is,
6, 6+5, 6+10…
=6,11,16….</td><td>1
1</td></tr>
<tr><td>5</td><td>$\because$ Mode = 38.
$\therefore$ The modal class is 30-40.
Mode = $l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$</td><td>1/2
1/2</td></tr>
</table>

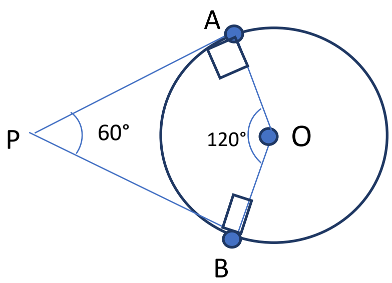
	$=30+\frac{16-12}{32-12-x}$ x 10 = 38 $\frac{4}{20-x}$ x 10 =8 8(20-x) = 40 20-x= 5 X= 15	1/2 1/2
6	 ∵XY is the tangent to the circle at the point D $\therefore$ OD $\perp$ XY $\Rightarrow \angle$ ODX $= 90^0 \Rightarrow \angle$ EDX $= 90^0$ Also, MN is the tangent to the circle at E $\therefore$ OE $\perp$ MN$\Rightarrow \angle$ OEN $= 90^0 \Rightarrow \angle$ DEN $= 90^0$ $\Rightarrow \angle$ EDX $= \angle$ DEN $(each\ 90^0)$. which are alternate interior angles. $\therefore$ XY || MN **OR**  ∵Tangent segments drawn from an external point to a circle are equal ∴ BP=BQ CR=CQ DR=DS AP=AS ⇒BP+CR+DR+AP = BQ+CQ+DS+AS ⇒ AB+DC = BC+AD ∴ AD= 10-7= 3 cm	1/2 1/2 1 1 1
	Section-B	

7	First Term of the AP(a) = 5 Common difference (d) = 8-5=3	
	Last term = a_{40} = a+(40-1) d = 5 + 39 × 3 = 122	1
	Also $a_{31} = a + 30d = 5 + 30 \times 3 = 95$	1
	Sum of last 10 terms = $\frac{n}{2}(a_{31} + a_{40})$ $= \frac{10}{2}(95 + 122)$ $= 5 \times 217 = 1085$	1
8	Let, AB be the tree broken at C, Also let $AC = x$ In Δ CAD, sin30^0 = $\frac{AC}{DC}$	1
	$\Rightarrow \frac{1}{2} = \frac{x}{8}$ $\Rightarrow x = 4\ m$	1/2
	⇒the length of the tree is = 8+4 =12m	1/2
	 	1(correct Fig.)
	OR	
	Let AB and CD be two poles of height h meters also let P be a point between them on the road which is *x* meters away from foot of first pole AB, PD= (80-x) meters.	
	In ΔABP, $tan60^o = \frac{h}{x} \Rightarrow h = x\sqrt{3}$ ....(1)	1
	In ΔCDP, $tan\,30^o = \frac{h}{80-x} \quad \Rightarrow h = \frac{80-x}{\sqrt{3}}$ ....(2) $x\sqrt{3} = \frac{80-x}{\sqrt{3}}$ $[\because LHS(1) = LHS(2), so\ equating\ RHS]$ $\Rightarrow 3x = 80 - x \Rightarrow 4x = 80 \Rightarrow x = 20m$	1/2
	So, $80 - x = 80 - 20 = 60m$ Hence the point is 20m from one pole and 60 meters from the other pole.	1/2
	 	1(correct Fig.)

9	PA = PB (Tangent segments drawn to a circle from an external point are equal) ∴ In $\Delta APB,$ ∠ PAB = ∠ PBA Also, ∠ APB = 60^0 In $\Delta APB,$ sum of three angles is 180^0. Therefore, ∠ PAB + ∠ PBA = 180^0 - ∠ APB= $180^0 - 60^0 = 120^0$. ∴∠ PAB = ∠ PBA = 60^0 (∵∠ PAB = ∠ PBA) ∵ ΔAPB is an equilateral triangle. So, $AB = 6cm$	1 1 1
10	Let the three consecutive multiples of 5 be 5x, 5x+5, 5x+10. Their squares are $(5x)^2, (5x+5)^2$and$(5x+10)^2$. $(5x)^2 + (5x+5)^2 + (5x+10)^2 = 725$ ⇒25x^2 + 25x^2+ 50x + 25 + 25x^2 + 100x + 100 = 725 ⇒ $75x^2 + 150x - 600 = 0$ ⇒ $x^2 + 2x - 8 = 0$ ⇒ $(x+4)(x-2) = 0$ ⇒ $x = -4, 2$ ⇒ $x = 2$ (ignoring –ve value) So the numbers are 10, 15 and 20	1 1 1
	Section-C	

11	 Draw two concentric circles with center O and radii 3cm and 7cm respectively. Join OP and bisect it at O', so $PO' = O'O$ Construct circle with center O' and radius $O'O$ Join PA and PB	1 1 1 1

OR



Draw a circle of radius 6cm

Draw OA and Construct $\angle AOB = 120^0$ 1

Draw $\angle OAP = \angle OBP = 90^0$ 1

PA and PB are required tangents 1

Join OP and apply $\tan\angle APO = \tan 30° = \frac{6}{PA}$

$\Rightarrow$ Length of tangent = $6\sqrt{3}$ cm 1

12

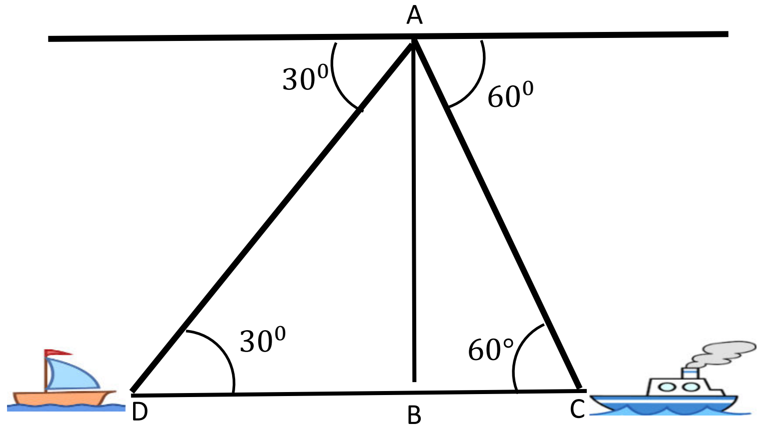
Converting the cumulative frequency table into exclusive classes, we get:

Age	No of passengers(f_i)	x_i	$f_i x_i$
0-10	14	5	70
10-20	30	15	450
20-30	38	25	950
30-40	52	35	1820
40-50	50	45	2250
50-60	61	55	3355
60-70	42	65	2730
70-80	13	75	975
	$\sum f_i = 300$		$\sum f_i x_i = 12600$

2

Mean age = $\bar{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{12600}{300}$ 1

$\bar{x} = 42$ 1

13 (i)	The ship is nearer to the lighthouse as its angle of depression is greater. In Δ ACB, $\tan 60^0 = \frac{AB}{BC}$ ⇨ $\sqrt{3} = \frac{40}{BC}$ ∴ BC $= \frac{40}{\sqrt{3}} = \frac{40\sqrt{3}}{3} m$  	1 1
(ii)	In Δ ADB, $\tan 30^0 = \frac{AB}{BD}$ ⇒ $\frac{1}{\sqrt{3}} = \frac{40}{DB}$ ∴ DB = $40\sqrt{3}m$ Time taken to cover this distance = $(\frac{60}{2000} \times 40\sqrt{3})$ minutes $= \frac{60\sqrt{3}}{100}$ = 2.076 minutes	1 1
14 (i)	Let $r_1 and\ r_2$ be respectively the radii of apples and oranges $\because 2r_1 : 2r_2 = 2:3 \Rightarrow r_1 : r_2 = 2:3$ $4\pi r_1^2 : 4\pi r_2^2 = \left(\frac{r_1}{r_2}\right)^2 = \left(\frac{2}{3}\right)^2 = 4:9$	1/2 $1\frac{1}{2}$
(ii)	Let the height of the drum be h. Volume of the drum = volume of the cylinder + volume of the sphere $\pi 3^2 h = (\pi 3^2 \times 8 + \frac{4}{3}\pi 3^3)\ cm^3$ $\Rightarrow h = (8+4)cm$ $\Rightarrow h = 12cm$	1 1