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Grade/Class : 12/.........   **Mathematics Teacher** : ....

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150

ANSWER BOOKLET
Paper 2
12 June 2017

QUESTION 1

1	2	3	4	5	6	7	8	9	10	11	12	13
17	20	21	25	29	30	35	41	56	60	70	85	88

20,53   68,23   M

1.1.	1.1. $\bar{x} = 44,38$ ✓	1
1.1.	1.2. $M = T_{\frac{1}{2}(1+13)}$	
	$= T_7$	
	$= 35$ ✓	1
1.1.	2. $\bar{x} - M = 44,38 - 35$ ✓	
	$= 9,38$	
	> 0	
	$\therefore$ data is positively skewed ✓	
	(skewed to the right)	2

1.2.	1. $\sigma = 23,85$ ✓	1
	2. $\bar{x} - \sigma$ $\qquad$ $\bar{x} + \sigma$	
	$= 44,38 - 23,85$ $\qquad$ $= 44,38 + 23,85$	
	$= 20,53$ ✓both $\qquad$ $= 68,23$	
	$\therefore \frac{8}{13} \times 100$ ✓	
	$= 61,54\ \%$ ✓	3

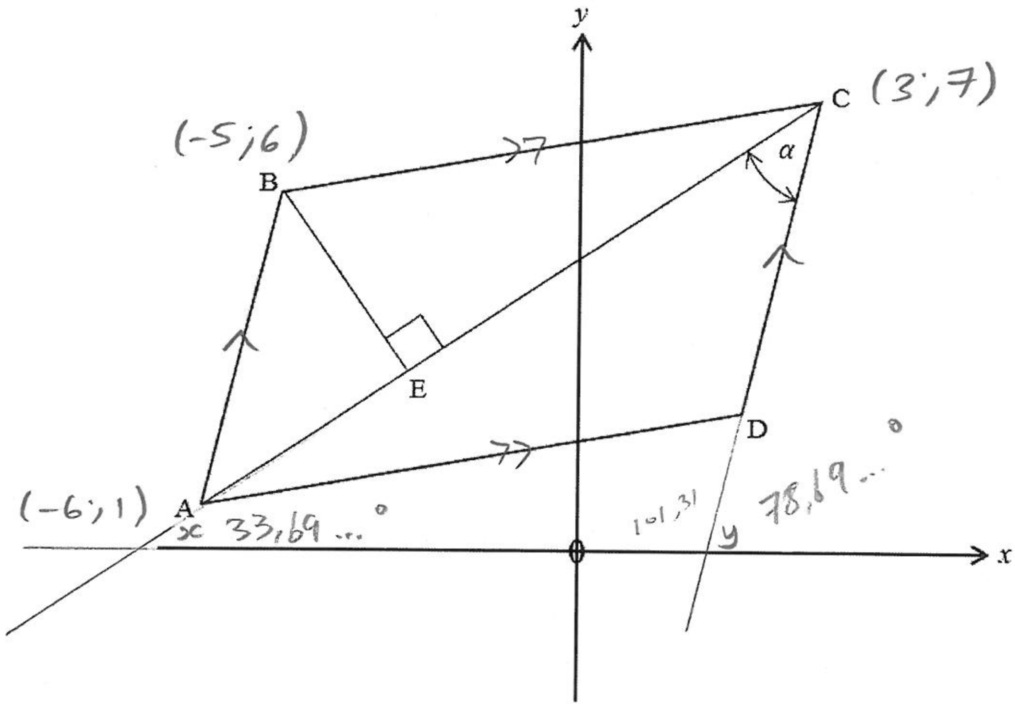
QUESTION 2

2.1.	63 ✓ learners	1
2.2.	$a = 10 - 0 = 10$ ✓	
	$b = 57 - 42 = 15$ ✓	2
2.3.	$40 < x \leq 50$ ✓	1
2.4.	$\leq 53 = 47$ ✓	
	$\therefore > 53 = 63 - 47$	
	$= 16$ ✓ ± 1	2

QUESTION 3

3.1.	$a = 0{,}90$ ✓	
	$b = 0{,}85$ ✓	
	$\therefore y = 0{,}90 + 0{,}85x$ ✓	3
3.2.	Yes ✓, $r = 0{,}87$ ✓ reflecting a	
	strong correlation.	2
3.3.	$30 = 0{,}90 + 0{,}85x$	
	$x = 34{,}23\ldots$ $\frac{582}{17}$	
	≈ 34 ✓	1

QUESTION 4

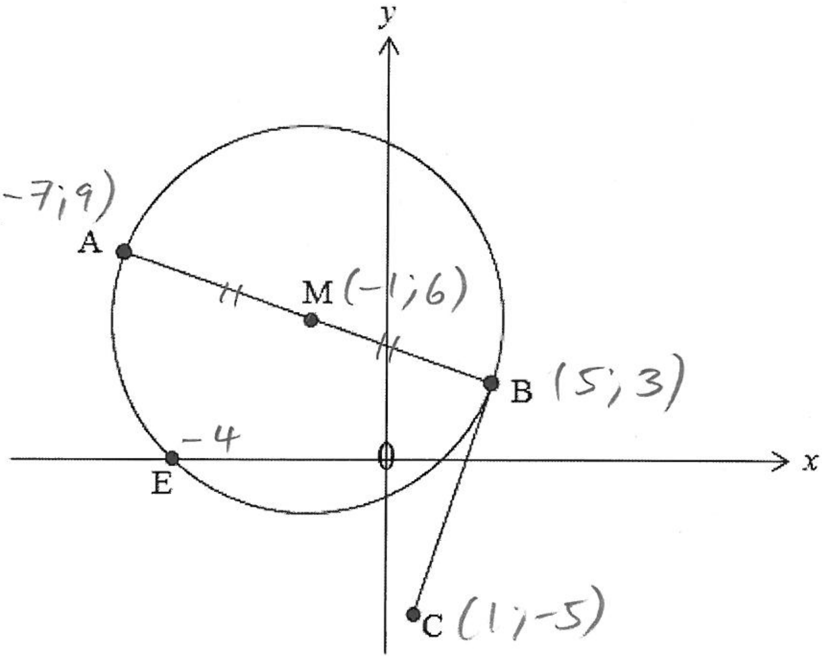


4.1.	1. $m_{AC} = \frac{7-1}{3-(-6)}$ A(-6;1) C(3;7)		
	$= \frac{2}{3}$ ✓		
	$y = \frac{2}{3}x + c$		
	sub A(-6;1)		
	$1 = \frac{2}{3}(-6) + c$ ✓		
	$5 = c$		
	$\therefore y = \frac{2}{3}x + 5$ ✓		3
4.1.	2. $m_{BE} = -\frac{3}{2}$ ✓ B(-5;6) E		
	$y = -\frac{3}{2}x + c$		
	sub B(-5;6)		

	$6 = -\frac{3}{2}(-5) + c$ ✓	
	$-\frac{3}{2} = c$	
	$\therefore \; y = -\frac{3}{2}x - \frac{3}{2}$ ✓	3
4.2.	$y = \frac{2}{3}x + 5 \qquad y = -\frac{3}{2}x - \frac{3}{2}$	
	Solving simult.	
	$\frac{2}{3}x + 5 = -\frac{3}{2}x - \frac{3}{2}$ ✓	
	$\frac{13}{6}x = -\frac{13}{2}$ ✓	
	$x = \frac{-13}{2} \div \frac{13}{6}$	
	$= -3$	
	$\therefore \; y = \frac{2}{3}(-3) + 5$ ✓	
	$= 3$	
	$\therefore \; E(-3;3)$	3
4.3.	1. AC $\qquad A(-6;1) \; C(3;7)$	
	$= \sqrt{(7-1)^2 + (3-(-6))^2}$ ✓	
	$= \sqrt{117}$ ✓	2
4.3.	2. BE $\qquad B(-5;6) \; E(-3;3)$	
	$= \sqrt{(3-6)^2 + (-3-(-5))^2}$	
	$= \sqrt{13}$ ✓	1
4.4	Area $\Delta ABC = \frac{1}{2}\sqrt{117}\sqrt{13}$	
	$= \frac{39}{2}$ ✓	

	but $\Delta ABC \equiv \Delta DCA$ SSS	
	$\therefore$ area llgm ABCD	
	$= 2 \times \frac{39}{2}$ ✓	
	$= 39$ units^2 ✓	3
4.5.	$\tan x = \frac{2}{3}$ ✓	
	$x = 33,69...^\circ$ ✓	
	$m_{AB} = \frac{6-1}{-5-(-6)}$ $A(-6;1)$ $B(-5;6)$	
	$= 5$	
	$= m_{CD}$ opp sides llgm //	
	$\tan y = 5$ ✓	
	$y = 78,69...^\circ$ ✓	
	$\alpha + 33,69...^\circ = 78,69...^\circ$ ext $\angle\Delta$	
	$\therefore \alpha = 45^\circ$ ✓	5
4.6.	$B(-5;6) \xrightarrow[1\uparrow]{8\rightarrow} C(3;7)$	
	$A(-6;1) \xrightarrow[1\uparrow]{8\rightarrow} D(2;2)$ ✓✓	2

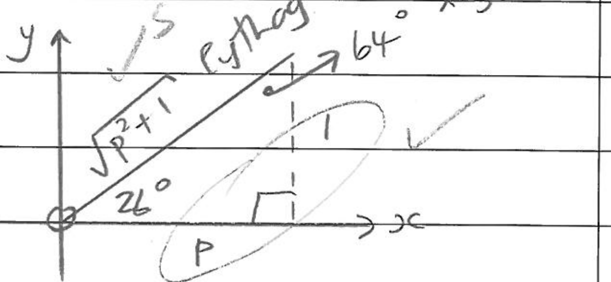
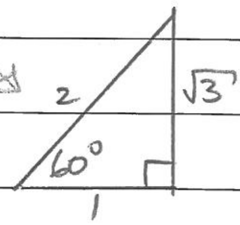
QUESTION 5



5.1.	1. $M(-1;6)$	1
5.1.	2 $\frac{x_A + 5}{2} = -1$ $\frac{y_A + 3}{2} = 6$	
	$x_A =$ $y_A = 9$	
	$\therefore A(-7;9)$	2
5.1.	3. $x$int: $(x+1)^2 + (0-6)^2 = 45$	
	$(x+1)^2 = 9$	
	$x+1 = \pm 3$	
	$\therefore x+1 = -3$	
	$x = -4$	
	$\therefore E(-4;0)$	3

5.2.	$m_{BC} = \frac{-5-3}{1-5}$ $B(5;3)$ $C(1;-5)$	
	$= 2$ ✓	
	$m_{MB} = \frac{6-3}{-1-5}$ $B(5;3)$ $M(-1;6)$	
	$= -\frac{1}{2}$ ✓	
	$m_{BC} \times m_{MB} = 2 \times -\frac{1}{2}$ ✓	
	$= -1$ ✓	
	$\therefore$ $BC \perp MB$	
	$\therefore$ BC is a ✓ conv [SR] tan ⊥ rad	
	tangent	5
5.3.	$m_{BC} = 2$ $D(d;-7\frac{5}{6})$ $B(5;3)$	
	method $m_{BC} = m_{DB}$	
	✓ $2 = \frac{3-(-7\,5/6)}{5-d}$ ✓ m_{DB}	
	$2(5-d) = \frac{65}{6}$	
	$d = -\frac{5}{12}$ ✓	3
5.4.	$(-1;6) \xrightarrow{2\uparrow} (-1;8)$	
	$r=\sqrt{45} \xrightarrow{\times 2} r = 2\sqrt{45}$	
	$(x+1)^2 + (y-8)^2 = (2\sqrt{45})^2$	
	$(x+1)^2 + (y-8)^2 = 180$	2
	✓ ✓	

QUESTION 6

6.1.	$\sin(A-B)$	
	$= \cos(90^\circ - (A-B))$ ✓	
	$= \cos(90^\circ - A + B)$	
	$= \cos((90^\circ - A) - (-B))$	set up and
	$= \cos(90^\circ - A)\cos(-B) + \sin(90^\circ - A)\sin(-B)$	expand ✓
	$= (\sin A)(+\cos B) + (\cos A)(-\sin B)$ ✓ all reductions shown	
	$= \underline{\sin A \cos B - \cos A \sin B}$	3
6.2.	$p\tan 26^\circ - 1 = 0$	
	$\tan 26^\circ = \frac{1}{p} \quad \frac{y}{x}$	
		
	$\sin 86^\circ = \sin(60^\circ + 26^\circ)$	
	✓ $= \sin 60^\circ \cos 26^\circ + \cos 60^\circ \sin 26^\circ$	
	$= \left(\frac{\sqrt{3}}{2}\right)\left(\frac{p}{\sqrt{p^2+1}}\right) + \left(\frac{1}{2}\right)\left(\frac{1}{\sqrt{p^2+1}}\right)$	
	26° ratios ✓	
	60° ratios ✓ lose ✓ no	
		5

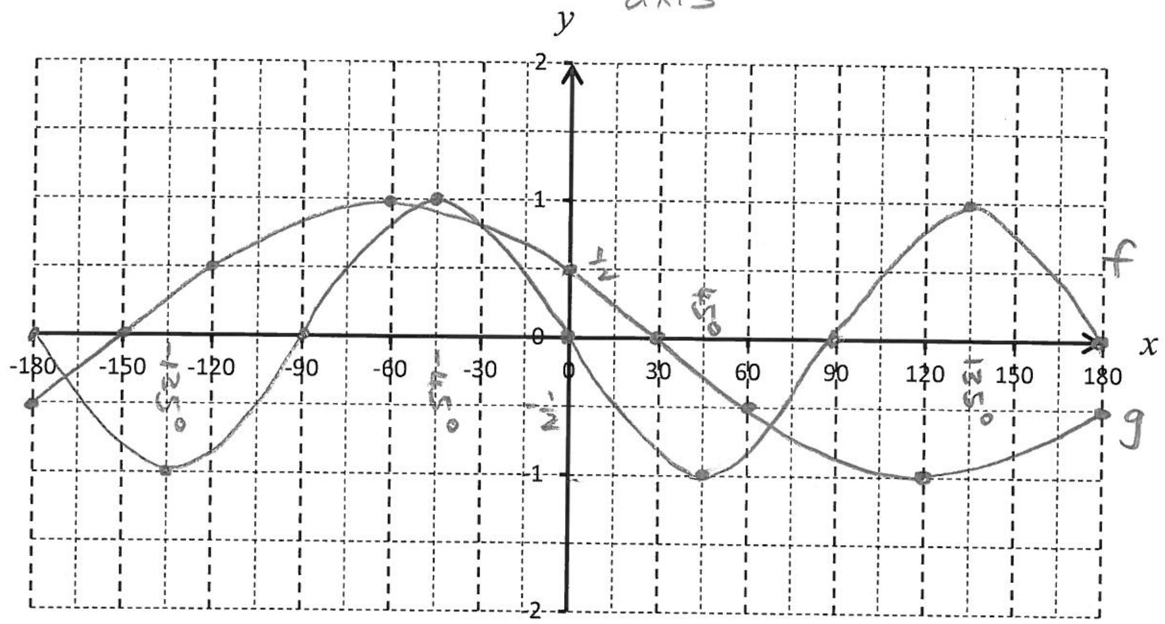
6.2.	2. $\cos 2x = 1 - 2\sin^2 x$	
	$\cos 26^\circ = 1 - 2\sin^2 13^\circ$ ✓	
	$\frac{p}{\sqrt{p^2+1}} = 1 - 2\sin^2 13^\circ$ ✓	
	$\sin 13^\circ = \sqrt{\frac{\frac{p}{\sqrt{p^2+1}} - 1}{-2}}$ ✓	3
6.2.	3. $\tan 2096^\circ$	
	$= \tan 296^\circ$ ✓	
	$= \tan(360^\circ - 64^\circ)$	
	$= -\tan 64^\circ$ ✓	
	$= -\frac{p}{1}$ $\qquad \frac{o}{a}$	
	$= -p$ ✓	3
6.3.	$\cos(-x) = \cos x$ ✓	
	$\cos 2x = 2\cos^2 x - 1$	
	$\frac{3}{5} = 2\cos^2(-x) - 1$ ✓	
	$\cos^2(-x) = \frac{4}{5}$	
	$\cos(-x) = \pm\sqrt{\frac{4}{5}}$ ✓	3
	$\left(\sqrt{\frac{4}{5}} = \frac{\sqrt{4}}{\sqrt{5}} = \frac{2}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{2\sqrt{5}}{5}\right)$	

QUESTION 7

turning points + intercepts with axes

MUST BE CLEARLY LABELLED

7.1.



f: $y = -\sin 2x$ g: $y = \cos(x + 60°)$

✓ y int ✓ penalise if $\frac{1}{2}$ not labelled

✓ x int ✓

penalise if $x = \pm 45°$ and $\pm 135°$ not labelled ✓ tp ✓

6

7.2.	1.	R_f : $y \in [-1; 1]$ ✓	1
7.2.	2.	$\text{Period}_f = \frac{360°}{2}$	
		$= 180°$ ✓	1
7.3.	1.	$f(x) = g(x)$	
		$-\sin 2x = \cos(x + 60°)$	
		$A = 2x$ $B = 60°$	

$-\sin A = \cos B$

$\cos(90°+A)$ $\quad \cos(270° - A)$ $\quad (k \in \mathbb{Z})$

II $\quad$ III

$\cos(90°+A) = \cos B$ or $\cos(270°-A) = \cos B$

$90°+A = B + k\,360°$	$270°-A = B + k\,360°$
$90° + 2x = x+60° + k360°$	$270° - 2x = x+60° + k360°$
$x = -30° + k\,360°$	$-3x = -210° + k\,360°$
	$x = 70° + k\,120°$

5

7.3. 2. $x \in [-180°; 180°]$:

x ; $-30°$; x

x ; $-170°$; $-50°$; $70°$; x

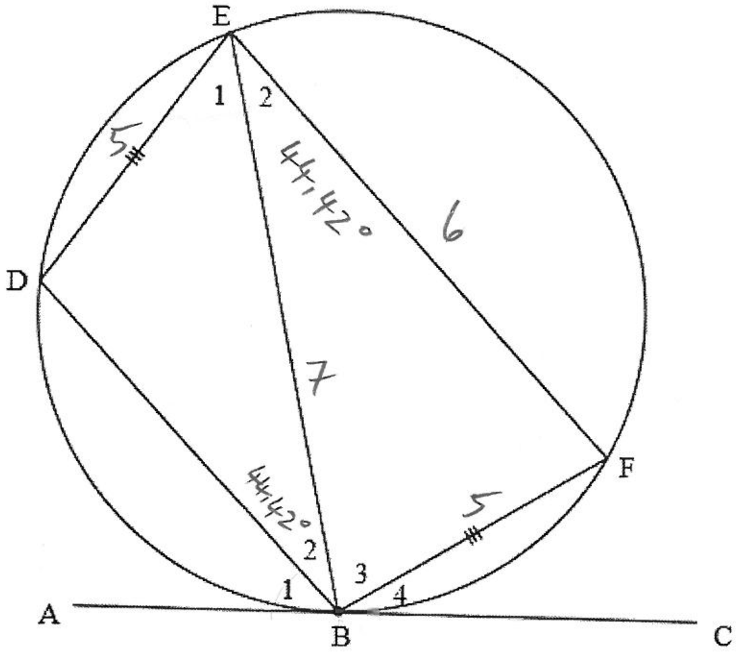
$f(x) > g(x)$

$y_f > y_g$

$x \in [-180°; -170°)$ or $(-50°; -30°)$ or $(70°; 180°]$ 3

✓A ✓A ✓A

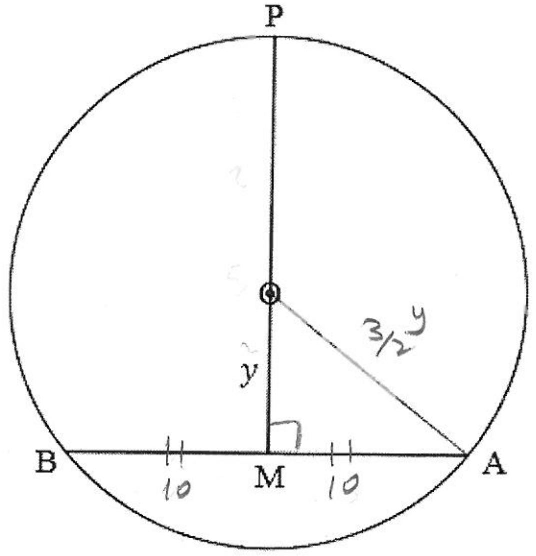
QUESTION 8



8.1.	$5^2 = 6^2 + 7^2 - 2.6.7.\cos \hat{E}_2$ ✓	
	$84.\cos \hat{E}_2 = 60$	
	$\cos \hat{E}_2 = \frac{5}{7}$ ✓	
	$\hat{E}_2 = 44,42^\circ$ ✓	3
	$\xrightarrow{\hspace{3cm}} D$	
8.2.	$\hat{B}_2 = 44,42^\circ$ ✓S ✓R = chords = ∠'s @ circum	
	$\frac{\sin \hat{D}}{7} = \frac{\sin 44,42^\circ}{5}$ ✓	
	$\sin \hat{D} = 0,97\ldots$ ✓	
	ref ∠ $= 78,48\ldots^\circ$	
	Sin + in	
	I : x	
	II : $\hat{D} = 101,51\ldots^\circ$ ✓ $\hat{D} > 90^\circ$	

	$\therefore \hat{E}_1 = 34{,}06\ldots°$ ✓ $\angle$'s $\Delta = 180°$	
	$\therefore \hat{B}_1 = 34{,}07°$ ✓ ✓ $\angle$ tan chord	8

QUESTION 9



9.1.	MA = 10 ✓S given	1
9.2.	line from centre O to midpt	
	chord ✓R	1
9.3.	$\frac{PM}{OM} = \frac{5}{2}$	
	$PM = \frac{5}{2} OM$	
	$= \frac{5}{2} y$ ✓	
	$OP = PM - OM$	
	$= \frac{5}{2}y - y$	
	$= \frac{3}{2}y$ ✓	
	$= OA$ radii	

	$y^2 + 10^2 = (\frac{3}{2}y)^2$ ✓ S Pythag	
	$y^2 + 100 = \frac{9}{4}y^2$	
	$100 = \frac{5}{4}y^2$	
	$80 = y^2$	
	$y = \pm\sqrt{80}$	
	$= \sqrt{80}$ reject $-$	
	$= 8,94$ ✓	4

Q 9.3. alternative

9.3. $\frac{PM}{OM} = \frac{5}{2}$

let $PM = 5x$ and $OM = 2x$

NOT 5y and 2y as y is given in diagram!

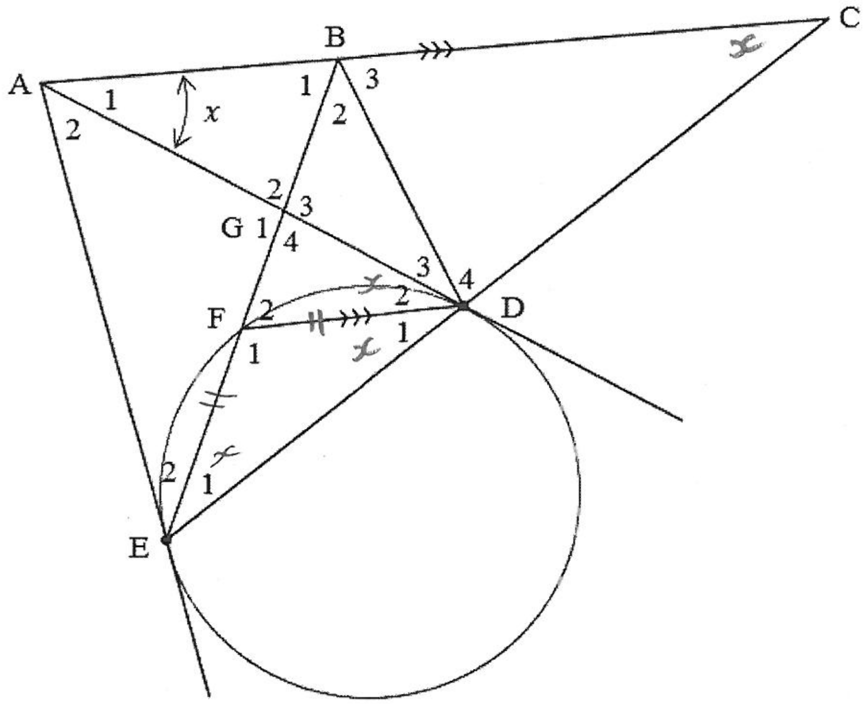
$\therefore \boxed{y = 2x}$ OM

$\therefore OP = 5x - 2x$
$= 3x$
$= OA$ radii

$OA^2 = OM^2 + MA^2$ Pythag
$(3x)^2 = (2x)^2 + (10)^2$
$9x^2 = 4x^2 + 100$
$5x^2 = 100$
$x^2 = 20$
$x = \sqrt{20}$ reject −

$\therefore y = 2 . \sqrt{20}$ $y = 2x$
$= 8,94$

QUESTION 10

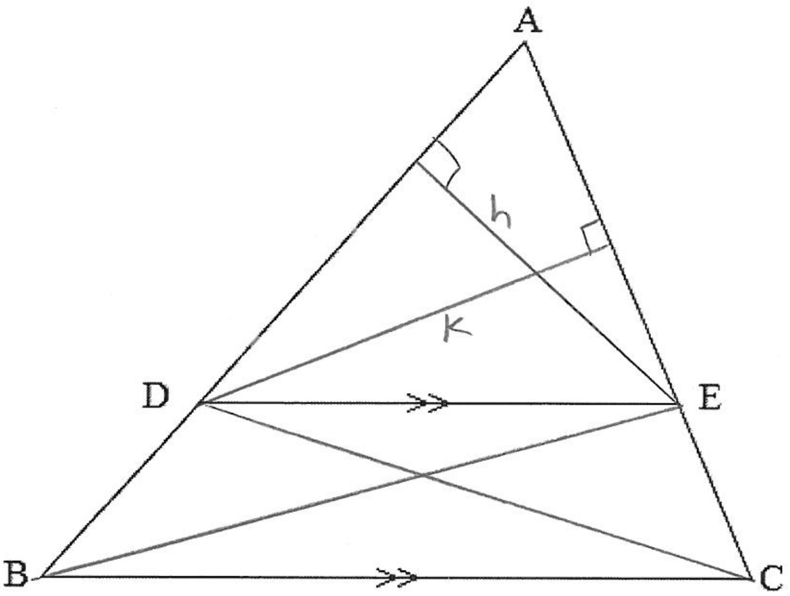


10.1.	$\hat{A}_1 = x$	
	$\therefore \hat{D}_2 = x$ ✓SR alt $\angle$'s =, AC ∥ FD	
	$\therefore \hat{E}_1 = x$ ✓S ✓R $\angle$ tan chord	
	$\therefore \hat{A}_1 = \hat{E}_1$ both $= x$	
	∴ ABDE is a ✓R conv $\angle$'s in same	
	cyclic quad ⊙ segment =	4
10.2.	$\hat{D}_1 = x$ ✓SR $\angle$'s opp = sides	
	$\therefore \hat{C} = x$ ✓SR corr $\angle$'s =, AC ∥ FD	
	$\therefore \hat{C} = \hat{A}_1$ both $= x$	

	$\therefore$ CD = AD ✓ sides opp = ∠s	
	but AD = AE ✓ ✓ tan's ext common pt =	
	$\therefore$ AE = CD both = AD	5

QUESTION 11

11.1.



✓ constr

$$\frac{\text{area } \Delta ADE}{\text{area } \Delta DBE} = \frac{\frac{1}{2} AD \cdot h}{\frac{1}{2} DB \cdot h} = \frac{AD}{DB}$$

$$\frac{\text{area } \Delta AED}{\text{area } \Delta ECD} = \frac{\frac{1}{2} AE \cdot k}{\frac{1}{2} EC \cdot k} = \frac{AE}{EC}$$

- area ΔADE = area ΔAED

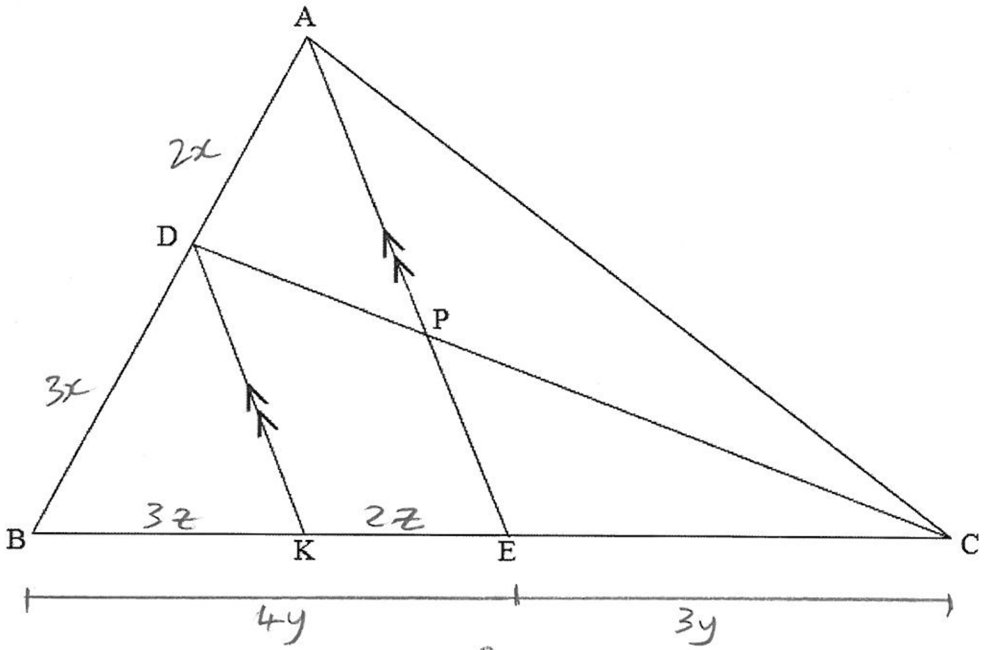
  same Δ

- area ΔDBE = area ΔECD

  same base (DE)
  same height ($DE \parallel BC$)

	$\therefore \dfrac{\text{area } \Delta ADE}{\text{area } \Delta DBE} = \dfrac{\text{area } \Delta AED}{\text{area } \Delta ECD}$ ✓	
	$\therefore \dfrac{AD}{DB} = \dfrac{AE}{EC}$	6

11.2.



$\frac{BK}{KE} = \frac{BD}{DA}$ ✓R line ∥ 1 side of Δ

$= \frac{3}{2}$ ✓S fill in 3z 2z

$\frac{CP}{PD} = \frac{CE}{EK}$ ✓SR line ∥ 1 side of Δ

$= \frac{3y}{2z}$

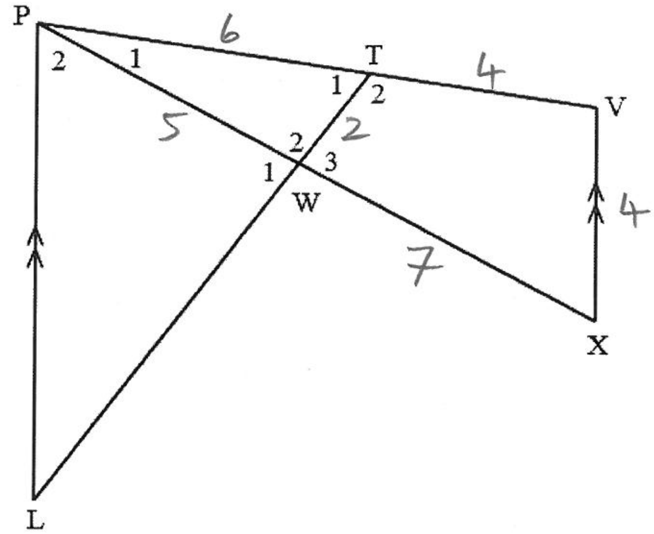
$5z = 4y$

$= \frac{3(\frac{5}{4}z)}{2z}$ ✓ $\frac{5}{4}z = y$

$= \frac{15}{8}$ ✓

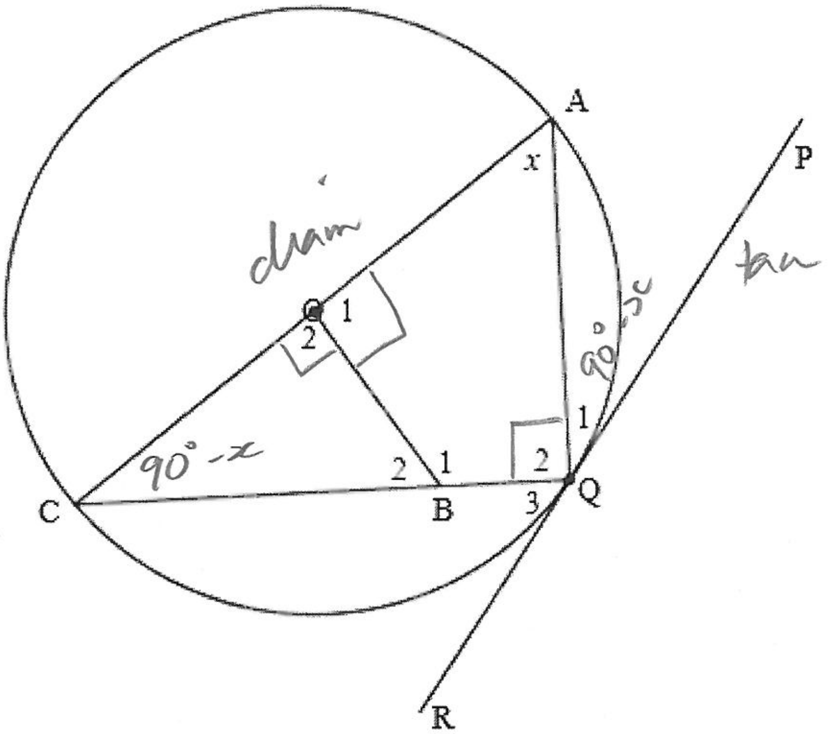
5

QUESTION 12



12.1.	In Δ's PTW, PXV	
	1. $\frac{PT}{PX} = \frac{6}{12} = \frac{1}{2}$ ✓	
	2. $\frac{TW}{XV} = \frac{2}{4} = \frac{1}{2}$ ✓	
	3. $\frac{WP}{VP} = \frac{5}{10}$ $\frac{1}{2}$ ✓	
	$\therefore \frac{PT}{PX} = \frac{TW}{XV} = \frac{WP}{VP} = \frac{1}{2}$	
	$\therefore \Delta PTW \parallel\!\mid \Delta PXV$ sides of Δ in prop^n ✓R	4
12.2.	$\hat{P}_2 = \hat{X}$ ✓SR alt $\angle$s =, PL ∥ VX	
	$= \hat{T}_1$ ✓SR $\Delta P_1 T_1 W_2 \parallel\!\mid \Delta P_1 X V$	
	$\therefore \hat{P}_2 = \hat{T}_1$ ✓S both $= \hat{X}$	
	$\therefore$ PL is a ✓conv $\angle$ tan chord	
	tangent	4

QUESTION 13



13.1.	$\hat{O}_1 = 90°$ given	
	$\hat{Q}_2 = 90°$ ✓S ✓R $\angle$ in semi $\odot = 90°$	
	$\therefore \hat{O}_1 + \hat{Q}_2$	
	$= 90° + 90°$	
	$= 180°$ ✓S ✓R	
	$\therefore$ BOAQ is a conv opp $\angle$'s cyclic	
	cyclic quad quad $= 180°$	4
13.2.	$\hat{C} = 90° - x$ ✓SR $\angle$'s $\Delta = 180°$	
	$\hat{Q}_1 = 90° - x$ ✓SR $\angle$ tan chord	2

13.3.	1. In Δ's C $B_2 O_2$, C A Q_2	
	1. $\hat{C} = \hat{C}$ ✓SR common	
	2. $\hat{O}_2 = \hat{Q}_2$ ✓S both = 90°	
	$\therefore \Delta CBO \ \|\|\| \ \Delta CAQ$ AAA ✓R	3
13.3.	2. $\frac{CB}{CA} = \frac{CO}{CQ}$ ✓SR $\Delta \hat{C}BO \ \|\|\| \ \Delta \hat{C}AQ$	
	$\therefore CB.CQ = CO.CA$ ✓	
	$= CO.2CO$ ✓S radii	
	$= 2CO^2$ ✓	
	$= 2(CB^2 - OB^2)$ ✓SR Pythag	
	$= 2CB^2 - 2OB^2$	5