Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
Provinsie van die Oos Kaap: Department van Onderwys
Porafensie Ya Kapa Botjahabela: Lefapha la Thuto

NATIONAL
SENIOR CERTIFICATE

GRADE 11

MATHEMATICS P2

JUNE EXAMINATION 2025

MARKS : 100

TIME: : 2 hr

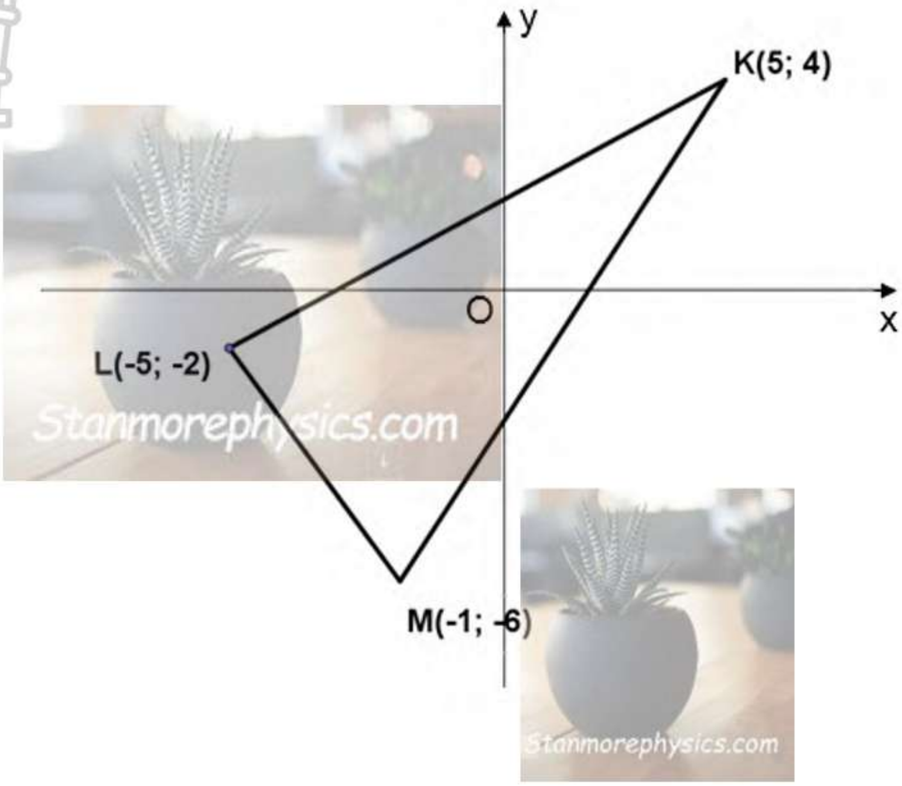
This question paper consists of 8 pages.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of 5 questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams graphs, et cetera which you have used in determining the answers.
4. Answers only will NOT necessarily be awarded full marks.
5. If necessary round off your answers to TWO decimal places unless stated otherwise.
6. Diagrams are not necessarily drawn to scale.
7. You may use an approved scientific calculator (non-programmable and no graphical) unless stated otherwise.
8. Write neatly and legibly.

QUESTION 1

In the diagram below $L(-5;-2), M(-1;-6)$ and $K(5;4)$ are the vertices of ΔKLM in a Cartesian plane.



1.1 Calculate the coordinates of N, the midpoint of MK (2)

1.2 Determine the gradient of LM (2)

1.3 Determine the equation of the line NP parallel to LM passing through N. (3)

1.4 Determine the angle of inclination of LM (2)

1.5 Show that $\angle KLM = \angle KML$ (5)

1.6 Show that $LM = 2NP$, where P is on KL (6)

[20]

QUESTION 2

2.1 If $8\tan A = -15$ and $\sin A > 0$, determine

Determine without the use of a calculator and with aid of a diagram the value of $\cos A$ (5)

2.2 If $\sin 54^\circ = p$, express the following in terms of p without using a calculator.

2.2.1 $\sin(-126^\circ)$ (4)

2.2.2 $\tan 234^\circ$ (2)

2.3 Simplify without the use of a calculator

2.3.1 $\dfrac{\cos(180^\circ - x).\tan(-x).\sin^2(90^\circ - x)}{\sin(180^\circ - x)} + \sin^2 x$ (7)

2.3.2 $\sin^2 23^\circ + \sin^2 67^\circ$ (2)

[20]

QUESTION 3

3.1 Determine the general solution of

$2\sin(x + 15^\circ) = \cos 203{,}5^\circ$ (5)

3.2 Solve without using a calculator

$\cos(2x - 10^\circ) = \sin(x + 40^\circ)$ where $x \in [-180^\circ; 180^\circ]$ (7)

3.3 Consider the following identity :

$$\frac{1 + 2\sin\theta.\cos\theta}{\sin\theta + \cos\theta} = \sin\theta + \cos\theta$$

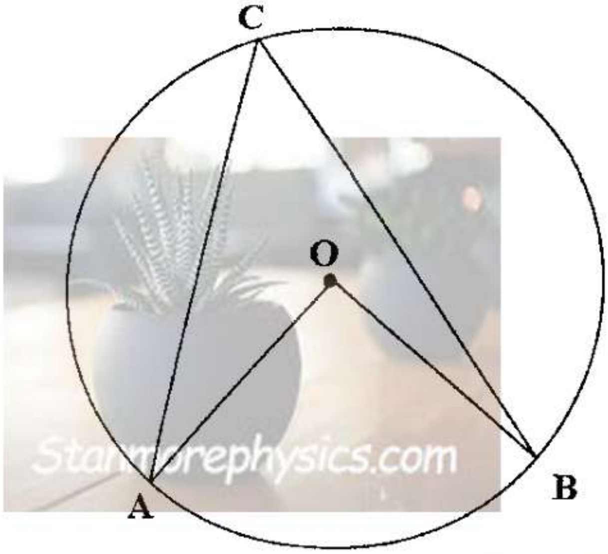
3.3.1 Prove the identity (4)

3.3.2 For which values of x is the identity undefined for $x \in (-180^\circ; 180\ )$ (5)

[21]

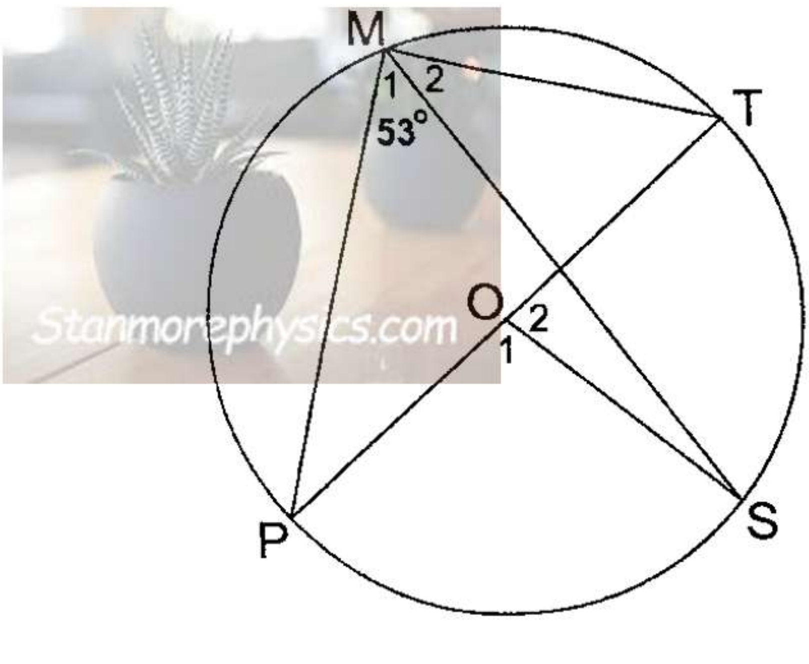
QUESTION 4

4.1 In the diagram below A, B and C are points on the circle



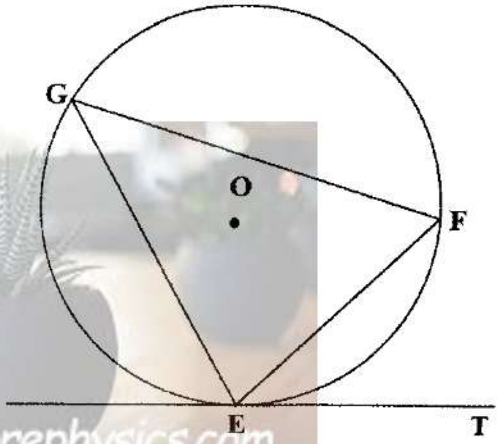
Use the diagram to prove the Theorem which states that : if O is the centre of the circle, then $A\hat{O}B = 2\hat{C}$ (6)

4.2 M, P, S and T are points on a circle with centre O, PT is a diameter. MP, MT, MS are drawn. $\hat{M} = 53^\circ$



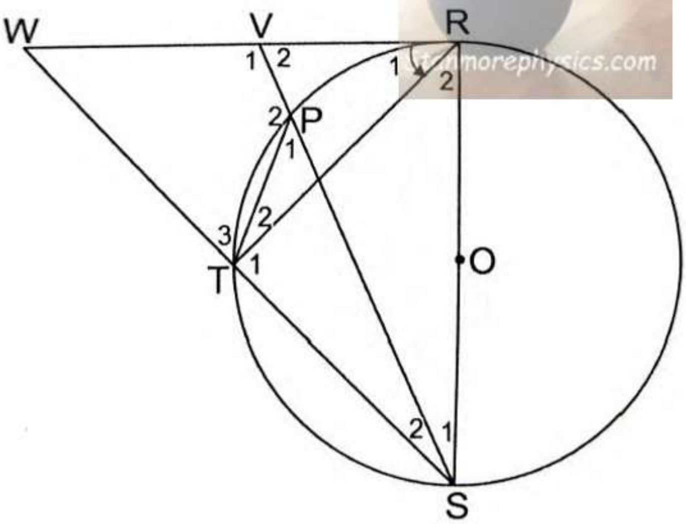
Determine with reasons, the size of $\hat{O}_2$ (4)

4.3 In the diagram below, O is the centre of the circle GEF. Use the diagram to prove the Theorem which states that:



If ET is a tangent to the circle, then $F\hat{E}T = \hat{G}$ (7)

4.4 RS is a diameter of the circle with centre O. Chord ST is produced to W. Chord SP produced Meets the tangent RW at V. $\hat{R}_1 = 55^\circ$.



Calculate the size of :

4.4.1 $W\hat{R}S$ (1)

4.4.2 $\hat{W}$ (2)

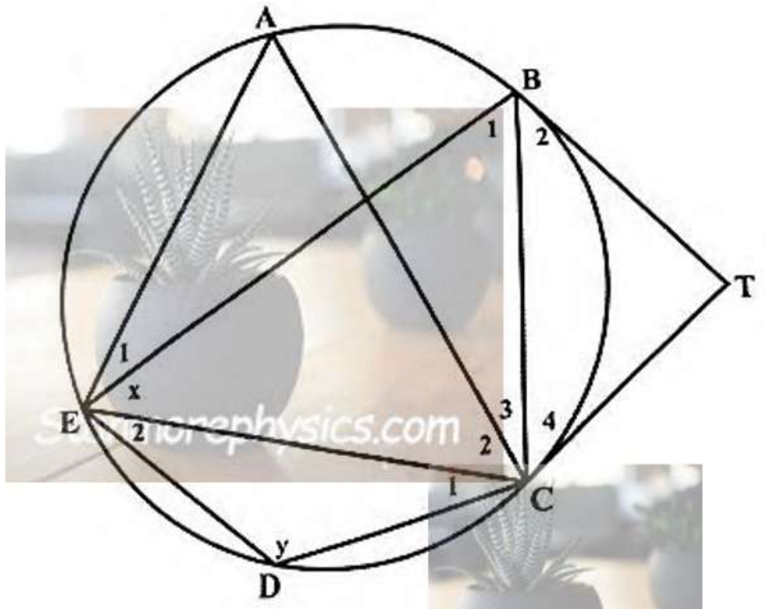
4.4.3 $\hat{P}_1$ (3)

4.4.4 Prove that: $\hat{V}_1 = P\hat{T}S$ (4)

[27]

QUESTION 5

In the diagram below, a circle is drawn passing through A, B, C, D and E. The tangent at B and C meet at T. $B\hat{E}C = x$ and $\hat{D} = y$.



Express each of the following in terms of x and /or y.

5.1 $\hat{B}_2$ (2)

5.2 $\hat{C}_4$ (3)

5.3 $\hat{T}$ (3)

5.4 $\hat{A}$ (2)

5.5 $\hat{B}_1$ (2)
[12]

INFORMATION SHEET: MATHEMATICS

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1+ni) \qquad A = P(1-ni) \qquad A = P(1-i)^n \qquad A = P(1+i)^n$$

$$T_n = a + (n-1)d \qquad S_n = \frac{n}{2}\left(2a + (n-1)d\right)$$

$$T_n = ar^{n-1} \qquad S_n = \frac{a\left(r^n - 1\right)}{r-1} \ ; \quad r \neq 1 \qquad S_\infty = \frac{a}{1-r} \ ; \ -1 < r < 1$$

$$F = \frac{x\left[(1+i)^n - 1\right]}{i} \qquad P = \frac{x\left[1 - (1+i)^{-n}\right]}{i}$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad M\left(\frac{x_1 + x_2}{2} ; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

$$(x-a)^2 + (y-b)^2 = r^2$$

$$\text{In } \Delta ABC: \ \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \qquad a^2 = b^2 + c^2 - 2bc.\cos A$$

$$area\,\Delta ABC = \frac{1}{2} ab.\sin C$$

$$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta \qquad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta \qquad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad \sin 2\alpha = 2\sin\alpha.\cos\alpha$$

$$\bar{x} = \frac{\sum x}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx \qquad b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
Provinsie van die Oos Kaap: Departement van Onderwys
Porafensie Ya Kapa Botjahabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS P2

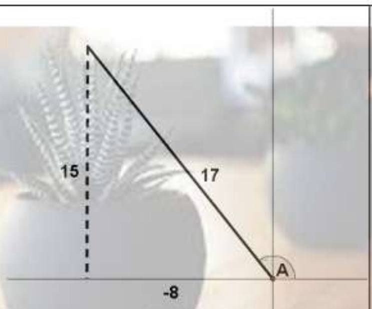
JUNE EXAMINATION 2025

MARKING GUIDELINE

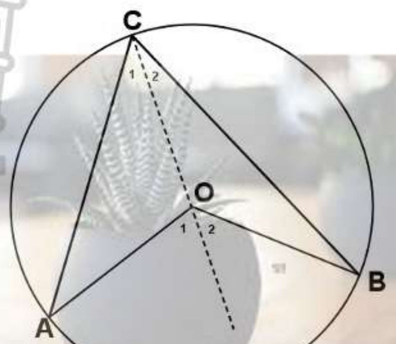
MARKS : 100

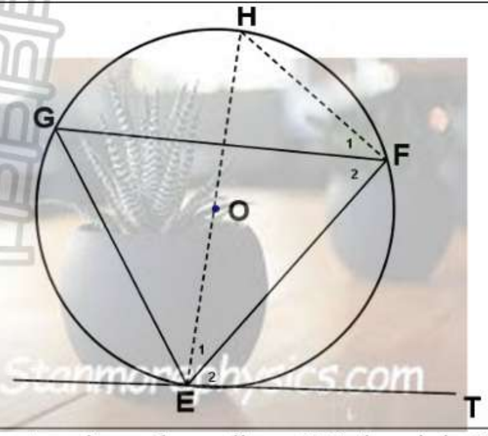
This Marking Guideline consists of 7 pages

QUESTION1		
1.1	$N\left(\frac{5-1}{2};\frac{4-6}{2}\right)$ $=(2;-1)$	✓ x – coordinate ✓ y – coordinate (2)
1.2	$m_{ML}=\frac{-6+2}{-1+5}$ $=-1$	✓ subst. in corr. orm ✓ answer (2)
1.3	$m_{NP}=m_{ML}$ (NP// ML) $=-1$ $y=-x+c$ $-1=-(2)+c$ $c=1$ $y=-x+1$	✓ $m_{NP}=-1$ ✓ subst. ✓ answer (3)
1.4	$\tan\theta=-1$ $\theta=135^{\circ}$	✓ $\tan\theta=-1$ ✓ answer (2)
1.5	$LK=\sqrt{(5+5)^2+(4+2)^2}$ $=2\sqrt{34}$ $MK=\sqrt{(5+1)^2+(4+6)^2}$ $=2\sqrt{34}$ $\therefore LK=MK$ $\angle KLM=\angle KML$ (L's opp. = sides)	✓ subst. in corr. Form ✓ LK value ✓ subst. in corr. Form ✓ MK value ✓ $\therefore LK=MK$ (5)
1.6	$LM=\sqrt{(-5+1)^2+(-2+6)^2}$ $=4\sqrt{2}$ But $P\left(\frac{5-5}{2};\frac{4-2}{2}\right)$ (mid-point theorem, PN//ML) $p(0;1)$ $\therefore PN=\sqrt{(2-0)^2+(-1-1)^2}$ $=2\sqrt{2}$ $\therefore LM=2PN$	✓ subst in corr. Form. ✓LM value ✓ Reason ✓ P coordinates ✓subst. in corr. form. ✓ PN value (6)
		[20]

QUESTION 2		
2.1	$8\tan A = -15$ $\tan A = -\frac{15}{8}$  $r = \sqrt{(-8)^2 + (15)^2}$ $= 17$ $\cos A = -\frac{8}{17}$	✓ dividing by 8 ✓ r – value ✓✓ diagram ✓ $\cos A$ - value (5)
2.2.1	$\sin 54^\circ = p$ $x = \sqrt{1-p^2}$ $\sin(-126^\circ)$ $= -\sin 126$ $= -\sin 54^\circ$ $= -p$	✓ x – value ✓ $-\sin 126$ ✓ $-\sin 54^\circ$ ✓ answer (4)
2.2.2	$\tan 234^\circ$ $= \tan 54^\circ$ $= \frac{p}{\sqrt{1-p^2}}$	✓ $\tan 54^\circ$ ✓ answer (2)
2.3.1	$\frac{\cos(180^\circ - x).\tan(-x).\sin^2(90^\circ - x)}{\sin(180^\circ - x)} + \sin^2 x$ $= \frac{(-\cos x).(-\tan x).\cos^2 x}{\sin x} + \sin^2 x$ $= \frac{-\cos x.-\frac{\sin x}{\cos x}.\cos^2 x}{\sin x} + \sin^2 x$ $= \cos^2 x + \sin^2 x$ $= 1$	✓ $-\cos x$ ✓ $-\tan x$ ✓ $\cos^2 x$ ✓ $\sin x$ ✓ $-\frac{\sin x}{\cos x}$ ✓ simplification ✓ 1 (7)
2.3.2	$\sin^2 23^\circ + \sin^2 67^\circ$ $= \sin^2 23^\circ + \cos^2 23^\circ$ $= 1$	✓ $\cos^2 23^\circ$ ✓ 1 (2)
		[20]

QUESTION 3		
3.1	$2\sin(x+15^\circ)=\cos 203{,}5^\circ$ $2\sin(x+15^\circ)=-0.92$ $\sin(x+15^\circ)=-0.46 \quad RA=27.39^\circ$ $x+15^\circ=180^\circ+27.39^\circ+k.360^\circ$ or $x+15^\circ=360^\circ-27.39^\circ+k.360^\circ \quad k\in Z$ $x=192.39^\circ+k.360^\circ$ or $x=317.61^\circ+k.360^\circ$ $k\in Z$ **OR** $2\sin(x+15^\circ)=\cos 203{,}5^\circ$ $2\sin(x+15^\circ)=-0.92$ $\sin(x+15^\circ)=-0.46$ $x+15^\circ=\sin^{-1}(-0.46)+k.360^\circ$ or $x+15^\circ=180^\circ-\sin^{-1}(-0.46)+k.360^\circ$ $x=-42.39^\circ+k.360^\circ$ or $x=192.39^\circ+k.360^\circ$ $k\in Z$	✓ -0.92 ✓ -0.46 ✓ $x=192.39^\circ+k.360^\circ$ ✓ $x=317.61^\circ+k.360^\circ$ ✓ $k\in Z$ (5) **OR** ✓ -0.92 ✓ -0.46 ✓ $x=-42.39^\circ+k.360^\circ$ ✓ $x=192.39^\circ+k.360^\circ$ ✓ $k\in Z$ (5)
3.2	$\cos(2x-10^\circ)=\sin(x+40^\circ)$ $\cos(2x-10^\circ)=\cos[90^\circ-(x+40^\circ)]$ $\cos(2x-10^\circ)=\cos(50^\circ-x)$ $2x-10^\circ=50^\circ-x+k{,}360^\circ$ or $2x-10^\circ=-50^\circ+x+k{,}360^\circ \quad k\in Z$ $3x=60^\circ+k{,}360^\circ$ or $x=-40^\circ+k.360^\circ \quad k\in Z$ $x=20^\circ+k.120^\circ$ $x=-100^\circ;-40^\circ;20^\circ;140^\circ$	✓ $\cos[90^\circ-(x+40^\circ)]$ ✓ $2x-10^\circ=50^\circ-x+k{,}360^\circ$ ✓ $2x-10^\circ=-50^\circ+x+k{,}360^\circ$ ✓ simplification ✓ $x=-100^\circ$ ✓ $x=20^\circ$ ✓ $x=-40^\circ$ (7)
3.3.1	$L.H.S=\dfrac{1+2\sin\theta.\cos\theta}{\sin\theta+\cos\theta}$ $=\dfrac{\sin^2\theta+\cos^2\theta+2\sin\theta.\cos\theta}{\sin\theta+\cos\theta}$ $=\dfrac{(\sin\theta+\cos\theta)(\sin\theta+\cos\theta)}{\sin\theta+\cos\theta}$ $=\sin\theta+\cos\theta \qquad =RHS$	✓ identity ✓ ✓ factorizing ✓ answer (4)
3.3.2	$\sin\theta+\cos\theta=0$ $\sin\theta=-\cos\theta$ $\dfrac{\sin\theta}{\cos\theta}=-1$ $\tan\theta=-1$ $\theta=\tan^{-1}(-1)+180^\circ.k$ $\theta=-45^\circ,135^\circ,$	✓ transposing ✓ dividing by cos ✓ identity ✓ -45° ✓ 135° (5)
		[21]

QUESTION 4		
4.1	 Construction : join C to O and produced	✓ construction
	In ΔAOC $\hat{C}_1 = \hat{A}$ (*OC = OA, radii*) $\hat{O}_1 = \hat{C}_1 + \hat{A}$ (*ext.* $\angle$ *of a* Δ) $\therefore \hat{O}_1 = 2\hat{C}_1$	✓ S/R ✓ S/R
	In ΔBOC $\hat{C}_2 = \hat{B}$ (*OC = OB, radii*) $\hat{O}_2 = \hat{C}_2 + \hat{B}$ (*ext.* $\angle$ *of a* Δ) $\therefore \hat{O}_2 = 2\hat{C}_2$ $\therefore \hat{O}_1 + \hat{O}_2 = 2\hat{C}_1 + 2\hat{C}_2$ $\therefore \hat{O} = 2\hat{C}$ $A\hat{O}B = 2\hat{C}$	✓ S/R ✓ S/R ✓S (6)
4.2	$\hat{O}_1 = 106^\circ$ ($\angle$ at centre = 2 × *L* at circum.) $\therefore \hat{O}_2 = 74^\circ$ ($\angle$s on a str, line) OR $\hat{M}_2 = 37^\circ$ ($\angle$ subt. by diameter) $\therefore \hat{O}_2 = 74^\circ$ ($\angle$ at centre = 2 × $\angle$ at circum.)	✓ S ✓ R ✓ S ✓ R (4) ✓ S ✓ R ✓ S ✓ R (4)

4.3		
	Construction : draw diam. EH then join H to F $\hat{F}_1 + \hat{F}_2 = 90^\circ$ (∠subt. by diam.) $\hat{E}_1 + \hat{H}_2 = 90^\circ$ (sum of L's in a Δ) Also $\hat{E}_1 + \hat{E}_2 = 90^\circ$ (tan ⊥ radius) $\hat{E}_1 + \hat{H}_2 = \hat{E}_1 + \hat{E}_2$ $\hat{E}_2 = \hat{H}_2$ but $\hat{G} = \hat{H}_2$ (∠s on the same segm.) $F\hat{E}T = \hat{G}$	✓ constr. ✓ S/R ✓ S/R ✓ S/R ✓ S ✓ S ✓R (7)
4.4.1	$W\hat{R}S = 90^\circ$ (tan ⊥ radius)	✓S/R (1)
4.4.2	$\hat{T}_1 = 90^\circ$ (∠subt. by diam.) $\hat{W} + \hat{R}_1 = \hat{T}_1$ (ext. ∠ of Δ) $\hat{W} = 90^\circ - 55^\circ$ $= 35^\circ$	✓ S/R ✓ answer (2)
4.4.3	$\hat{P}_1 = \hat{R}_2$ (∠'s a the same segm.) $\hat{R}_2 = 90^\circ - 55^\circ$ $= 35^\circ$ $\therefore \hat{P}_1 = 35^\circ$	✓ S/R ✓ S ✓ S (3)
4.4.4	$\hat{P}_1 = \hat{W} = 35^\circ$ (proved) $\therefore PVWT$ is a cyclic quad. (conv., ext ∠= int. opp. ∠) $\hat{V}_1 = P\hat{T}S$ (ext. L of a cyclic quad.)	✓ S ✓ S ✓R ✓ R (4)
		[27]

QUESTION 5		
5.1	$\hat{B}_2 = x$ (tan – chord Theorem)	✓ S ✓ R (2)
5.2	$BT = CT$ (tang. from same point) $\hat{C}_4 = x$ ($\angle$s opp. = sides)	✓ S ✓ R ✓ S/R (3)
5.3	$\hat{T} = 180^\circ - \hat{B}_2 - \hat{C}_4$ (sum of $\angle$s of a Δ) $\therefore \hat{T} = 180^\circ - 2x$	✓ S ✓ R ✓ S (3)
5.4	$\hat{A} = 180^\circ - y$ (opp. $\angle$'s of a cyclic quad.)	✓ S ✓ R (2)
5.5	$\hat{B}_1 = 180^\circ - y$ (opp. $\angle$'s of a cyclic quad.) **OR** $\hat{B}_1 = 180^\circ - y$ ($\angle$ on the same segment)	✓ S ✓ R (2) **OR** ✓ S ✓ R (2)
		[12]

TOTAL: 100 MARKS