Name and Surname : .... set/file

Grade/Class : 11/.........

Mathematics Teacher : ......Solns......

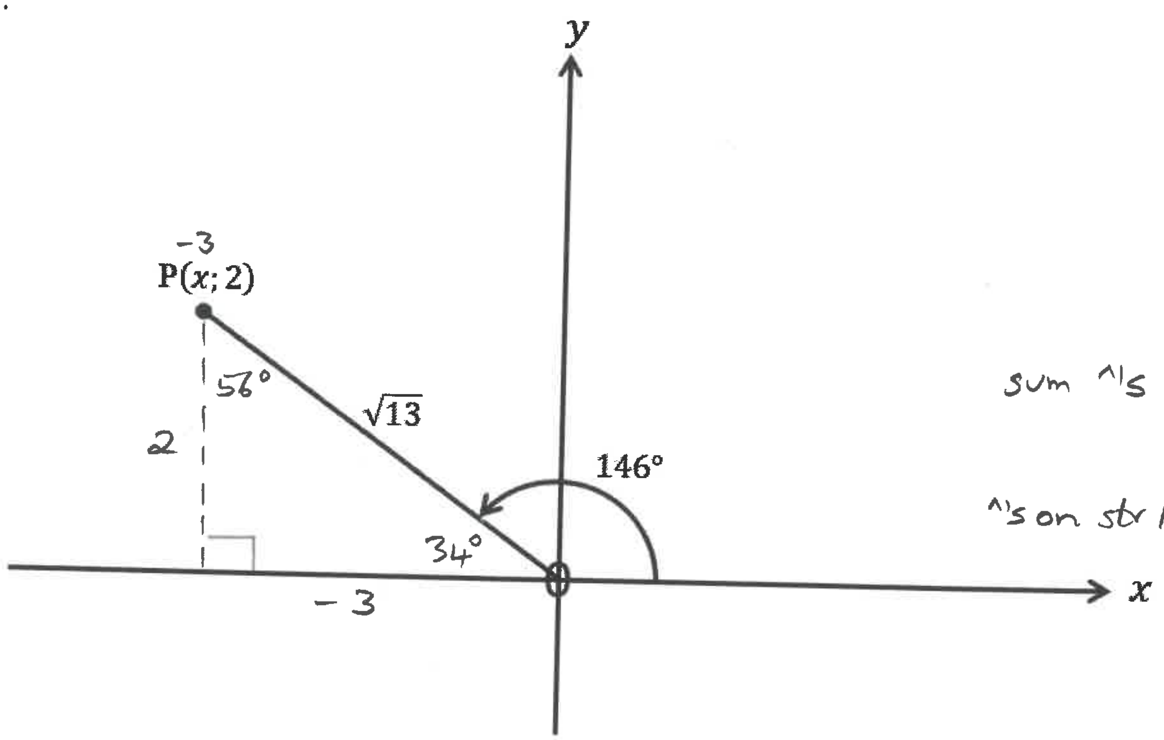
June Examination 2025
Paper 2

ANSWER BOOKLET

100

QUESTION 1

1.1.



sum ^'s in Δ = 180°

^'s on str line = 180°

1.1.1	$x^2 + (2)^2 = (\sqrt{13})^2$ Pythag	
	$x^2 = 9$	
	$x = \pm 3$ reject +	
	$\therefore x = -3$ ✓	1
1.1.2. (a)	$\cos 146° = \frac{x}{r}$	
	$= \frac{-3}{\sqrt{13}}$ ✓	1
(b)	$\sin^2(-146°)$	
	$= [\sin(-146°)]^2$	
	$= [-\sin 146°]^2$	
	$= [-\frac{y}{r}]^2$	

$$= \left[-\frac{2}{\sqrt{13}} \right]^2$$

$$= \frac{4}{13}$$ ✓ 1

(c) $\tan 56^\circ = \frac{o}{a}$

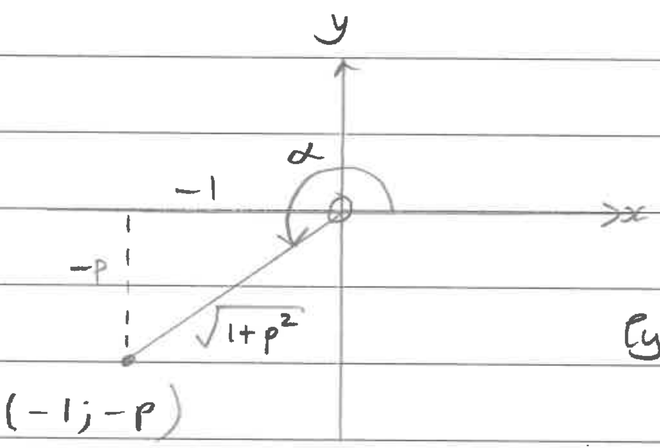
$= \frac{3}{2}$ ✓ NB + !!! 1

1.2.1. $\tan \alpha = p = \frac{p}{1}$ $\quad \frac{y}{x}$ + $\frac{-p}{-1}$

$\sin \alpha$ –

x, y ✓

r ✓



Pythag 2

1.2.2. $\cos(-\alpha - 180^\circ) = \cos(-\alpha + 180^\circ)$

$= \cos(180^\circ - \alpha)$

$= -\cos \alpha$ ✓

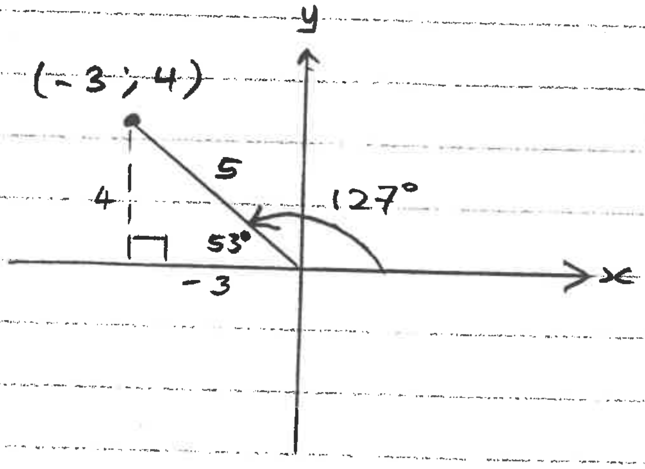
$= -\frac{x}{r}$

$= -\frac{-1}{\sqrt{1+p^2}}$

$= \frac{1}{\sqrt{1+p^2}}$ ✓ 2

NB x, y, r vs o, a, h

- When θ is in standard position ($127°$)
  ie measured from the direction of the positive x-axis anti clockwise



we use the definitions of x, y, r

eg $\cos 127° = \frac{x}{r}$

$= \frac{-3}{5}$

- When θ is NOT in standard position ($53°$)
  we use the definitions of o, a, h.

★ Now, o, a, h are the lengths of sides $\therefore$ always POSITIVE + !

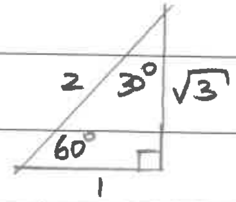
eg $\cos 53° = \frac{a}{h}$

$= \frac{3}{5}$ NOT $\frac{-3}{5}$!!

☺ $\cos 53° \longrightarrow \cos$ Q I $\therefore$ ⊕ !!

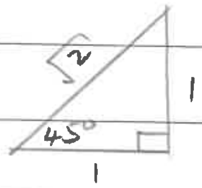
QUESTION 2

2.1.1. (a)



1

(b)



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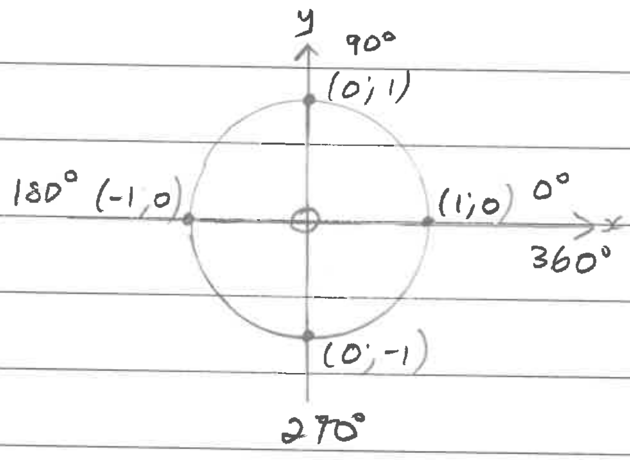
(c)



$r = 1$

1

2.1.2 (a) $\tan(-1575°) = \tan 225°$

$= \tan(180° + 45°)$

$= \tan 45°$

$= \frac{o}{a}$ 2.1.1 (b)

$= \frac{1}{1}$

$= 1$

2

2.1.2. (b) $\sin 1710° = \sin 270°$

$= \frac{y}{r}$

$= \frac{-1}{1}$ 2.1.1 (c)

$= -1$

2

(c) • $\cos(-\theta) = \cos\theta$

• $\sin(-\theta) = -\sin\theta$

• $\cos(\theta - 270°) = \cos(\theta + 90°)$

$= \cos(90° + \theta)$

$= -\sin\theta$

$\therefore \frac{1 - (\cos\theta)}{(-\sin\theta)(-\sin\theta)} = \frac{1 - \cos\theta}{\sin^2\theta}$

$= \frac{1 - \cos\theta}{1 - \cos^2\theta}$

$= \frac{1 - \cos\theta}{(1 - \cos\theta)(1 + \cos\theta)}$

$= \frac{1}{1 + \cos\theta}$

6

(d) • $\sin 210° = \sin(180° + 30°)$

$= -\sin 30°$

$= -\frac{o}{h}$ 2.1.1 (a)

$= -\frac{1}{2}$

• $\cos 193° = \cos(270° - 77°)$

$= -\sin 77°$

• $\tan 103° = \tan(180° - 77°)$

$= -\tan 77°$

	$\bullet\ \sin 347^\circ = \sin(270^\circ + 77^\circ)$	
	$= -\cos 77^\circ$	
	$\therefore \dfrac{(-\frac{1}{2})(-\sin 77^\circ)}{(-\tan 77^\circ)(-\cos 77^\circ)} = \dfrac{\frac{1}{2}.\sin 77^\circ}{\frac{\sin 77^\circ}{\cos 77^\circ}.\cos 77}$	
	$= \frac{1}{2}$	7
2.2.1	Let $A = \frac{x}{3}$	
	$5 + \sqrt{3}\tan A = 4\cos 4320^\circ$	
	$\tan A = -\frac{\sqrt{3}}{3}$	
	ref $\hat{}$ $= 30^\circ$	
	tan − in	
	II : $A = 150^\circ + k.180^\circ$	
	$\frac{x}{3} = 150^\circ + k\ 180^\circ$	
	$x = 450^\circ + k.540^\circ;\ k \in \mathbb{Z}$	2
2.2.2	$x = -90^\circ$ or 450°	1
2.3.1	$\sin x = 0,8$	
	ref $\hat{}$ $= 53,13...^\circ$	
	sin + in	
	I : $x = 53,13^\circ + k.360^\circ;\ k \in \mathbb{Z}$ or	
	II : $x = 126,87^\circ + k.360^\circ;\ k \in \mathbb{Z}$	2

2.3.2. Let $A = x + 10°$

$2 \sin A - 3 \cos A = 0$

$\div \cos A$: $\frac{2 \sin A}{\cos A} - \frac{3 \cos A}{\cos A} = \frac{0}{\cos A}$

$2 \tan A - 3 = 0$

$\tan A = 3/2$ ✓

$\text{ref} \angle = 56,30\ldots°$

tan + in

I : $A = 56,30\ldots° + k.180°$

$\theta + 10° = 56,30\ldots° + k\,180°$

$\theta = 46,31° + k.180° ; k \in \mathbb{Z}$ ✓ 2

2.3.3. Let $A = 2(x+10°)$ $B = 3(x+10°)$

$= 2x + 20°$ $= 3x + 30°$

$\sin A + \cos B = 0$

$\sin A = -\cos B$ ✓

$\sin(270° - B)$ $\sin(270° + B)$

III IV

$\sin A = \sin(270° - B)$ or $\sin A = \sin(270° + B)$

$A = 270° - B + k\,360°$	$A = 270° + B + k\,360°$
✓ $2x + 20° = 270° - (3x + 30°) + k.360°$	✓ $2x + 20° = 270° + (3x + 30°) + k.360°$
$2x + 20° = 270° - 3x - 30° + k.360°$	$2x + 20° = 270° + 3x + 30° + k.360°$
$5x = 220° + k.360°$	$-x = 280° + k\,360°$
✓ $x = 44 + k.72° ; k \in \mathbb{Z}$	✓ $x = -280° - k.360° ; k \in \mathbb{Z}$ 5

2.3.4.

$2\cos^2 x = -3\sin x$

$2(1-\sin^2 x) = -3\sin x$ ✓

$2 - 2\sin^2 x = -3\sin x$

$0 = 2\sin^2 x - 3\sin x - 2$ ✓

$= (\sin x - 2)(2\sin x + 1)$ ✓

$\therefore \sin x = 2$ or ✓ $\sin x = -\frac{1}{2}$

no soln

ref ∠ $= 30°$

sin − ive

III : $x = 210° + k.360°;\ k \in \mathbb{Z}$ ✓

or

IV : $x = 330° + k.360°;\ k \in \mathbb{Z}$ ✓

6

2.4.

$8 - 2\sin x \cos x - 23\cos^2 x$

$= 8.1 - 2\sin x \cos x - 23\cos^2 x$

$= 8(\sin^2 x + \cos^2 x) - 2\sin x\cos x - 23\cos^2 x$ ✓

$= 8\sin^2 x + 8\cos^2 x - 2\sin x\cos x - 23\cos^2 x$

$= 8\sin^2 x - 2\sin x\cos x - 15\cos^2 x$ ✓

$= (2\sin x - 3\cos x)(4\sin x + 5\cos x)$ ✓

3

2.5.1. LHS

$$= \frac{1}{\tan^2 x} - \cos^2 x$$

$$= \frac{1}{\frac{\sin^2 x}{\cos^2 x}} - \cos^2 x$$

$$= \frac{\cos^2 x}{\sin^2 x} - \frac{\cos^2 x}{1}$$

$$= \frac{\cos^2 x - \cos^2 x \cdot \sin^2 x}{\sin^2 x}$$

$$= \frac{\cos^2 x(1 - \sin^2 x)}{\sin^2 x}$$

$$= \frac{\cos^2 x \cdot \cos^2 x}{\sin^2 x}$$

$$= \frac{\cos^4 x}{\sin^2 x}$$

$= \text{RHS}$

4

2.5.2 ID not valid when:

$\cdot \tan x = \text{UD}$ and $\tan^2 x = 0$ and $\sin^2 x = 0$

$\frac{\sin x}{\cos x} = \text{UD}$ | $\frac{\sin^2 x}{\cos^2 x} = 0$ | done!

$\cos x = 0$ | $\sin^2 x = 0$

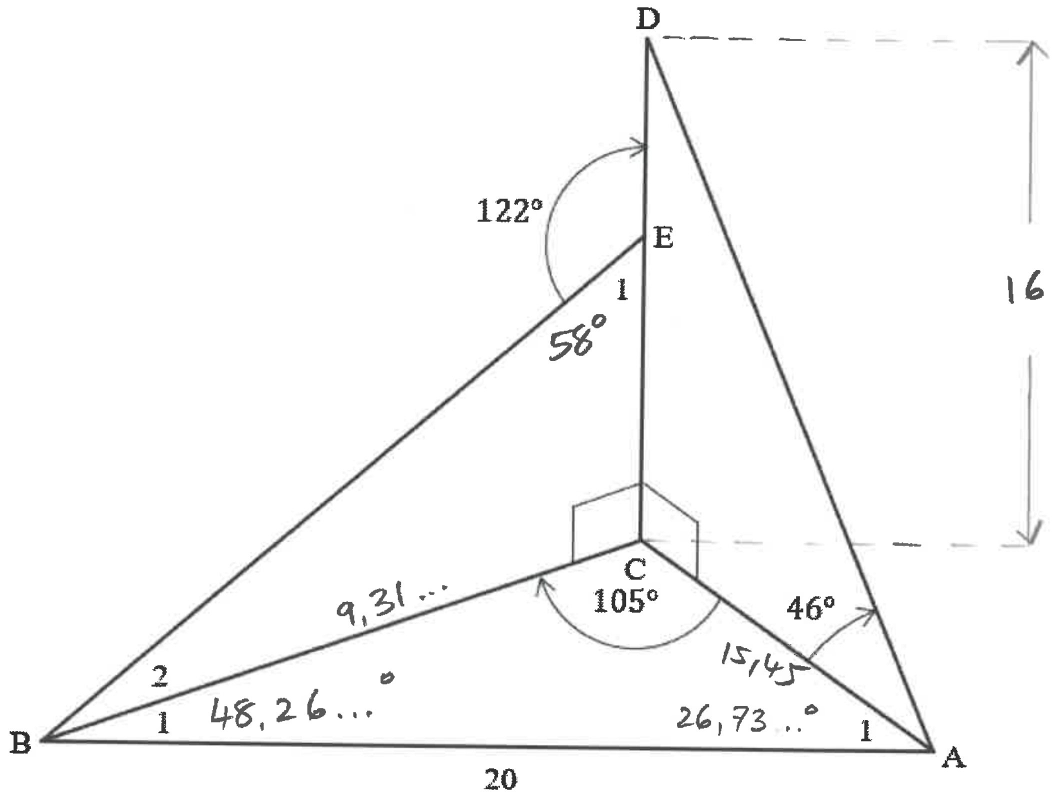
$x = 90° + k.180°; k \in \mathbb{Z}$ | $\sin x = 0$

$x = k.180°; k \in \mathbb{Z}$

2

QUESTION 3

3.



3.1	$\tan 46^\circ = \frac{16}{AC}$ ✓	
	$AC \tan 46^\circ = 16$	
	$AC = \frac{16}{\tan 46^\circ}$	
	$= 15,45$ m ✓	2
3.2	$\frac{\sin \hat{B}_1}{15,45} = \frac{\sin 105^\circ}{20}$ ✓	
	$\sin \hat{B}_1 = 0,746...$	
	ref $\hat{}$ $= 48,26...^\circ$	
	Sin + in	
	I : $\hat{B}_1 = 48,26...^\circ$ ✓	
	or	
	II : reject	

$\therefore \hat{A}_1 = 26,73...^\circ$ sum ∠'s in Δ = 180°

$$\frac{BC}{\sin 26,73...^\circ} = \frac{20}{\sin 105^\circ}$$

$BC = 9,31...$

$\hat{E}_1 = 58^\circ$ ∠'s on str line = 180°

$$\tan 58^\circ = \frac{9,31..}{CE}$$

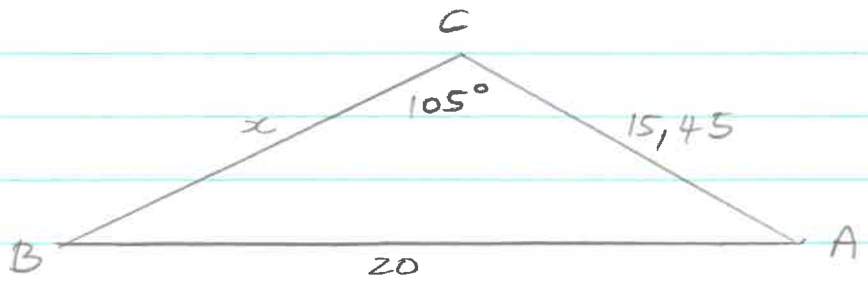
$CE \tan 58^\circ = 9,31..$

$$CE = \frac{9,31...}{\tan 58^\circ}$$

$= 5,82$ m

6

3.2.



$$20^2 = x^2 + 15,45^2 - 2x\ 15,45 \cos 105°$$

$$400 = x^2 + 238,7025 - 7,997\ldots x$$

$$0 = x^2 - 7,997\ldots x - 161,2975$$

$$x = \frac{-(-7,997\ldots) \pm \sqrt{(-7,997\ldots)^2 - 4(1)(-161,2975)}}{2(1)}$$

$$= \frac{7,997\ldots \pm \sqrt{709,15\ldots}}{2}$$

$$= 9,31\ldots \quad \text{or} \quad \cancel{-17,31\ldots}$$

reject

$E_1 = 58°$ ∠'s on str line $= 180°$

$$\tan 58° = \frac{9,31\ldots}{CE}$$

$$CE \cdot \tan 58° = 9,31\ldots$$

$$CE = \frac{9,31\ldots}{\tan 58}$$

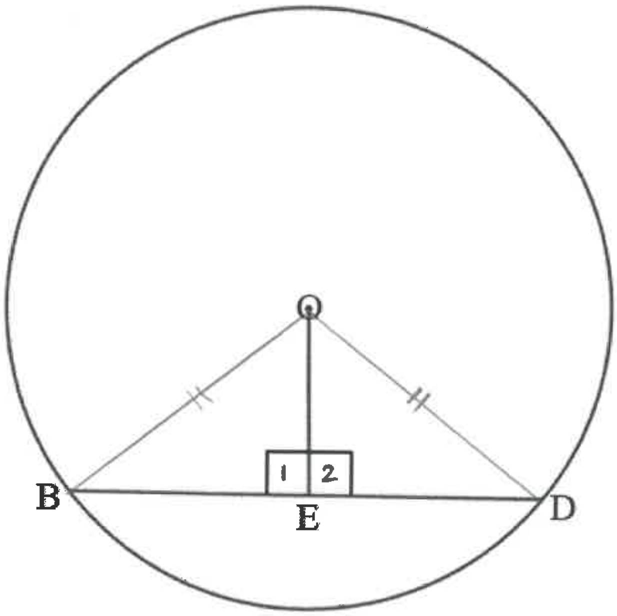
$$= 5,82 \text{ m}$$

6

— pg 11.1 —

QUESTION 4

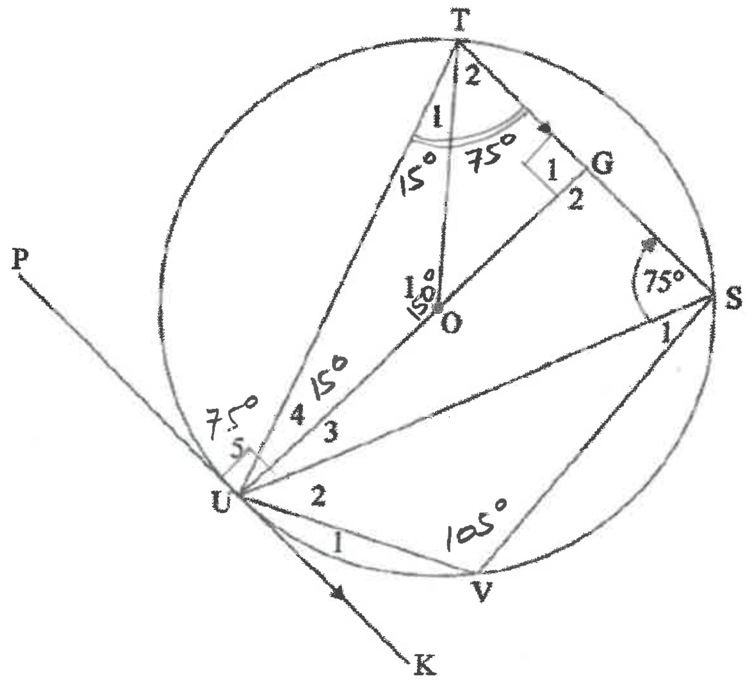
4.1.



✓ constr

	In Δ's OBE, ODE		
	1. $OE = OE$ ✓SR common		
	2. $OB = OD$ ✓SR radii		
	3. $\hat{E}_1 = \hat{E}_2 = 90°$ ✓S given		
	$\therefore \Delta OBE \equiv \Delta ODE$ ✓SR RHS		
	$\therefore BE = ED$ $\Delta OBE \equiv \Delta ODE$	5	

4.2.

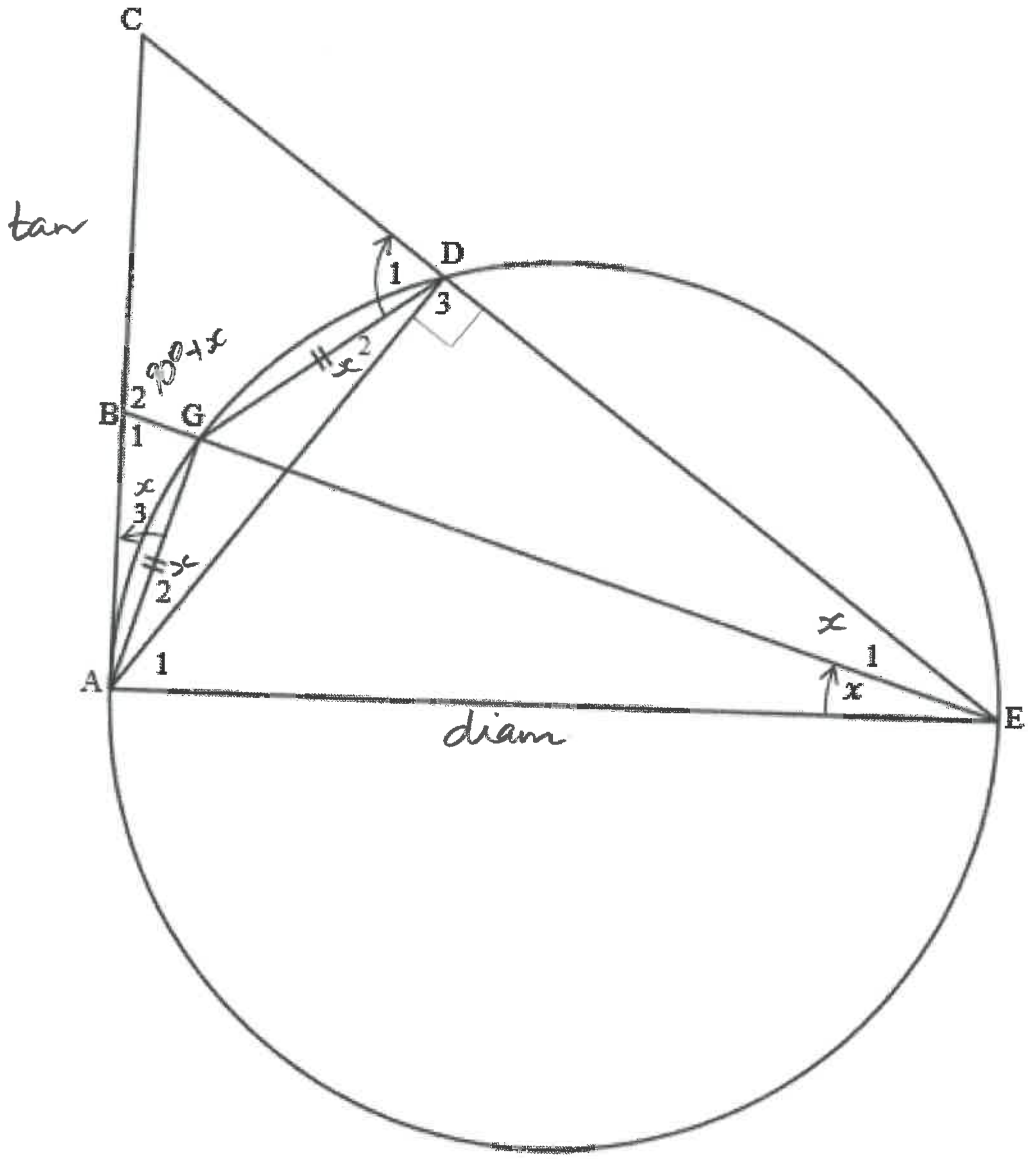


4.2.1	(a) $\hat{O}_1 = 150°$ ✓S ✓R ∠ @ centre = 2× ∠@ circumf		2
	(b) $\hat{U}_5 = 75°$ ✓S ✓R tan chord thm		2
	(c) $\hat{U}_4 + \hat{U}_5 = 90°$ ✓R tan ⊥ rad		
	$\therefore \hat{U}_4 = 15°$ ✓S		
	$OU = OT$ radii		
	$\therefore \hat{T}_1 = 15°$ ✓SR ∠'s opp = sides		3

4.2.1.	(d) $\hat{T}_1 + \hat{T}_2 = 75°$ ✓SR alt ∠'s =, TS ∥ PK	
	$\therefore \hat{V} = 105°$ ✓S ✓R opp ∠s cyclic quad = 180°	3
	(e) $\hat{G}_1 = 90°$ ✓SR coint ∠'s = 180°, TS ∥ PK	1
4.2.2.	$TG = GS$ ✓R line from centre ⊙ ⊥ to chord	
	$\therefore TG = 5$ units ✓S	2

QUESTION 5

5.

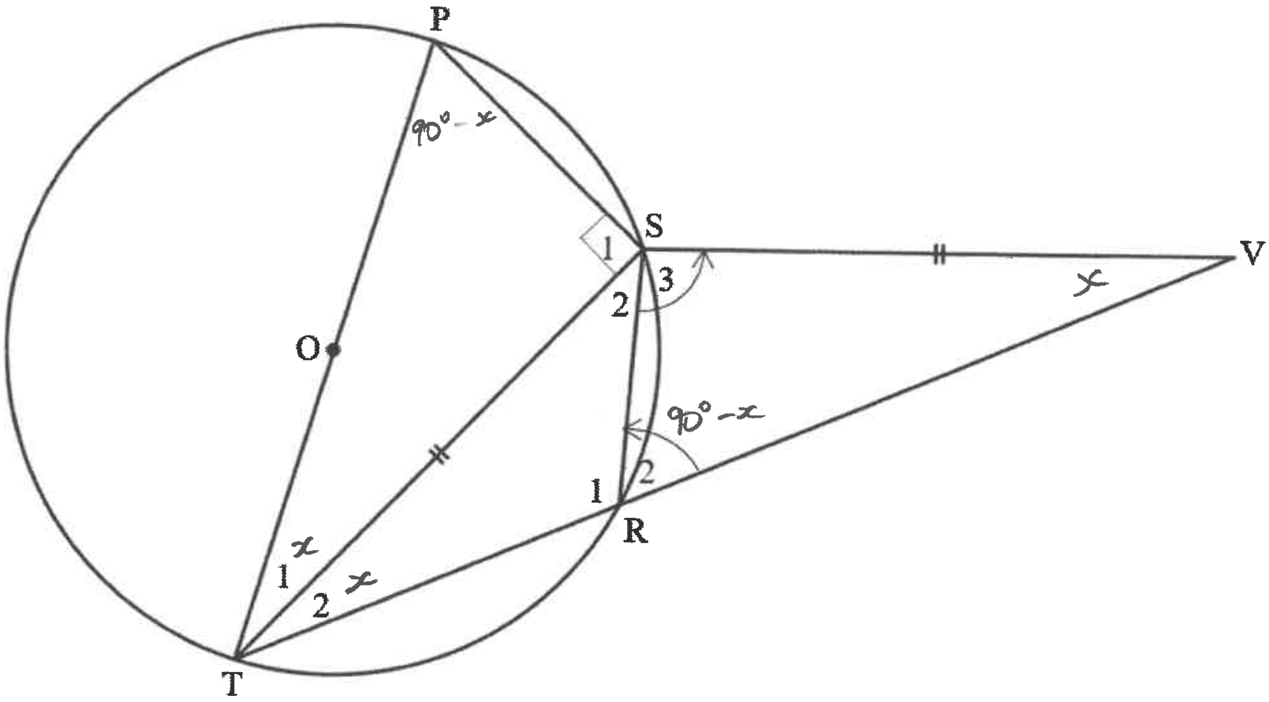


5.1	$\hat{E}_1 = x$	✓S ✓R	= chords = ∠'s @ circumf	
	$\hat{A}_3 = x$	✓SR	tan chord thm	
	$\hat{D}_2 = x$	✓S ✓R	∠'s in same ⊙ segm =	
	$\hat{A}_2 = x$	✓SR	∠'s opp = sides	6

5.2.	$\hat{D}_3 = 90°$ ✓SR ^ in semi ⊙ = 90°	
	$\hat{D}_2 + \hat{D}_3 = 90° + x$ ✓	
	$\hat{A}_1 + \hat{A}_2 + \hat{A}_3 = 90°$ {tan ⊥ rad	
	$\therefore \hat{B}_2 = 90° + x$ ✓SR {ext ^ △	
	$\therefore \hat{B}_2 = \hat{D}_2 + \hat{D}_3$ both = $90° + x$	
	∴ BCDG is a ✓R conv ext ^ cyclic	
	cyclic quad quad	4

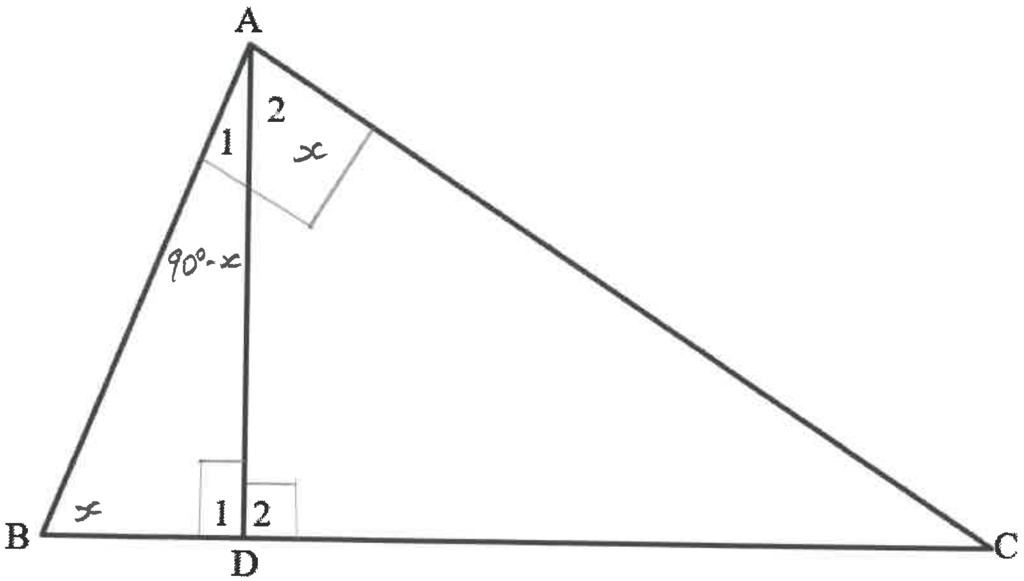
QUESTION 6

6.1.



	Let $\hat{T}_1 = \hat{T}_2 = x$		
	$\hat{S}_1 = 90°$	$\angle$ in semi $\odot = 90°$	
	$\therefore \hat{P} = 90° - x$ ✓SR	sum $\angle$'s in $\Delta = 180°$	
	$\therefore \hat{R}_2 = 90° - x$ ✓S ✓R	ext $\angle$ cyclic quad	
	$\hat{V} = x$ ✓SR	$\angle$'s opp = sides	
	$\hat{S}_3 + x + 90° - x = 180°$	sum $\angle$'s in $\Delta = 180°$	
	$\hat{S}_3 = 90°$ ✓SR		
	$\therefore$ RV is diam ✓R	conv $\angle$ in semi	
	of $\odot$ RSV	$\odot = 90°$	6

6.2.



Let $\hat{A}_2 = x$

$\therefore \hat{A}_1 = 90° - x$ ✓S

$\therefore \hat{B} + 90° - x = 90°$ ext ∠ Δ

$\therefore \hat{B} = x$ ✓SR

$\therefore \hat{A}_2 = \hat{B}$ both $= x$

$\therefore$ AC is a tan ✓R conv tan chord thm

to ⊙ ABD

3

ADDITIONAL SPACE