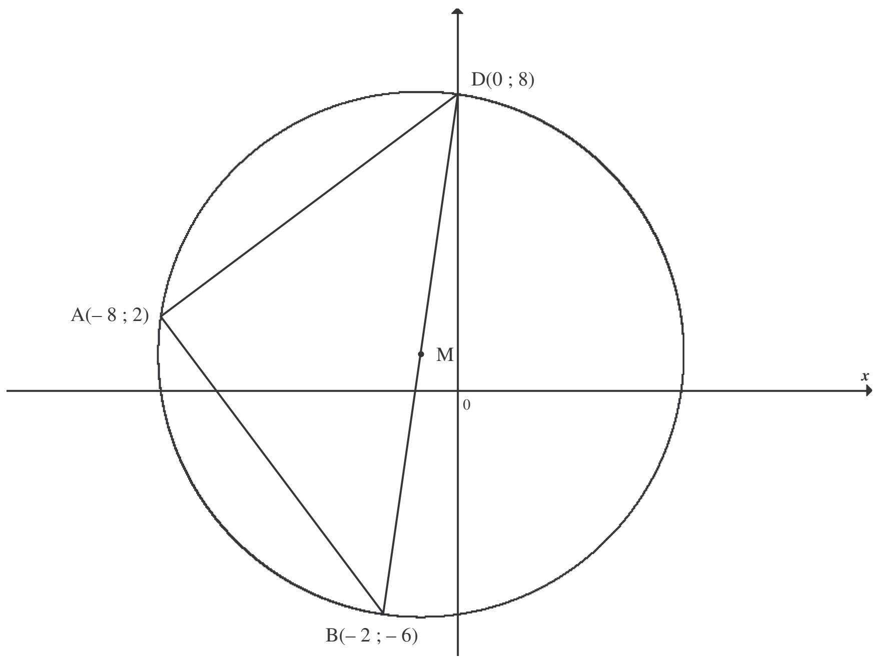
- Consistent Accuracy will apply as a general rule.
- If a candidate does a question twice and does not delete either, mark the FIRST attempt.
- If a candidate does a question, crosses it out and does not re-do it, mark the deleted attempt.

QUESTION 5



5.1	Midpoint BD $\left(\frac{0-2}{2};\frac{8-6}{2}\right)$ $= (-1; 1)$	✓x-coordinate ✓y-coordinate (2)
5.2	$y = 7(-8) + 58$ $= 2$ $\therefore$ A lies on the line.	✓substitution (1) Substitute both at the same time with justification (1)
5.3	The line $y = 7x + 58$ is a tangent to the circle at A. $m_{line} = 7$ $m_{AM} = \frac{2-1}{-8-(-1)} = -\frac{1}{7}$ $m_{line} \times m_{AM} = 7 \times -\frac{1}{7} = -1$ $\therefore$ AM $\perp$ to the line OR	✓relationship ✓✓ $m_{AM} = \frac{2-1}{-8-(-1)} = -\frac{1}{7}$ ✓ $m_{line} = 7$ ✓product (5)

NOTE:
$m_{line} = 7$ and CA gradient of AM then no relationship: 4/5

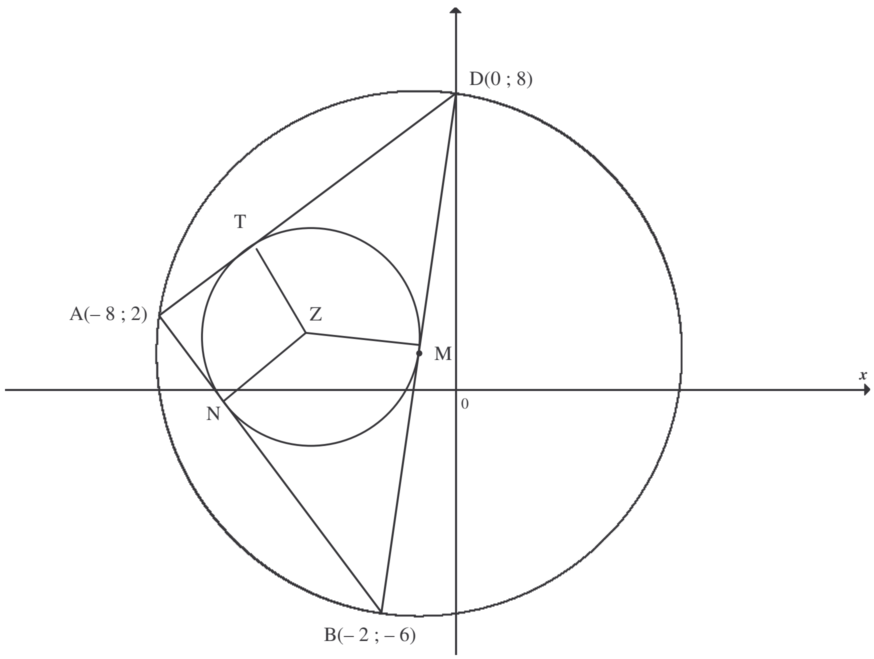
- Consistent Accuracy will apply as a general rule.
- If a candidate does a question twice and does not delete either, mark the FIRST attempt.
- If a candidate does a question, crosses it out and does not re-do it, mark the deleted attempt.

5.3 contd	**OR** $m_{BD} = 7$ $m_{line} = 7$ $\therefore$ line // diameter **OR** $(x+1)^2 + (y-1)^2 = 50$ $x^2 + 2x + 1 + y^2 - 2y + 1 = 50$ $x^2 + 2x + 1 + (7x+58)^2 - 2(7x+58) + 1 = 50$ $x^2 + 2x + 1 + 49x^2 + 812x + 3364 - 14x - 116 + 1 = 50$ $50x^2 + 800x + 3200 = 0$ $x^2 + 16x + 64 = 0$ $(x+8)^2 = 0$ $x = -8$ $y = 2$ $y = 7x + 58$ is a tangent to the circle	✓✓ $m_{BD} = 7$ ✓ $m_{line} = 7$ ✓✓conclusion (5) Note: Only lines parallel 4/5 ✓ circle equation ✓substitution of $y = 7x + 58$ ✓standard form ✓ answer ✓ tangent (5)
5.4	$\text{AD} = \sqrt{(8-2)^2 + (0+8)^2}$ $= \sqrt{36+64}$ $= 10$ $\text{AB} = \sqrt{(2+6)^2 + (-8+2)^2}$ $= \sqrt{64+36}$ $= 10$	✓ substitution ✓ answer ✓ substitution ✓ answer (4) Note: Answers $\sqrt{10}$ then 3/4

- Consistent Accuracy will apply as a general rule.
- If a candidate does a question twice and does not delete either, mark the FIRST attempt.
- If a candidate does a question, crosses it out and does not re-do it, mark the deleted attempt.

5.5	$m_{AD} = \frac{8-(2)}{0-(-8)}$ $m_{AD} = \frac{3}{4}$ $m_{AB} = \frac{2-(-6)}{-8-(-2)}$ $= -\frac{4}{3}$ $m_{AB}.m_{AD} = -\frac{4}{3} \times \frac{3}{4}$ $= -1$ $D\hat{A}B = 90°$	✓ gradient of AD ✓ gradient of AB ✓ PRODUCT (3)
	OR $BD^2 = (8+6)^2 + (0+2)^2$ $= 200$ $= AD^2 + AB^2$ $\therefore D\hat{A}B = 90°$	✓ distance formula ✓ Pythagoras ✓ conclusion (3)
	OR $a^2 = b^2 + d^2 - 2(b)(d)\cos A$ $200 = 100 + 100 - 2(10)(10)\cos A$ $0 = -200\cos A$ $A = 90°$	✓ cos rule ✓ substitution ✓ conclusion (3)
	OR $(AD)^2 = 100$ $(AB)^2 = 100$ $BD^2 = (-2-0)^2 + (-6-8)^2$ $= 4 + 196$ $= 200$ $\therefore BD^2 = AD^2 + AB^2$ $\therefore D\hat{A}B = 90°$ (Pyth)	✓ $BD^2 = 200$ ✓ $BD^2 = AD^2 + AB^2$ ✓ conclusion (3)
	OR $\hat{A} = 90°$ (angles in semi - circle)	✓ ✓✓reason (3)
5.6	$\theta = 45°$	✓ answer (1)

- Consistent Accuracy will apply as a general rule.
- If a candidate does a question twice and does not delete either, mark the FIRST attempt.
- If a candidate does a question, crosses it out and does not re-do it, mark the deleted attempt.



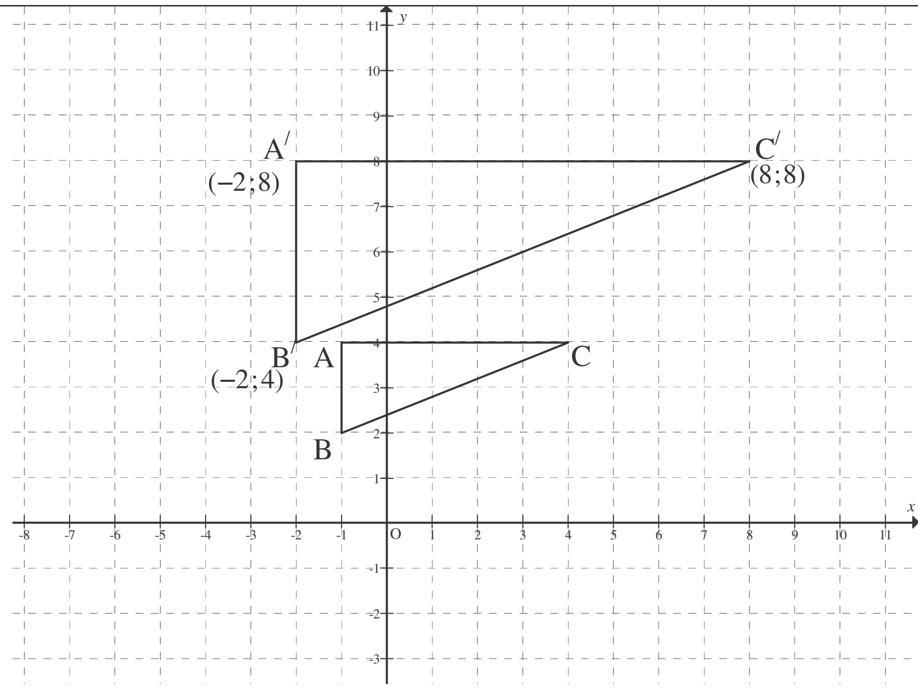
5.7	Let the radius of circle TNM be r NB = BM (properties of a kite) AN = TZ = r (TZNA is a square) NB = $10 - r$ BD = 2MB $\sqrt{(8-(-6))^2+(0-(-2))^2} = 2(10-r)$ $\sqrt{200} = 2(10-r)$ $10\sqrt{2} = 2(10-r)$ $r = 10 - 5\sqrt{2}$ $= 2,93$ **OR** $Z\hat{M}B = 90°$ $MB = \frac{1}{2}\sqrt{200}$ $= 7,07$ $\frac{ZM}{MB} = \tan 22,5°$ $ZM = 7,07 \tan 22,5°$ $= 2,93$ **OR**	✓ NB = BM ✓ AN = TZ = r ✓ NB = $10 - r$ ✓ BD = 2MB ✓BD = $\sqrt{200}$ ✓answer (6) ✓tan radius theorem ✓✓MB ✓✓tan 22,5° ✓answer (6)

- Consistent Accuracy will apply as a general rule.
- If a candidate does a question twice and does not delete either, mark the FIRST attempt.
- If a candidate does a question, crosses it out and does not re-do it, mark the deleted attempt.

5.7 contd	$MB^2 = (-1+2)^2 + (1+6)^2$ $= 1 + 49$ $= 50$ $MB = \sqrt{50}$ $\frac{\text{ZM}}{\text{MB}} = \tan 22{,}5°$ $\text{ZM} = 7{,}07 \tan 22{,}5°$ $= 2{,}93$	✓✓MB ✓✓tan 22,5° ✓✓answer (6)
	OR By a well known formula Area ΔABD = $r \times$ (semi—perimeter) $\frac{1}{2} \times 10 \times 10 = r \times \frac{1}{2}(20 + \sqrt{200})$ $50 = r(10 + 5\sqrt{2})$ $r = 2{,}93$	✓✓ formula ✓ $\sqrt{200}$ ✓✓ answer (6)
	OR $MB = \sqrt{50}$ (radius of circle) $NB = \sqrt{50}$ (adjacent sides of kite) AB = 10 AN = $10 - \sqrt{50}$ = 2,93 But TANZ is a square ∴ AN = ZN ∴ radius = 2,93	✓MB ✓ NB ✓✓AN = 2,93 ✓ square ✓answer (6)

- Consistent Accuracy will apply as a general rule.
- If a candidate does a question twice and does not delete either, mark the FIRST attempt.
- If a candidate does a question, crosses it out and does not re-do it, mark the deleted attempt.

QUESTION 6

6.1.1	$4 \times 5 = 20$ squared units	✓✓answer $2^2 \times 5$ 1/2 If $2 \times 5 = 10$ 0/2 (2)
6.1.2	$(x\,;\,y) \rightarrow (2x\,;\,2y)$ Note: If candidate state: coordinates times two 2/2	✓ $2x$ ✓ $2y$ (2) If $(kx\,;\,ky)$:1/2 If $2(x\,;\,y)$: 2/2
6.1.3		✓ coordinates A' ✓ coordinates B' ✓ coordinates C' (3) If diagram not drawn but coordinates correctly given: 1/3 If coordinates correctly plotted but not joined: 2/3
6.1.4	Not rigid. The shape remains the same, whilst the size is changed /enlarged **Note:** Shape remains the same: 1/2 Only the shape remains the same: 2/2	✓✓same shape and different size (2) not rigid only 2/2 just enlarged 0/2
6.2	Reflection about the line $y = x$: $(x\,;\,y) \rightarrow (y\,;\,x)$ Rotate clockwise about the origin: $(y\,;\,x) \rightarrow (x\,;\,-y)$ Translate 2 left and 3 down: $(x\,;\,-y) \rightarrow (x-2\,;\,-y-3)$ **OR** General rule: $(x\,;\,y) \rightarrow (x-2\,;\,-y-3)$	Mark per coordinate ✓✓ reflection ✓✓rotation ✓✓translation (6) **Answer only:** Full marks **[15]**

- Consistent Accuracy will apply as a general rule.
- If a candidate does a question twice and does not delete either, mark the FIRST attempt.
- If a candidate does a question, crosses it out and does not re-do it, mark the deleted attempt.

	OR The first 2 transformations in the given order is the same as the reflection in the x-axis i.e. $(x\,;y) \to (x\,;-y)$ Then the translation gives us $(x\,;y) \to (x\,;-y) \to (x-2\,;\,-y-3)$ **NOTE:** If just given: $(x\,;y) \to (x-2\,;y-3)$: 2/6 If using $(x\,;y) \to (y\,;x)$ ✓✓ $(x\,;y) \to (y\,;-x)$ ✓ $(x\,;y) \to (x-2\,;y-3)$ ✓ throughout :4/6	If learner starts with $(x\,;y)$ and continue to use $(x\,;y)$ for the second and third transformation 4/6

QUESTION 7

7.1	$T^{/}\ (x\cos\theta - y\sin\theta\,;\,y\cos\theta + x\sin\theta)$	✓ x coordinate ✓ y coordinate (2) Clock-wise formula: 0/2
7.2	$A^{/}\ (p\cos135° - q\sin135°\,;\,q\cos135° + p\sin135°)$ If clockwise rotation: $A^{/}\ (p\cos135° + q\sin135°\,;\,q\cos135° - p\sin135°)$	✓ x coordinate ✓ y coordinate (2) CA from 7.1
7.3	$x' = p\cos(135°) - q\sin(135°)$ $-1-\sqrt{2} = -p\cos45° - q\sin45°$ $-1-\sqrt{2} = -p\left(\frac{\sqrt{2}}{2}\right) - q\left(\frac{\sqrt{2}}{2}\right)$ $-1-\sqrt{2} = -\frac{\sqrt{2}}{2}p - \frac{\sqrt{2}}{2}q$.................(1) and $y' = y\cos(135°) + p\sin(135°)$ $1-\sqrt{2} = -q\cos45° + p\sin45°$ $1-\sqrt{2} = q\left(-\frac{\sqrt{2}}{2}\right) + p\left(\frac{\sqrt{2}}{2}\right)$ $1-\sqrt{2} = -\frac{\sqrt{2}}{2}q + \frac{\sqrt{2}}{2}p$..................(2) (1) + (2): $-2\sqrt{2} = -\sqrt{2}q$ $q = 2$	✓ equating ✓ substitution ✓ equating ✓ substitution $\frac{\sqrt{2}}{2}$ ✓ solving simultaneously

- Consistent Accuracy will apply as a general rule.
- If a candidate does a question twice and does not delete either, mark the FIRST attempt.
- If a candidate does a question, crosses it out and does not re-do it, mark the deleted attempt.

		✓ answer for q
	Substitute $q = 2$ into …..(1) $-1-\sqrt{2} = -\frac{\sqrt{2}}{2}p - \frac{\sqrt{2}}{2}(2)$ $-1 = -\frac{\sqrt{2}}{2}p$ $p = \sqrt{2}$ $\therefore \text{A} = (\sqrt{2}\,;2)$ Note: If not left in surd form: 6/7	✓ answer for p (7)
	OR	
	$x' = p\cos(135°) - q\sin(135°)$ $-1-\sqrt{2} = -p\cos 45° - q\sin 45°$ $-1-\sqrt{2} = -p\left(\frac{\sqrt{2}}{2}\right) - q\left(\frac{\sqrt{2}}{2}\right)$ $-1-\sqrt{2} = -\frac{\sqrt{2}}{2}p - \frac{\sqrt{2}}{2}q$................(1)	✓ equating ✓ substitution
	and $y' = y\cos(135°) + p\sin(135°)$ $1-\sqrt{2} = -q\cos 45° + p\sin 45°$ $1-\sqrt{2} = q\left(-\frac{\sqrt{2}}{2}\right) + p\left(\frac{\sqrt{2}}{2}\right)$ $-0{,}41 = -0{,}71q + 0{,}71p$..................(2)	✓ equating ✓ substitution $\frac{\sqrt{2}}{2}$
	(1) + (2): $-2\sqrt{2} = -\sqrt{2}q$ $q = 2$ Substitute $q = 2$ into …..(1) $-2{,}41 = -0{,}71p - 0{,}71q$ (2) $1{,}42p = 2$ $p = 1{,}41$ $\therefore \text{A} = (\sqrt{2}\,;2)$ Note: If not left in surd form: 6/7	✓ solving simultaneously ✓ answer for q ✓ answer for p (7)
	OR	

- Consistent Accuracy will apply as a general rule.
- If a candidate does a question twice and does not delete either, mark the FIRST attempt.
- If a candidate does a question, crosses it out and does not re-do it, mark the deleted attempt.

	$-\frac{\sqrt{2}}{2}(p+q) = -1-\sqrt{2}$ $p+q = -\frac{2}{\sqrt{2}}(-1-\sqrt{2})$ $p+q = \sqrt{2}+2$ and $\frac{1}{\sqrt{2}}(p-q) = 1-\sqrt{2}$ $p-q = \sqrt{2}-2$ $p+q = \sqrt{2}+2$ $2p = 2\sqrt{2}$ $p = \sqrt{2}$ $q = 2$	✓ $-\frac{\sqrt{2}}{2}(p+q) = -1-\sqrt{2}$ ✓ substitution ✓ $\frac{1}{\sqrt{2}}(p-q) = 1-\sqrt{2}$ ✓ substitution $\frac{\sqrt{2}}{2}$ ✓ solving simultaneously ✓ answer for q ✓ answer for p (7)
	OR A(p ; q) is obtained from A/ by a rotation through 135° in a clockwise direction $p = (-1-\sqrt{2})\cos(-135°) - (1-\sqrt{2})\sin(-135°)$ $= (-1-\sqrt{2})\left(-\frac{1}{\sqrt{2}}\right) - (1-\sqrt{2})\left(-\frac{1}{\sqrt{2}}\right)$ $= \frac{2}{\sqrt{2}}$ $= \sqrt{2}$ $q = (1-\sqrt{2})\cos(-135°) + (-1-\sqrt{2})\sin(-135°)$ $= (1-\sqrt{2})\left(-\frac{1}{\sqrt{2}}\right) + (-1-\sqrt{2})\left(-\frac{1}{\sqrt{2}}\right)$ $= \frac{2\sqrt{2}}{\sqrt{2}}$ $= 2$ $\therefore A = (\sqrt{2}\,;2)$	✓ substituting $(-1-\sqrt{2})$ ✓ substitution $\frac{1}{\sqrt{2}}$ ✓ equating ✓ substitution $\frac{1}{\sqrt{2}}$ ✓ substituting $(-1-\sqrt{2})$ ✓ answer for q ✓ answer for p (7)