FINAL

KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

MATHEMATICS P2

COMMON TEST

JUNE 2025

MARKING GUIDELINES

NATIONAL
SENIOR CERTIFICATE

GRADE 11

MARKS: 100

These marking guidelines consist of 13 pages.

QUESTION 1

1.1.1	$AB^2=(-6+2)^2+(-2-10)^2$ $=16+144$ $AB=4\sqrt{10}$	✓A substitution into distance formula ✓CA answer (2)
1.1.2	$m_{AC}=\dfrac{10+6}{-2-0}$ $=-8$ $y-y_1=m(x-x_1)$ $y-(-2)=-8(x-(-6))$ $y=-8x-50$ **OR** $m_{AC}=\dfrac{10+6}{-2-0}$ $=-8$ $y=mx+c$ $-2=-8(-6)+c$ $c=-50$ $\therefore y=-8x-50$	✓A substitution into gradient formula ✓CA m_{AC} ✓A substitute B(–6 ; –2) into eqn of line ✓CA answer (4) ✓A substitution into gradient formula ✓CA m_{AC} ✓A substitute B(–6 ; –2) into eqn of line ✓CA answer (4)
1.1.3	$\tan\theta=m_{AC}=-8$ $\theta=180°-\tan^{-1}(8)$ $\theta=97,13°$ $\tan\alpha=m_{AB}$ $=\dfrac{10+2}{-2+6}$ $\tan\alpha=3$ $\therefore\alpha=71,57°$ $\beta=\theta-\alpha$ $=97,13°-71,57°$ $=25,56°$	✓M $\tan\theta=m_{AC}$ ✓CA size of θ ✓A $\tan\alpha=3$ ✓CA size of α ✓CA answer (5)

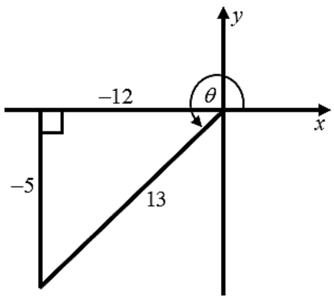
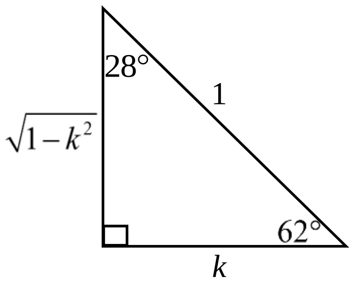
1.1.4	$\text{midpt}_{AC}\left(\frac{-2+0}{2}\ ;\ \frac{10-6}{2}\right)$ $(-1\ ;\ 2)$ $\frac{x_D-6}{2}=-1 \qquad \frac{y_D-2}{2}=2$ $x_D=4 \qquad y_D=6$ $\therefore D(4\ ;\ 6)$ **Answer only: FULL MARKS**	✓A $x=4$ ✓ A $y=6$ (2)
	OR	
	$B(-6\ ;\ -2)\rightarrow C(0\ ;\ -6)$ $\therefore A(-2\ ;10)\rightarrow D(x+6\ ;y-4)$ $\therefore D(-2+6\ ;10-4)$ $\therefore D(4\ ;6)$ **Answer only: FULL MARKS**	✓A $x=4$ ✓ A $y=6$ (2)
	OR	
	$B(-6\ ;\ -2)\rightarrow A(-2\ ;10)$ $\therefore C(0\ ;-6)\rightarrow D(x+4\ ;y+12)$ $\therefore D(0+4\ ;\ -6+12)$ $\therefore D(4\ ;6)$ **Answer only: FULL MARKS**	✓A $x=4$ ✓ A $y=6$ (2)
1.2	$m_{AB}=m_{BC}$ $\frac{1-0}{x+5-8}=\frac{2-0}{x+7-8}$ $\frac{1}{x-3}=\frac{2}{x-1}$ $2x-6=x-1$ $x=5$	✓A $m_{AB}=m_{BC}$ ✓A $m_{AB}=\frac{1}{x-3}$ ✓A $m_{BC}=\frac{2}{x-1}$ ✓ CA answer (4)
	OR	
	$m_{AC}=m_{BC}$ $\frac{2-1}{x+7-(x+5)}=\frac{2-0}{x+7-8}$ $\frac{1}{2}=\frac{2}{x-1}$ $x-1=4$ $x=5$	✓A $m_{AC}=m_{BC}$ ✓A $m_{AB}=\frac{1}{2}$ ✓A $m_{BC}=\frac{2}{x-1}$ ✓ CA answer (4)
		[17]

QUESTION 2

2.1	$M\left(\frac{0-12}{2}\ ;\ \frac{6-0}{2}\right)$ $M(-6\ ;\ 3)$ **Answer only: FULL MARKS**	✓A substitution ✓A answer (2)
2.2	$D\hat{M}G = D\hat{O}G = 90°$	✓A answer (1)
2.3	$m_{DE} = \frac{6-0}{0+12} = \frac{1}{2}$ $\therefore m_{MG} = -2$ $\text{Equation}_{MG} : y - y_1 = m(x - x_1)$ $y - 3 = -2(x - (-6))$ $y - 3 = -2x - 12$ $y = -2x - 9$	✓A $m_{DE} = \frac{1}{2}$ ✓CA $m_{MG} = -2$ ✓CA substitute M & m_{MG} into equation of straight line ✓CA answer (4)
	OR	
	$m_{DE} = \frac{6-0}{0+12} = \frac{1}{2}$ $\therefore m_{MG} = -2$ $\text{Equation}_{MG} : y = mx + c$ $3 = -2(-6) + c$ $c = -9$ $\therefore y = -2x - 9$	✓A $m_{DE} = \frac{1}{2}$ ✓CA $m_{MG} = -2$ ✓CA substitute M & m_{MG} into equation of straight line ✓CA answer (4)

2.4	Coordinates of G: $-2x-9=0$ $x=-\frac{9}{2}$ $\therefore \text{G}\left(-\frac{9}{2}\ ;\ 0\right)$ $\therefore \text{EG}=\frac{15}{2}$ units Area $\Delta\text{MEG}=\frac{1}{2}\times b\times h$ $=\frac{1}{2}\times\frac{15}{2}\times 3$ $=\frac{45}{4}$ or 11,25 sq. units Area $\Delta\text{DOE}=\frac{1}{2}\times 12\times 6=36$ square units Area DMGO = Area ΔDOE – Area ΔMEG $=36-\frac{45}{4}$ $=\frac{99}{4}$ or 24,75 square units	✓CA coordinates of G ✓CA length of EG ✓CA substitution into area formula ✓CA area ΔMEG ✓A area ΔDOE ✓CA answer (6)
	OR $\text{D}(0\ ;\ 6)$ $\text{M}(-6\ ;\ 3)$ $\text{G}\left(-\frac{9}{2}\ ;\ 0\right)$ $\text{DM}=\sqrt{(0+6)^2+(6-3)^2}$ $=3\sqrt{5}$ units $\text{MG}=\sqrt{\left(-6+\frac{9}{2}\right)^2+(3-0)^2}$ $=\frac{3\sqrt{5}}{2}$ units Area DMFO = Area ΔDMG + Area ΔDOG $=\frac{1}{2}(\text{DM})(\text{MG})+\frac{1}{2}(\text{DO})(\text{OG})$ $=\left(\frac{1}{2}\times 3\sqrt{5}\times\frac{3\sqrt{5}}{2}\right)+\left(\frac{1}{2}\times 6\times\frac{9}{2}\right)$ $=\frac{45}{4}+\frac{27}{2}$ $=\frac{99}{4}$ or 24,75 square units	✓CA length of DM ✓CA length of MG ✓CA substitution into area formula ✓CA area of ΔDMG ✓CA area of ΔDOG ✓CA answer (6)
		[13]

QUESTION 3

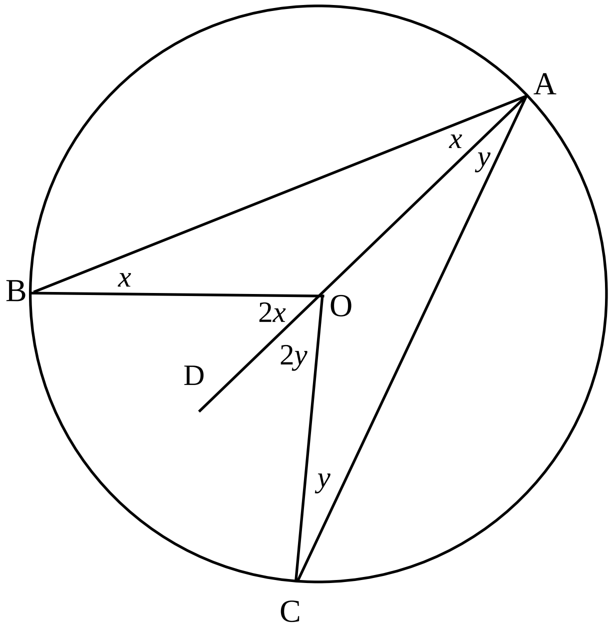
3.1	$\tan\theta = \frac{5}{12}$ $y = -5\ ;\ x = -12$  $r^2 = x^2 + y^2$ $= (-12)^2 + (-5)^2$ $r = 13$ $\sin\theta + \cos\theta = \left(\frac{-5}{13}\right) + \left(\frac{-12}{13}\right)$ $= -\frac{17}{13}$	✓A diagram in the correct quadrant ✓A $r = 13$ ✓CA substitution ✓CA answer (4)
3.2.1	$\cos 62° = k$ $\therefore \sin 28° = k$	✓A answer (1)
3.2.2	 $y = \sqrt{r^2 - x^2}$ $= \sqrt{(1)^2 - (k)^2}$ $= \sqrt{1-k^2}$ $\tan 332° = -\tan 28°$ $= -\frac{k}{\sqrt{1-k^2}}$	✓A 3rd side $= \sqrt{1-k^2}$ ✓A reduction ✓CA answer (3)
		[8]

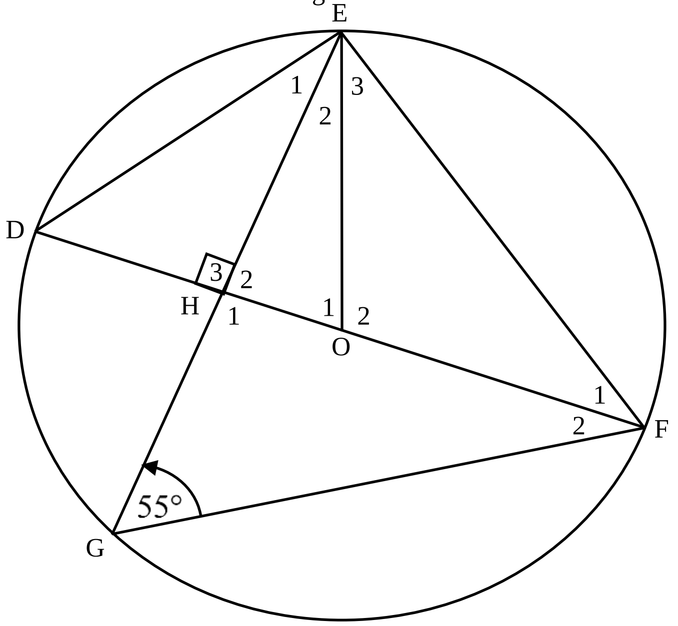
QUESTION 4

4.1	$\dfrac{\cos 150°.\tan 300°}{\sin(-30°).\tan 945°}=\dfrac{(-\cos 30°).(-\tan 60°)}{(-\sin 30°).(\tan 45°)}$ $=\dfrac{\left(-\frac{\sqrt{3}}{2}\right).\left(-\frac{\sqrt{3}}{1}\right)}{\left(-\frac{1}{2}\right).1}$ $=-3$	✓A numerator ✓A denominator ✓CA special ∠ values ✓CA answer (4)
4.2	$\dfrac{\sin(450°-x).\cos(-x)}{\sin(360°-x).\cos(90°+x)}=\dfrac{(\cos x).(\cos x)}{(-\sin x).(-\sin x)}$ $=\dfrac{\cos^2 x}{\sin^2 x}$ $=\dfrac{1}{\tan^2 x}$	✓A $\cos x$ ✓A $\cos x$ ✓A $-\sin x$ ✓A $-\sin x$ ✓CA answer (5)
4.3.1	$\text{LHS}=(\tan^2 x-\sin^2 x)\left(1+\dfrac{\cos^2 x}{\sin^2 x}\right)$ $=\left(\dfrac{\sin^2 x}{\cos^2 x}-\dfrac{\sin^2 x}{1}\right)\left(\dfrac{\sin^2 x+\cos^2 x}{\sin^2 x}\right)$ $=\left(\dfrac{\sin^2 x-\sin^2 x.\cos^2 x}{\cos^2 x}\right)\left(\dfrac{1}{\sin^2 x}\right)$ $=\dfrac{\sin^2 x(1-\cos^2 x)}{\cos^2 x}\times\dfrac{1}{\sin^2 x}$ $=\dfrac{1-\cos^2 x}{\cos^2 x}$ $=\dfrac{\sin^2 x}{\cos^2 x}$ $=\tan^2 x$ $=\text{RHS}$ **OR** $\text{LHS}=(\tan^2 x-\sin^2 x)\left(1+\dfrac{\cos^2 x}{\sin^2 x}\right)$ $=\left(\dfrac{\sin^2 x}{\cos^2 x}-\sin^2 x\right)\left(1+\dfrac{\cos^2 x}{\sin^2 x}\right)$ $=\dfrac{\sin^2 x}{\cos^2 x}+1-\sin^2 x-\cos^2 x$ $=\tan^2 x+\cos^2 x-\cos^2 x$ $=\tan^2 x$ = RHS	✓A $\tan^2 x=\dfrac{\sin^2 x}{\cos^2 x}$ ✓A $\sin^2 x+\cos^2 x=1$ ✓A common factor ✓A $1-\cos^2 x=\sin^2 x$ (4) ✓A $\tan^2 x=\dfrac{\sin^2 x}{\cos^2 x}$ ✓A $\dfrac{\sin^2 x}{\cos^2 x}+1-\sin^2 x-\cos^2 x$ ✓A $\dfrac{\sin^2 x}{\cos^2 x}=\tan^2 x$ ✓A $1-\sin^2 x=\cos^2 x$ (4)

4.3.1	$\text{LHS} = \left(\tan^2 x - \sin^2 x\right)\left(1 + \dfrac{\cos^2 x}{\sin^2 x}\right)$ $= \left(\dfrac{\sin^2 x}{\cos^2 x} - \dfrac{\sin^2 x}{1}\right)\left(\dfrac{\sin^2 x + \cos^2 x}{\sin^2 x}\right)$ $= \left(\dfrac{\sin^2 x}{\cos^2 x} - \dfrac{\sin^2 x}{1}\right)\left(\dfrac{1}{\sin^2 x}\right)$ $= \dfrac{1}{\cos^2 x} - 1$ $= \dfrac{1 - \cos^2 x}{\cos^2 x}$ $= \dfrac{\sin^2 x}{\cos^2 x}$ $= \tan^2 x$ $= \text{RHS}$	✓A $\tan^2 x = \dfrac{\sin^2 x}{\cos^2 x}$ ✓A $\sin^2 x + \cos^2 x = 1$ ✓A $\dfrac{1}{\cos^2 x} - 1$ ✓A $1 - \sin^2 x = \cos^2 x$ (4)
4.3.2	$\sin^2 x = 0$ $\therefore \sin x = 0$ $\therefore x = 0°$ or $x = 180°$ or where $\tan x$ is undefined $\therefore x = 90°$	✓A $0°$ and $180°$ ✓A $90°$ (2)
4.4	$5\cos x - 5\sin x - \dfrac{2}{\cos x} = 0$ $5\cos^2 x - 5\sin x\cos x - 2 = 0$ $5\cos^2 x - 5\sin x\cos x - 2\left(\sin^2 x + \cos^2 x\right) = 0$ $5\cos^2 x - 5\sin x\cos x - 2\sin^2 x - 2\cos^2 x = 0$ $3\cos^2 x - 5\sin x\cos x - 2\sin^2 x = 0$ $\left(3\cos x + \sin x\right)\left(\cos x - 2\sin x\right) = 0$ $3\cos x + \sin x = 0$ or $\cos x - 2\sin x = 0$ $\tan x = -3$ or $\tan x = \dfrac{1}{2}$ $x = 180° - \tan^{-1}(3) + k.180°$ or $x = \tan^{-1}\left(\dfrac{1}{2}\right) + k.180°$ $= 180° - 71{,}57° + k.180°$ or $x = 26{,}57° + k.180°$; $k \in \mathbb{Z}$ $= 108{,}43° + k.180$; $k \in \mathbb{Z}$	✓A multiplication by $\cos x$ ✓A introduction of $\sin^2 x + \cos^2 x$ ✓CA factors ✓CA both equations ✓CA acute angle ✓CA obtuse angle ✓A $+k.180°$; $k \in \mathbb{Z}$ (7)
		[22]

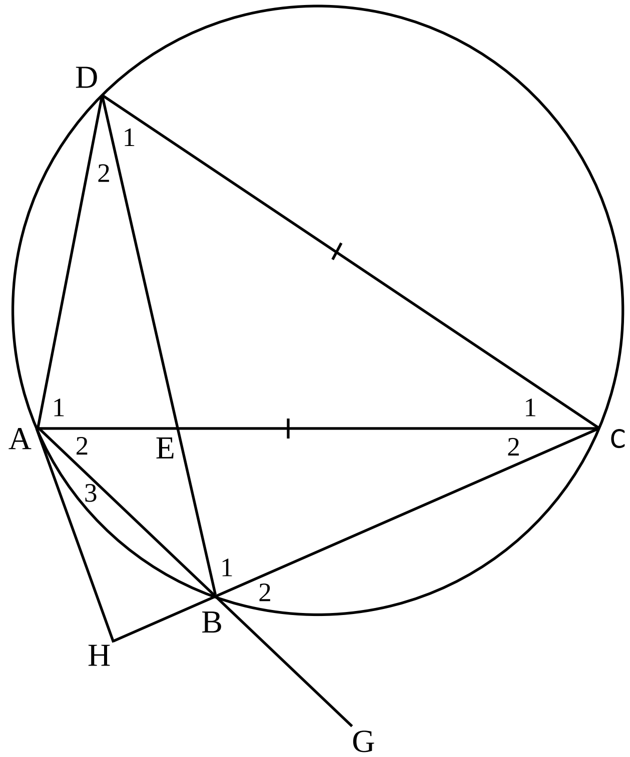
QUESTION 5

<table>
<tr><td>5.1</td><td>
</td><td></td></tr>
<tr><td></td><td>Construction:
Draw AO and extend to D.
Proof:
Let $B\hat{A}O = x$
$\therefore A\hat{B}O = x$ [angles opp = sides]
$\therefore B\hat{O}D = 2x$ [ext ∠ of Δ]
Let $C\hat{A}O = y$
Similarly: $C\hat{O}D = 2y$
$\therefore B\hat{O}C = 2x + 2y$
$= 2(x + y)$
$= 2\hat{A}$</td><td>✓construction
✓S/R
✓S/R
✓S
✓S
(5)</td></tr>
</table>

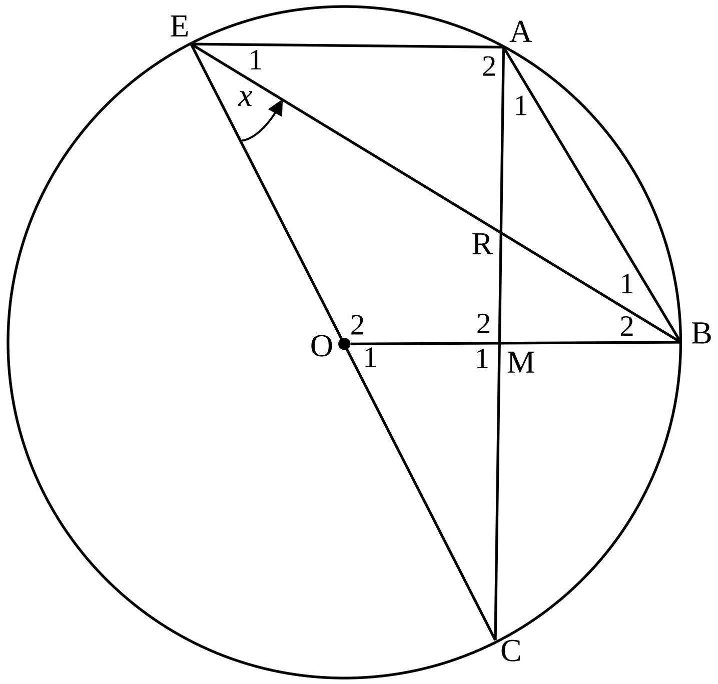


5.2.1 (a)	$\hat{D} = \hat{G} = 55°$	[∠s in the same segment]	✓S ✓R (2)
5.2.1 (b)	$\hat{O}_2 = 110°$	[∠ at centre = 2× ∠ at circumference]	✓S ✓R (2)
5.2.1 (c)	$D\hat{E}F = 90°$ $\hat{F}_1 = 35°$ $\hat{E}_3 = \hat{F}_1 = 35°$ **OR** $\hat{O}_2 = 110°$ $\hat{E}_3 = \hat{F}_1$ $\therefore 2\hat{E}_3 = 70°$ $\therefore \hat{E}_3 = 35°$	[∠ in the semi-circle] [sum of ∠s of ΔDEF] [∠s opp = sides] [proved above] [∠s opp = sides] [sum of ∠s of ΔOEF]	✓S/R ✓S/R ✓S/R (3) ✓S/R ✓S/R ✓S (3)
5.2.1 (d)	$\hat{O}_1 = 70°$ $\hat{H}_2 = 90°$ $\therefore \hat{E}_2 = 20°$ **OR** $\hat{H}_2 = 90°$ $\therefore \hat{E}_2 = 20°$	[∠s on a st. line] [adj. ∠s on a line] [sum of ∠s of a Δ] [adj. ∠s on a line] [ext. ∠ of ΔEHO]	✓S/R ✓S/R (2) ✓S/R ✓S/R (2)
5.2.2	$EH = 4$ $OE = 5$ $OH^2 = 5^2 - 4^2$ $OH^2 = 9$ $OH = 3$ units	[line from centre ⊥ to chord] [diameter = 2× radius] [Pythagoras]	✓S ✓R ✓substitution ✓answer (4)
			[18]

QUESTION 6



6.1.1	**Angles** subtended by the same chord (or arc) **in the same segment are equal**. (Also allow $\angle$s in the same segment).		✓R (1)
6.1.2(a)	$\hat{A}_1 = \hat{B}_1$ $A\hat{D}C = \hat{A}_1$ $\therefore \hat{B}_1 = A\hat{D}C$	[$\angle$s in the same segment] [$\angle$s opposite = sides]	✓S ✓S/R (2)
6.1.2(b)	$A\hat{D}C = \hat{B}_2$ $A\hat{D}C = \hat{B}_1$ $\therefore \hat{B}_1 = \hat{B}_2$	[ext. $\angle$ of a cyclic quad.] [proven above]	✓S ✓R (2)
6.1.2(c)	$\hat{A}_2 + \hat{A}_3 = A\hat{D}C$ $A\hat{D}C = \hat{B}_1$ $\therefore \hat{A}_2 + \hat{A}_3 = \hat{B}_1$ $\therefore$ AHBE is a cyclic quadrilateral	[tan chord theorem] [proven in 6.1.2(a)] [conv. ext $\angle$ of cyclic quad]	✓S ✓R ✓R (3)



6.2.1(a)	$\hat{O}_1 = 2x$	[$\angle$ at centre = $2\times\angle$ at circumference]	✓S ✓R (2)
6.2.1(b)	$\hat{A}_1 = C\hat{E}B = x$ $\hat{M}_3 = 90°$ $A\hat{B}O = 90° - x$ **OR** $\hat{O}_1 = 2x$ $\hat{M}_1 = 90°$ $\therefore \hat{C} = 90° - 2x$ $\therefore \hat{B}_1 = 90° - 2x$ But $\hat{B}_2 = B\hat{E}C = x$ $\therefore A\hat{B}O = 90° - x$	[$\angle$s in the same segment] [line from centre to midpt. of chord] [sum of $\angle$'s of ΔAMB] [proved] [line from centre to midpt. of chord] [sum of $\angle$s of ΔOMC] [$\angle$s in the same segment] [$\angle$s opposite = sides] [sum of adjacent $\angle$s]	✓S/R ✓S ✓R ✓S (4) ✓S/R ✓S ✓R ✓S (4)
6.2.2	AE || OB $\hat{O}_1 = C\hat{E}A = 2x$ $\therefore \hat{E}_1 = x$ $\hat{A}_1 = x$ $\therefore \hat{E}_1 = \hat{A}_1$ $\therefore$ AB is a tangent to circle AER	[midpoint theorem] [corresponding $\angle$s =; AE || OB] [proved] [converse tan chord theorem]	✓ S/R ✓S/R ✓S ✓R (4)

	OR		
	$\hat{C} = 90° - 2x$	[sum of $\angle$s in a Δ]	
	$\hat{A}_2 = 90°$	[$\angle$ in the semi-circle]	✓S/R
	$\therefore \hat{E}_1 = x$	[sum of $\angle$s in a Δ]	✓S/R
	$\therefore \hat{E}_1 = \hat{A}_1$		
	$\therefore$ AB is a tangent to cicle AER	[converse tan chord theorem]	✓S ✓R (4)
	OR		
	$\hat{A}_2 = 90°$	[$\angle$ in the semi-circle]	
	$\hat{M}_1 = 90°$	[line from centre to midpt. of chord]	✓S/R
	$\therefore AE \parallel OB$	[corresponding $\angle$s =]	✓S/R
	$C\hat{E}A = \hat{O}_1 = 2x$	[corresponding $\angle$s =; $AE \parallel OB$]	
	$\therefore \hat{E}_1 = x$		
	$\therefore \hat{E}_1 = \hat{A}_1$		
	$\therefore$ AB is a tangent to cicle AER	[converse tan chord theorem]	✓S ✓R (4)
6.2.3	In ΔAEC:		
	$EC^2 = AE^2 + AC^2$	[Pythagoras]	✓S
	but AC = 2AM and EC = 2EO		
	$\therefore (2EO)^2 = AE^2 + (2AM)^2$		✓S
	$\therefore 4EO^2 = AE^2 + 4AM^2$		
	In ΔAMB:		
	$AM^2 = AB^2 - MB^2$	[Pythagoras]	✓S
	$\therefore 4EO^2 = AE^2 + 4(AB^2 - MB^2)$		✓Substitution
	$\therefore AE^2 = 4EO^2 - 4AB^2 + 4MB^2$		(4)
			[22]

TOTAL MARK: 100