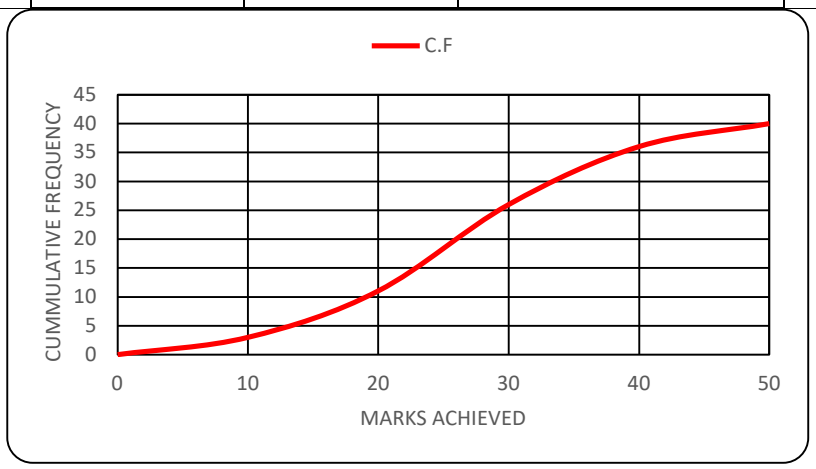
GRADE 11 PAPER 2: MEMO

QUESTION 1

	Possible Solution(s)	*Descriptor*	*Mark*
1.1		• 3, 8, 26 • 36, 4	(2)
1.2		• Grounded at (0; 0) • Shape (***no ruler used***) • Endpoints of Int. used • Accuracy	(4)
1.3	$Q_3 = 33 \quad ; \quad Q_1 = 19$ $IQR = 33 - 19 = 14$	• Upper Quartile • Lower Quartile • Subtracting • IQR	(4)
1.4	$\frac{20}{100} \times 40 = 8\ learners$ **…from OGIVE:** $\frac{17,5}{50}$	• 8 learners • Pass mark	(2)
			[12]

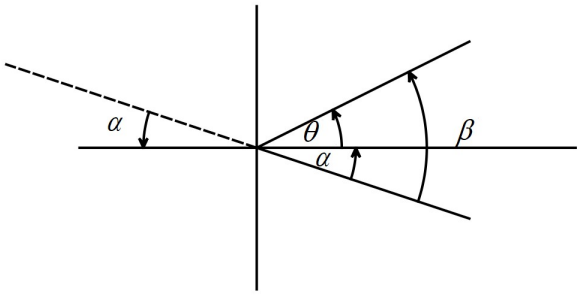
Marks	Frequency	Cumulative Frequency
$0 < x \leq 10$	3	**3**
$10 < x \leq 20$	**8**	11
$20 < x \leq 30$	15	**26**
$30 < x \leq 40$	10	**36**
$40 < x \leq 50$	**4**	40

QUESTION 2

<table>
<tr><td></td><td>Possible Solution(s)</td><td>Descriptor</td><td>Mark</td></tr>
<tr><td>2.1</td><td>
<table>
<tr><th>Marks</th><th>Frequency</th></tr>
<tr><td>$10 < x \leq 20$</td><td>7</td></tr>
<tr><td>$20 < x \leq 30$</td><td>13</td></tr>
<tr><td>$30 < x \leq 40$</td><td>6</td></tr>
<tr><td>$40 < x \leq 50$</td><td>4</td></tr>
<tr><td>$50 < x \leq 60$</td><td>10</td></tr>
<tr><td>$60 < x \leq 70$</td><td>20</td></tr>
<tr><td>$70 < x \leq 80$</td><td>12</td></tr>
<tr><td>$80 < x \leq 90$</td><td>8</td></tr>
</table>
</td><td>• 13 ; 6
• 8
• 20</td><td>(3)</td></tr>
<tr><td>2.2</td><td>Skewed to the left / Negatively skewed
Reason: There is a higher concentration of data (most of the data is) towards the upper end. The data on the lower end causes the mean to become lower (towards the left) or pulls the mean to the left.</td><td>• Skewed left/Negatively skewed
• Reason</td><td>(2)</td></tr>
<tr><td></td><td></td><td></td><td>[5]</td></tr>
</table>

QUESTION 3

	Possible Solution(s)	*Descriptor*	*Mark*
3.1	$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{3-(-1)}{1-(-7)}$ $= \frac{4}{8} = \frac{1}{2}$	• Subst. • Answer $\left(\frac{1}{2}\right)$	(2)
3.2	$y - y_1 = m(x - x_1)$ $y-(-3) = \frac{1}{2}(x-6)$ $y+3 = \frac{1}{2}x - 3$ $y = \frac{1}{2}x - 6$	• $m = \frac{1}{2}$ • Subst. C • Equation	(3)
3.3	$M_{AC} = M_{BD}$ $\left(\frac{7}{2};0\right) \Rightarrow \frac{-7+x_D}{2} = \frac{7}{2}$ $\Rightarrow x_D = 14$ $\Rightarrow \frac{-1+y_D}{2} = 0$ $\Rightarrow y_D = 1$ $D(14;1)$ **OR** **…by inspection:** $x_A - x_B = 8 \quad units$ $x_D - x_C = 8$ $x_D - 6 = 8$ $x_D = 14$ **…similarly**: $y_D = 1 \quad \therefore D(14;1)$	• x-value • y-value	(2)

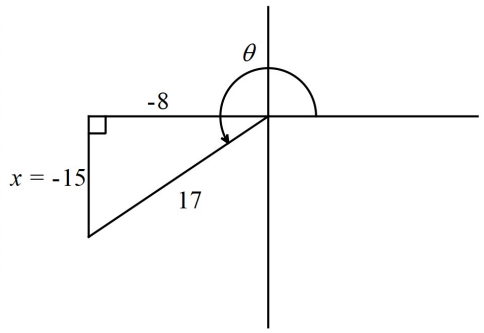
3.4	 $\theta = \tan^{-1}(m_{AB})$ $\quad$ $\alpha = \tan^{-1}(+m_{BC})$ $= \tan^{-1}\left(\frac{1}{2}\right)$ $\quad$ $= \tan^{-1}\left(\left\|-\frac{2}{13}\right\|\right)$ $\theta = 26,57°$ $\quad$ $\alpha = 8,75°$ $\beta = \theta + \alpha$ $\beta = 26,57° + 8,75° = 35,31°$ **OR** ***If cosine rule used***: $a^2 = 173 \quad ; \quad b^2 = 61 \quad ; \quad c^2 = 80$ $\beta = \cos^{-1}\left(\frac{a^2 + c^2 - b^2}{2ac}\right)$ $\beta = 35,31°$	• finding θ • $+m_{BC}$ • finding α • adding α and θ OR • a^2 and c^2 • b^2 • Sub into Cosine Rule. • $35,31°$	(4)
			[11]

QUESTION 4

	Possible Solution(s)	*Descriptor*	*Mark*
4.1.1	**$A-$ is the $y-int.$ of AB:** $y-2(0)+t=0$ $y=-t$ $A(0;-t)$	• Using eqn to find y-int of AB • coordinate of A **Ans ONLY** $\frac{2}{2}$	(2)
4.1.2	**$x-Coordinate$ of $B=x-int.$ of AB:** $0-2x+t=0$ $x_B=\frac{t}{2}$ $Area(\Delta ABC)=\frac{1}{2}(BC)(OA)$ $48=\frac{1}{2}(x_C-x_B)(y_O-y_A)$ $48=\frac{1}{2}\left(2t-\frac{t}{2}\right)(t)$ $48=\left(t-\frac{t}{4}\right)(t)$ $48=t^2-\frac{t^2}{4}$ $\frac{3}{4}t^2=48$ $t^2=64$ $t=\pm 8$ **…but t is $+ve$**: $\therefore t=8$	• finding x_B • $BC=2t-\frac{t}{2}$ **or** $BC=\frac{3}{2}t$ • $Area=48$ • Subst. BC and OA into Area Formula • $t=+8$	(5)
4.2.1	$x^2-6x+y^2-4y=12$ $(x-3)^2+(y-2)^2=12+9+4$ $(x-3)^2+(y-2)^2=25$ $\therefore C(3;2)$	• CTS on x • CTS on y • r^2 • Coordinate of C	(4)

4.2.2	**A is $+ve$ $y-int$ of circle O:** $(-3)^2+(y-2)^2=25$ $(y-2)^2=16$ $y-2=\pm 4$ $y=6 \quad or \quad y=-2$ $A(0;6) \quad \therefore OA=6$ $x^2+y^2=36$ **OR** $y^2-4y=12$ $y^2-4y-12=0$ $(y-6)(y+2)=0$ $y=6 \quad or \quad y=-2$ $A(0;6) \quad \therefore OA=6$ $x^2+y^2=36$	• $x=0$ • Method for finding y-values • Soln's for y • OA • Equation **OR** • $\times 2$ for eqn with $r^2=36$	(5)
4.2.3	$(2r)^2=4r^2$ $4r^2=4\times 25=100$ $(-y-2)^2=(y+2)^2$ $(x-3)^2+(y+2)^2=100$ OR $C_{old}(3;2) \quad \therefore C_{new}(3;-2) \quad (x-3)^2+(y+2)^2=100$	• 100 • $(y+2)^2$ in equation	(2)
			[18]

QUESTION 5

	Possible Solution(s)	***Descriptor***	***Mark***
5.1	 $-y=-\sqrt{(17)^2-(-8)^2}$ $=-15$	• Sketch in correct quad • Unknown side (-15)	(2)
5.1.1	$\left(\cos(90°-\theta)+\cos(180°-\theta)\right)^2$ $=(\sin\theta-\cos\theta)^2$ $=\left(-\frac{15}{17}+\frac{8}{17}\right)^2$ $=\left(-\frac{7}{17}\right)^2$ $=\frac{49}{289}$ *or* 0,17	• Reduction of $\cos(90°-\theta)$ • Reduction of $\cos(180°-\theta)$ • Subst. values using sketch • answer	(4)
5.2	$\frac{\cos480°\cdot\sin150°\cdot\tan120°}{\cos135°\cdot\sin(-225°)}$ $=\frac{\cos120°\cdot\sin30°\cdot(-\tan60°)}{(-\cos45°)\cdot\sin135°}$ $=\frac{-\cos60°\cdot\sin30°\cdot(-\tan60°)}{(-\cos45°)\cdot\sin45°}$ $=\frac{\left(-\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(-\sqrt{3}\right)}{\left(-\frac{1}{\sqrt{2}}\right)\left(\frac{1}{\sqrt{2}}\right)}$ $=\frac{\left(-\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(-\sqrt{3}\right)}{\left(-\frac{1}{2}\right)}$ $=-\frac{\sqrt{3}}{2}$	• $-cos60°$ • $sin30°$ • $-tan60°$ • $-cos45°$ • $sin45°$ • Special angles subst. (Numerator) • Special angles subst. (Denom.) • answer	(8)

5.3	$\tan 2x = -3,7$ $ref\angle = 74,88°$ *II Quad* : $2x = 180° - 74,88° + 180° \cdot k; k \in Z$ $x = 52,56° + 90° \cdot k$ $\therefore x = -37,44°;\quad 52,56°;\quad 142,56°$	• ref. angle (74,88°) • $180° \cdot k; k \in Z$ • Divide by 2 $52,56°$ • x-solutions	(4)
5.4	$\sin(x-15°) = \sin(2x+10°)$ $x - 15° = 2x + 10° + 360° \cdot k; \qquad k \in Z$ $x = -25° - 360° \cdot k$ If ref. angle is $(x - 15°)$: $x = -25° + 360° \cdot k$ ***OR*** $x - 15° = 180° - 2x - 10° + 360° \cdot k$ $x = 61,67° + 120° \cdot k$	• ref. angle • $+360° \cdot k \in Z$ • first quad soln • second quad soln.	(4)
5.5	$\frac{1-\sin^2 x}{\tan^2 x \cdot \cos^2 x} \cdot (\sin^2 x) = \cos^2 x$ $LHS = \frac{\cos^2 x}{\frac{\sin^2 x}{\cos^2 x} \cdot \cos^2 x} \cdot (\sin^2 x)$ $= \frac{\cos^2 x}{\sin^2 x} \cdot (\sin^2 x)$ $= \cos^2 x = RHS$	• pythag identity • change tan to $sin/\cos$ • simplification	(3)
			[25]

QUESTION 6

	Possible Solution(s)	***Descriptor***	***Mark***
6.1	Range of $g(x)$: $-1 \le y \le 1$ *or* $y \in [-1;1]$	• -1 and 1 • Correct symbols/ brackets	(2)
6.2	$a = 2$ $b = 3$	• Value of a • Value of b	(2)
6.3.1	$f(x) < 0$: $x \in [-60°;-30°) \cup (30°;90°)$ ***OR*** $-60° \le x < -30°$ *or* $30° < x < 90°$	• 1 for each set of soln's **If one correct: $\frac{2}{2}$**	(2)
6.3.2	$f(x) \cdot g(x) \ge 0$: $x \in [-60°;-30°] \cup [90°;120°]$ ***OR*** $-60° \le x \le -30°$ *or* $90° \le x \le 120°$	• 1 for each set of soln's **If one correct: $\frac{2}{2}$**	(2)
6.4	$h(x) = g\left(\frac{1}{2}x\right)$ $h(x) = \sin\left(\frac{1}{2}x - 30°\right)$ ***Period***: $720°$	• $720°$	(2)
6.5	$p(x) = h(x - 75°)$ $p(x) = \sin\left(\frac{1}{2}(x - 75°) - 30°\right)$ $p(x) = \sin\frac{1}{2}(x - 90°)$	• $x - 75°$ • Correct simplified equation for p **Eqn ONLY: $\frac{2}{2}$**	(2)
			[12]

QUESTION 7

	Possible Solution(s)	***Descriptor***	***Mark***
7.1	$D\hat{B}C = 90° - y$	• $90° - y$	(1)
7.2	$\frac{BD}{\sin x} = \frac{h}{\sin(90° - y)}$ $BD = \frac{h\sin x}{\cos y}$	• sub into sin-rule • co function	(2)
7.3	$Area\ (\triangle BED) = \frac{1}{2}(BE)(BD)\sin y$ $= \frac{1}{2}(15)\left(\frac{h\sin 135°}{\cos 60°}\right)\sin 60°$ $= \frac{15}{2}\left(\frac{h\left(\frac{1}{\sqrt{2}}\right)}{\frac{1}{2}}\right)\left(\frac{\sqrt{3}}{2}\right)$ $= \frac{15h\sqrt{3}}{2\sqrt{2}}$ *or* $\frac{15h\sqrt{6}}{4}\ units^2$	• sub area rule **Note: Sub $BE = 15; y = 60°$** • reduction and special angles • ans (units^2)	(3)
			[6]

QUESTION 8

	Possible Solution(s)	***Descriptor***	***Mark***
8.1	$RTP: A\hat{P}C = P\hat{B}C$ *Construct*: *PO, extend to D on circumference.* *Draw DB* $(A\hat{P}C = \hat{P}_1;\ O\hat{P}C = \hat{P}_2 = x)$ $(P\hat{B}C = \hat{B}_1;\ C\hat{B}D = \hat{B}_2)$ $\hat{P}_1 + \hat{P}_2 = 90°$ $(\tan \perp rad)$ $\hat{P}_1 = 90° - x$ $\hat{B}_2 = \hat{P}_2 = x$ $(\angle\ in\ same\ segment)$ $\hat{B}_1 + \hat{B}_2 = 90°$ $(\angle\ in\ semi\ circle)$ $\hat{B}_1 = 90° - x$ $\therefore \hat{P}_1 = \hat{B}_1$ $(both = 90° - x)$ $\Rightarrow A\hat{P}C = P\hat{B}C$	• construction • $\hat{P}_1 = 90° - x$ • $tan \perp rad$ • Statement + Reason (same segment $\angle's$) • $\hat{B}_1 = 90° - x$ • $\angle\ in\ semi\ circle$	(1) (1) (1) (1) (1) (1) **[6]**

8.2.1	*Statement*	Reason		
	a) $\widehat{F}_1 = 62°$	tan$-$*chord*	**a)** Answer + Reason	(2)
	b) $\widehat{H} = 62°$	tan$-$*chord* / $\angle$ *in same segment*	**b)** Answer + Reason	(2)
	c) $\widehat{J} = 90°$	$\angle$ *in semi* $-$ *circle*	**c)** $\hat{J}$ + Reason	(2)
	$\widehat{F}_2 = 180° - 62° - 90°$	$\angle$'*s in* ΔFJH	Answer	(1)
	$\widehat{F}_2 = 28°$			
8.2.2	*Statement*	Reason		(3)
	$\widehat{F}_3 = \widehat{F}_2 = 28°$	*given*	• Answer $(\hat{F}_3)$	
	$\widehat{F} + \widehat{G} = 62° + 2(28°) + 62°$		• Addition of $\hat{F}$ and $\hat{G}$	
	$= 180°$			
	$\therefore DF \| JG$	($co-$int. $\angle$'*s* suppl.)	• $co - int. \angle' s\ suppl.$	
	OR		OR	
	$\widehat{F}_3 = \widehat{F}_2 = 28°$	*given*	• Answer $(\hat{F}_3)$	
	$\widehat{J}_2 = \widehat{F}_3 = 28°$	$\angle$'*s in same segment*	• $\hat{J}_1 = 62° = \hat{F}_1$ & Reason	
	$\widehat{J}_1 = 90° - 28°$	complimentary $\angle$'*s*		
	$\widehat{J}_1 = 62° = \widehat{F}_1$			
	$\therefore DF \| JG$	($alt. \angle' s =$)	• $alt. \angle' s =$	
	OR		OR	
	$\widehat{F}_3 = \widehat{F}_2 = 28°$	*given*	• Answer $(\hat{J}_2)$ & Reason	
	$\widehat{J}_2 = \widehat{F}_3 = 28°$	$\angle$'*s in same segment*	• $J\hat{R}H = 90° = D\hat{F}R$ & Reason	
	$J\hat{R}H = 90° \left(= D\hat{F}R\right)$	*sum of* $\angle$'*s in* ΔJRH		
	$\therefore DF \| JG$	($corrsp. \angle' s =$)	• $corrsp. \angle' s =$	
				[16]

QUESTION 9

	Possible Solution(s)		***Descriptor***	***Mark***
	Statement	Reason		
	$ON = OA = 12 - x$	*given* $BN = 12$ *cm*	• Finding ON	(1)
	$AB = BC = 6$ *cm*	*line from centre* $\perp$ *to chord*	• AB & Reason	(2)
	In ΔAOB:			
	$OA^2 = OB^2 + AB^2$	*pythag.*		
	$(12-x)^2 = x^2 + (6)^2$			
	$x^2 - 24x + 144 = x^2 + 36$		• Value of x	(1)
	$24x = 108$			
	$x = 4,50$ *cm*			
	$Radius = 12 - 4,50 = 7,50$ *cm*		• Value of Radius	(1)
				[5]

QUESTION 10

	Possible Solution(s)		***Descriptor***	***Mark***
10.1	*Statement*	Reason	• Statement $(\hat{E}$ *or* $\hat{A})$	(4)
	$\hat{E} = x \ (or \ \hat{A} = x)$	$\angle$ *at centre* $= 2 \times \angle$ *at circumf.*	• Reason	
	$\therefore \ \hat{F}_1 = 180° - x$	*opp.* $\angle$*'s in cyclic quad.*	• Statement $(\widehat{F_1})$	
			• Reason	
10.2	**If $\widehat{A}$ was used in 10.1:**		• Statement $(\hat{E})$ + Reason	(4)
	Statement	Reason	• Statement $(\widehat{B_1})$ + Reason	
	$\widehat{E} = \widehat{A} = x$	$\angle$*'s in same segment*	• Statement $(\widehat{F_2})$ + Reason	
	$\widehat{B_1} = \widehat{E} = x$	corrsp. $\angle$*'s* $(EC \parallel BF)$	• Reason for ∥	
	$\widehat{F_2} = \widehat{E} = \widehat{A} = x$	*ext.* $\angle$ *of cyclic quad.*		
	$\therefore \widehat{B_1} = \widehat{F_2}$		**OR**	
	$\Rightarrow DF = DB$	$(sides\ opp. = \angle's)$		
	If $\widehat{E}$ was used in 10.1:			
	Statement	Reason		
	$\widehat{B_1} = \widehat{E} = x$	corrsp. $\angle$*'s* $(EC \parallel BF)$	• Statement $(\widehat{B_1})$	
	$\widehat{F_2} = \widehat{E} = \widehat{A} = x$	*ext.* $\angle$ *of cyclic quad.*	• Reason	
	$\therefore \widehat{B_1} = \widehat{F_2}$		• Statement $(\widehat{F_2})$ + Reason	
	$\Rightarrow DF = DB$	$(sides\ opp. = \angle's)$	• Reason for ∥	

10.4	*Statement* Reason *In* $\triangle DBF$: $\hat{D} = 180° - 2x$ *sum of* $\angle$*'s in* Δ $\widehat{O}_1 = 2x$ *given* $\hat{O}_1 + \hat{D} = 180° - 2x + 2x$ $= 180°$ $\therefore$ *OCDB is a cyclic quad.* $(conv.\ opp.\ \angle's\ of\ cyclic\ quad.)$ *OR* *In* $\triangle DBF$: $\hat{D} = 180° - 2x$ *sum of* $\angle$*'s in* Δ $\widehat{O}_2 = 180° - 2x$ $\angle$*'s on str. line* / suppl. $\angle$*'s* $\therefore$ *OCDB is a cyclic quad.* $(conv.\ ext.\ \angle\ of\ cyclic\ quad.)$	• Statement $(\widehat{D})$ + Reason • $\widehat{O_1} + \widehat{D}$ • Reason for C.Q **OR** • Statement $(\widehat{D})$ + Reason • Statement $(\widehat{O_2})$ + Reason • Reason for C.Q	(3)
			[11]