QUESTION 1

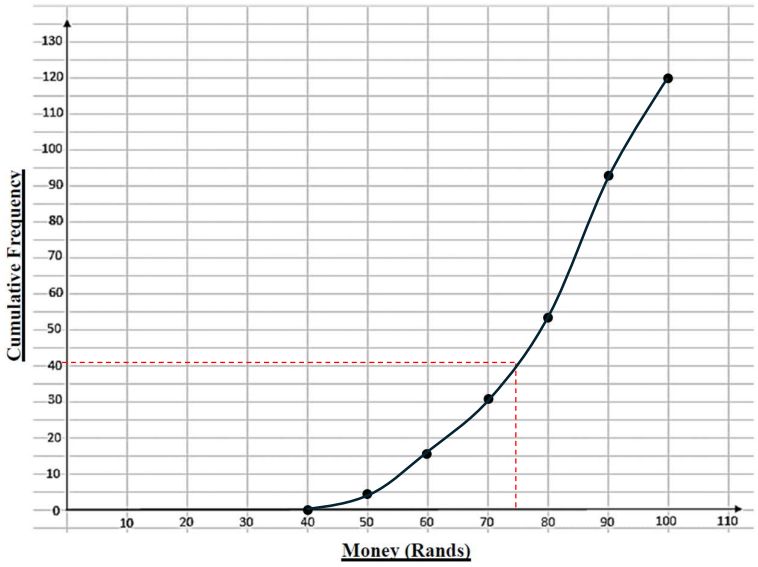
1.1.

Total spent x	Frequency	Cumulative Frequency
$40 < x \leq 50$	5	**5**
$50 < x \leq 60$	11	**16**
$60 < x \leq 70$	**16**	32
$70 < x \leq 80$	21	**53**
$80 < x \leq 90$	**40**	93
$90 < x \leq 100$	27	**120**

✓frequency values
✓cumulative frequency values

(2)

1.2.



✓grounding at (40; 0)
✓endpoints correctly plotted against CF
✓shape

(3)

1.3.

$120 - 40$

$= 80$ learners

✓40
✓80

(2)

1.4.1. $\bar{x} = 8{,}9$ min ✓ans. (1)

1.4.2. $\sigma = 3{,}56$ min ✓✓ans. (2)

1.4.3.

$8{,}9 + 3{,}56 = 12{,}46$

$\therefore$ 2 students

✓$\sigma + \bar{x}$
✓ans.

(2)

1.4.4.

$\frac{89+2x}{12} = 9{,}25$

$\therefore 89 + 2x = 111$

$\therefore 2x = 22$

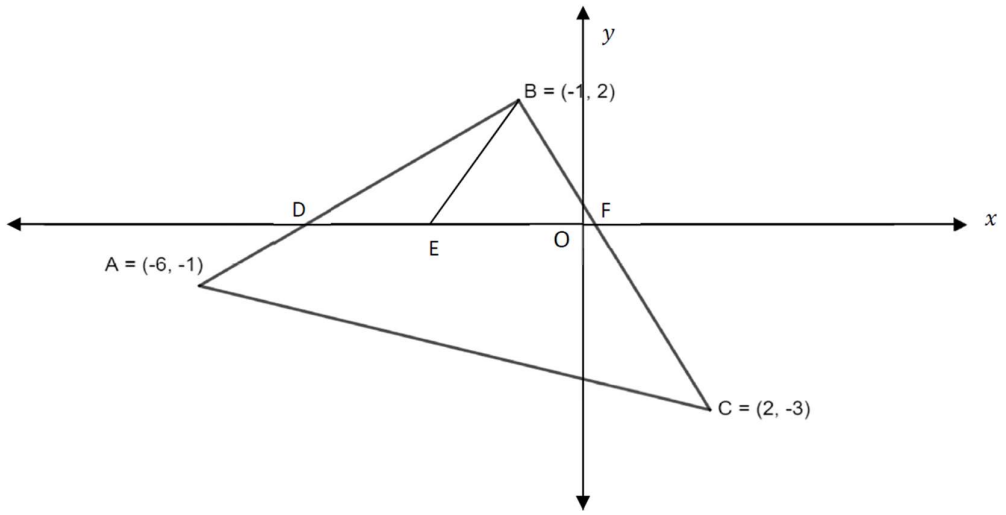
$\therefore x = 11\ min$

✓$89 + 2x$
✓$\div 12$
✓ans.

(3)

TOTAL = 15 MARKS

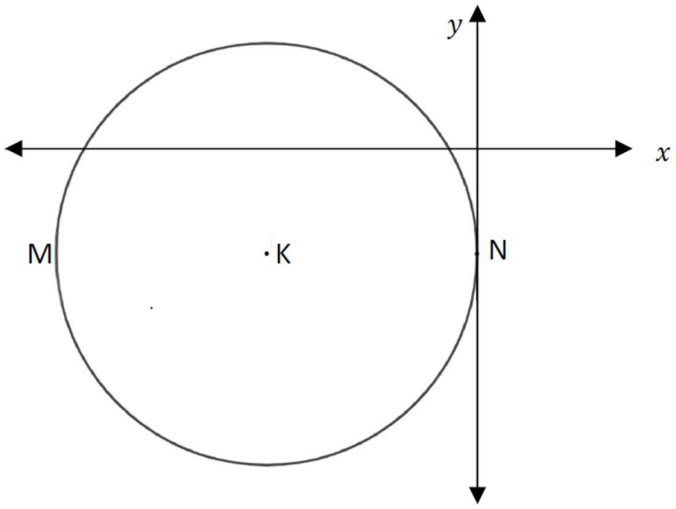
QUESTION 2



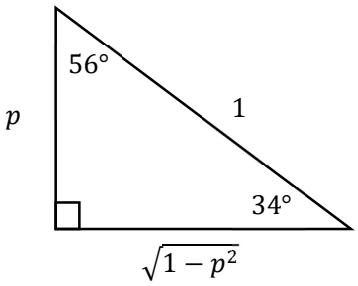
2.1.	$m_{BC} = \frac{2-(-3)}{-1-(2)}$ $\therefore m_{BC} = -\frac{5}{3}$ $\therefore y = -\frac{5}{3}x + c$ $\therefore (2) = -\frac{5}{3}(-1) + c$ $\therefore y = -\frac{5}{3}x + \frac{1}{3}$	✓m_{BC} ✓sub point ✓ans.	(3)
2.2.	$M(-3;-6)$	✓x ✓y	(2)
2.3.	$m_{AB} = \frac{2-(-1)}{-1-(-6)}$ $\therefore m_{AB} = \frac{3}{5}$ $\therefore m_{AB} \times m_{BC} = -1$ $\therefore A\hat{B}C = 90°$ $\therefore AC$ is the diameter (converse $\angle' s$ in semi-circle)	✓m_{AB} ✓conclusion	(2)
2.4.	$m_{AC} = -\frac{1}{4}$ $\tan\theta = \frac{1}{4}$ $\therefore \theta = 165{,}96°$ $m_{BC} = -\frac{5}{3}$ $\tan\alpha = -\frac{5}{3}$ $\therefore \alpha = 120{,}96°$ $\therefore B\hat{C}A = 45°$ $\therefore \hat{B} = 90°$ $\therefore B\hat{A}C = 45°$	✓θ ✓α ✓$B\hat{A}C$	(3)

2.5.	Centre $(-2;-2)$ Radius $= \sqrt{(-2-2)^2+(-2+3)^2}$ $= \sqrt{17}$ $\therefore (x+2)^2+(y+2)^2 = 17$	✓centre ✓radius ✓equation	(3)
2.6.	$\frac{68}{15} = 8x$ $\therefore x = \frac{17}{30}$ $EF = 5\left(\frac{17}{30}\right)$ $= \frac{17}{6}$ $E = \frac{17}{6} - \frac{1}{5}$ $= \left(\frac{79}{30};0\right)$	✓x ✓EF ✓ans.	(3)
TOTAL = 16 MARKS			

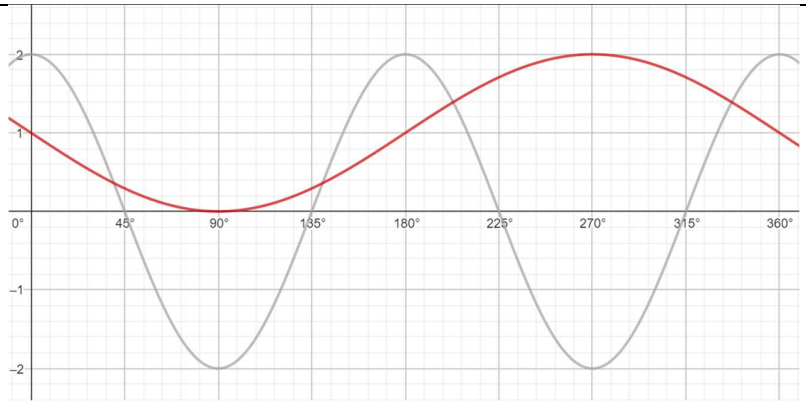
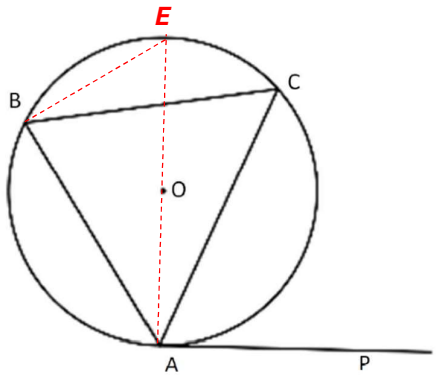
QUESTION 3

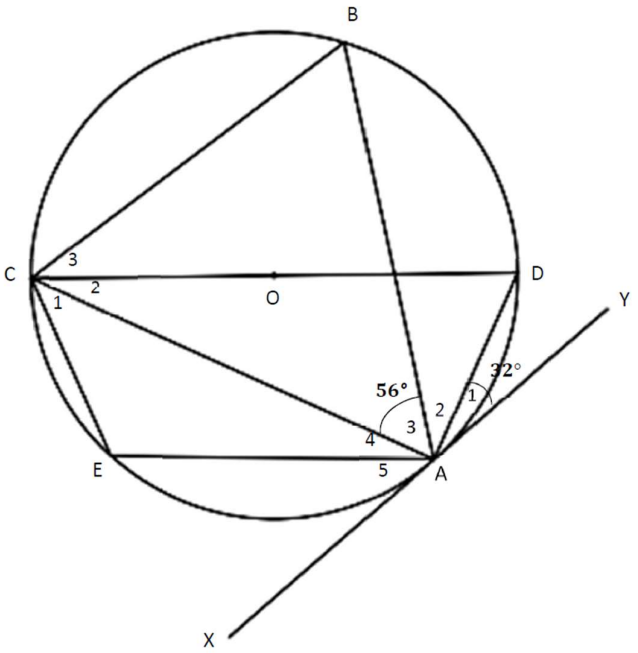


3.1.	$x^2+8x+y^2+4y = -4$ $\therefore (x+4)^2+(y+2)^2 = -4+16+4$ $\therefore (x+4)^2+(y+2)^2 = 16$ Centre: $(-4;-2)$ Radius: 4 units	✓complete the square method ✓x ✓y ✓r	(4)
3.2.	$M(-8;-2)$	✓x ✓y	(2)
3.3.	New centre: $(-8;-1)$ $\therefore (x+8)^2+(y+1)^2 = 16$	✓new centre coord ✓new equation	(2)
3.4.	New circle's equation (increased radius): $(x+8)^2+(y+1)^2 = 25$ Bottom of original circle K: $y = -6$ Top of new circle: $y = -3$	✓new radius ✓bottom circle K ✓top new circle	

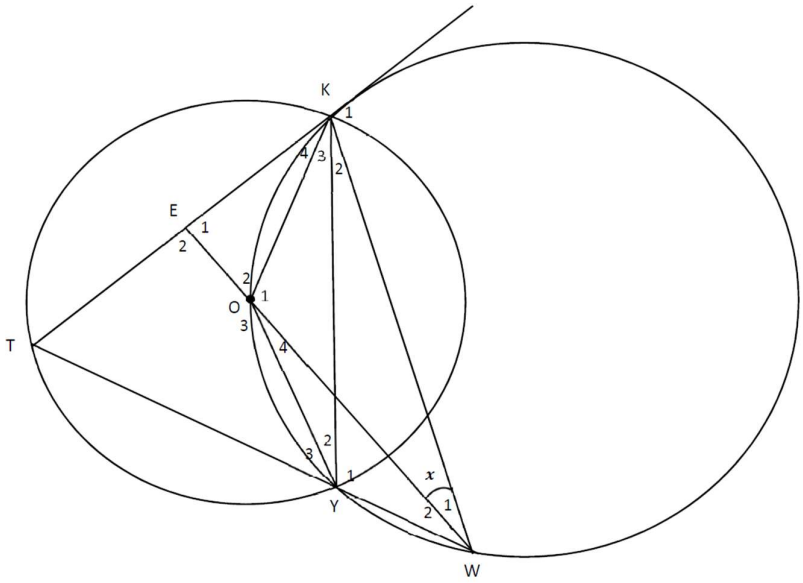
	∴ the two circles intersect **OR** $r_p = 5$ $KP = \sqrt{(-4+8)^2 + (-2+1)^2}$ $= \sqrt{17}$ But $r_P + r_K = 9$ $\therefore 9 > \sqrt{17}$ ∴ the circles will intersect	✓conclusion ✓KP ✓$r_P + r_K$ ✓$9 > \sqrt{17}$ ✓conclusion	(4)
TOTAL = 12 MARKS			
QUESTION 4  			
4.1.1.	$\cos 56°$ $= \cos(90° - 34°)$ $= \sin 34°$ $= p$	✓co-ratio ✓ans. (✓✓AO)	(2)
4.1.2.	$\sin 214°$ $= \sin(180° + 34°)$ $= -\sin 34°$ $= -p$	✓reduction ✓ans.	(2)
4.1.3	$\tan(-34°)$ $= -\tan 34°$ $= -\frac{p}{\sqrt{1-p^2}}$	✓$-\tan 34°$ ✓ans.	(2)
4.2.	$\frac{\tan(210°).\sin(480°).\sin(10°)}{\cos(-80°).\cos(225°).\sin(315°)}$ $= \frac{\tan 30°.\sin 60°.\cos 80°}{\cos 80°.(-\cos 45°)(-\text{si}\quad°)}$ $= \frac{\frac{\sqrt{3}}{3}.\frac{\sqrt{3}}{2}}{\left(-\frac{\sqrt{2}}{2}\right)\left(-\frac{\sqrt{2}}{2}\right)}$ $= 1$	✓$\tan 30°$ ✓$\sin 60°$ ✓co-ratio ✓$-\cos 45°$ ✓$-\sin 45°$ ✓special angles ✓ans.	(7)

4.3.	$\sin^2\theta - \sin\theta\cos\theta = 0$ $\therefore \sin\theta(\sin\theta - \cos\theta) = 0$ $\therefore \sin\theta = 0$ or $\sin\theta - \cos\theta = 0$ $\therefore I: 0° + k.360°; k \in Z$ $\therefore \tan\theta = 1$ $II: 180° + k.360°;\ k \in Z$ $\therefore \theta = 45° + k.180°;\ k \in Z$	✓factorise ✓tan ✓✓sin solutions ✓tan solution	(5)
4.1.	$\cos\theta(1 + \tan^2\theta) = \frac{1}{cos\theta}$		
4.4.1.	LHS $= \cos\theta\left(1 + \frac{\sin^2\theta}{\cos^2\theta}\right)$ $= \cos\theta + \frac{\sin^2\theta}{\cos\theta}$ $= \frac{\cos^2\theta + \sin^2\theta}{\cos\theta}$ $= \frac{1}{\cos\theta}$ $\therefore LHS = RHS$	✓tan identity ✓distribute ✓LCD	(3)
4.4.2.	Asymptote: $\theta = 90° + k.180°;\ k \in Z$ $\cos\theta = 0°$ $\therefore \theta = 90° + k.360°;\ k \in Z$	✓asymptote solution ✓cos solution	(2)
4.5.	$\sqrt{4^{\sin 150°}.2^{3\tan 225°}}$ $= \sqrt{4^{\sin 30°}.2^{3\tan 45°}}$ $= \sqrt{4^{\frac{1}{2}}.2^3}$ $= \sqrt{16}$ $= 4$	✓sin 30° ✓tan 45° ✓special angles ✓ans.	(4)
TOTAL = 27 MARKS			
QUESTION 5			
5.1.	$a = 2$ $b = 2$	✓a ✓b	(2)
5.2.	$180°$	✓ans.	(1)
5.3.	$45° < x < 135°$	✓values ✓inequality	(2)

5.4.		✓intercepts ✓TP ✓shape	(3)
5.5.	$k(x) = -2(-\sin x + 1) - 4$ $= 2\sin x - 6$	✓sub $g(x)$ ✓$k(x)$	(2)
TOTAL = 10 MARKS			
QUESTION 6			
6.1.	$D\hat{B}C = 180° - (\theta + \alpha)$	✓	(1)
6.2.	$\frac{DB}{\sin\alpha} = \frac{m}{\sin 180° - (\theta+\alpha)}$ $\therefore DB = \frac{m.\sin\alpha}{\sin(\theta+\alpha)}$ $\cos x = \frac{AD}{BD}$ $\therefore AD = BD.\cos x$ $\therefore AD = \frac{m.\cos x.\sin\alpha}{\sin(\theta+\alpha)}$	✓sine rule for DB ✓reduction ✓DB ✓cos ✓sub	(5)
TOTAL = 10 MARKS			
QUESTION 7			
7.1.	 Construct diameter AE and join EB. $E\hat{A}P = 90°$ (tan-chord thm) $A\hat{B}E = 90°$ (∠'s in semi-circle) Let $E\hat{B}C = x$ $\therefore E\hat{A}C = x$ (∠'s in same seg) $\therefore P\hat{A}C = 90° - x$ and $A\hat{B}C = 90° - x$ (compl. ∠'s) $\therefore P\hat{A}C = A\hat{B}C$	✓correct construction ✓tan-chord thm ✓∠'s in semi-circle ✓∠'s in same seg ✓both $90° - x$	(5)

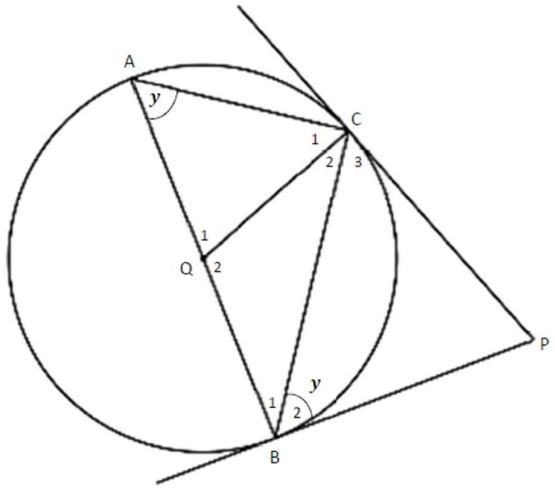
7.2.					
7.2.1.	a)	$\hat{A}_2 = 34°$	(∠'s in semi-circle)	✓S ✓R	(2)
	b)	$\hat{C}_2 = 32°$	(tan-chord thm)	✓S ✓R	(2)
	c)	$\hat{C}_3 = 34°$	(∠'s in same seg)	✓S ✓R	(2)
	d)	$\hat{B} = 58°$	(sum ∠'s in Δ)	✓S+R	
		$\therefore \hat{D} = 58°$	(∠'s in same seg)	✓S+R	
		$\therefore \hat{E} = 122°$	(opp. ∠'s of cyclic quad.)	✓S+R	(3)
7.2.2.	No. $\hat{C}_2 \neq \hat{E}$		(converse tan-chord thm)	✓no ✓reason	(2)
TOTAL = 16 MARKS					

QUESTION 8



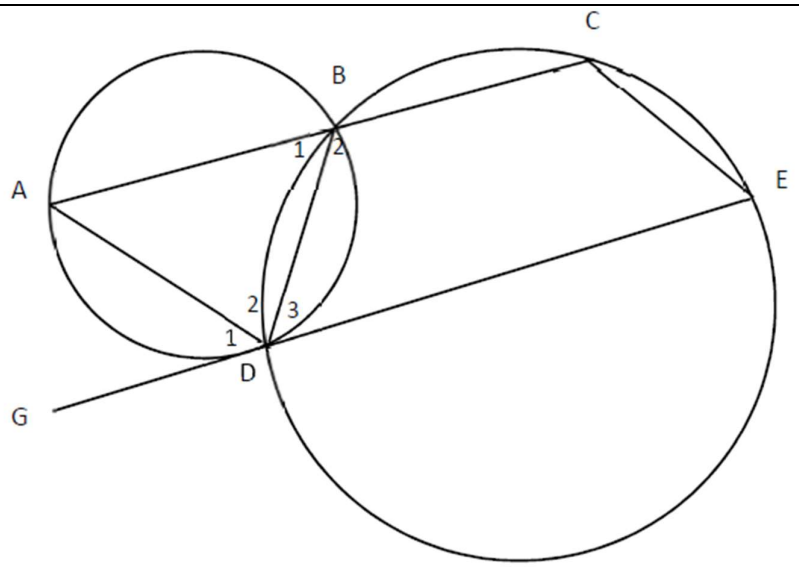
8.1.	$\hat{Y}_2 = x$	(∠'s in same seg)	✓S ✓R	
	$\hat{K}_4 = x$	(than-chord thm)	✓S ✓R	
	$OK = OY$	(radii)	✓S+R	
	$\therefore \hat{K}_3 = x$	(∠'s opp. = sides)	✓S+R	
	$\hat{W}_2 = x$	(∠'s in same seg)	✓S ✓R	(8)
8.2.	$K\hat{O}Y = 180° - 2x$	(sum ∠'s in Δ)	✓S+R	
	$\therefore \hat{T} = 90° - x$	(∠'s at centre = 2 × ∠ at circumf)	✓S ✓R	(3)
8.3.	$\hat{E} = 180° - (90° - x + x)$			
	$\therefore \hat{E} = 90°$		✓$\hat{E} = 90°$	
	$\therefore TK \perp OE$			
	$\therefore KE = ET$	(line from centre ⊥ chord)	✓S+R	(2)
TOTAL = 13 MARKS				

QUESTION 9



9.1.	$\hat{C}_3 = y$ (tans from common point) **OR** $\hat{C}_1 = y$ (∠'s opp. = sides)	✓ans.	(1)
9.2.	$\hat{P} = 180° - 2x$ (sum ∠'s in Δ) $\hat{Q}_2 = 2x$ (ext. ∠'s of Δ) $\therefore \hat{P} + \hat{Q}_2 = 180°$ $\therefore QCPB$ is a cyclic quadrilateral (converse opp. ∠'s of cyclic quad.)	✓$\hat{P}$ ✓$\hat{Q}_2$ ✓S+R	(3)
TOTAL = 4 MARKS			

QUESTION 10



Let $\hat{D}_3 = x$			
$\therefore \hat{A} = x$	(tan-chord thm)	✓S+R for $\hat{A}$	
$\therefore \hat{B}_1 = x$	(∠'s opp. = sides)	✓S+R for $\hat{B}_1$	
$\therefore \hat{D}_3 = \hat{B}_1$			
$\therefore AC \parallel DE$	(alt. ∠'s =)	✓S+R for $AC \parallel DE$	
$\hat{E} = \hat{B}_1 = x$	(ext. ∠ of cyclic quad)	✓S+R for $\hat{E}$	
$\hat{D}_1 = \hat{B}_1 = x$	(tan-chord thm)	✓S+R for $\hat{D}_1$ and $A\hat{D}E$	
$A\hat{D}E = 180° - x$	(∠'s on str. line)		
$\therefore A\hat{D}E + \hat{E} = 180°$			
$\therefore AD \parallel CE$	(co-int. ∠'s =)	✓S+R for $AD \parallel CE$	

TOTAL = 6 MARKS

GRAND TOTAL = 125 MARKS