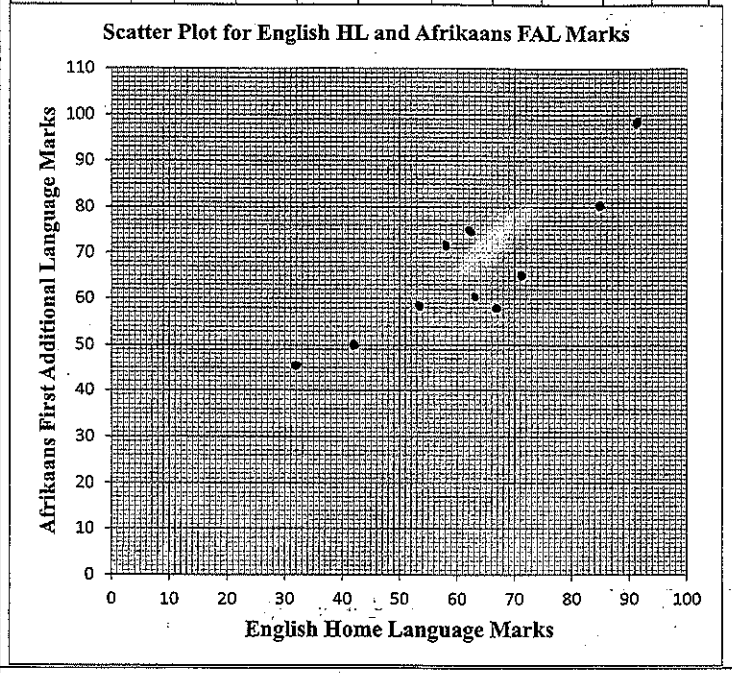
Gr12 2015 Sept

Paper 2 Solns

QUESTION 1

	Solution	Marks
1.1		

x	English HL	42	54	85	32	63	71	92	62	58	66
y	Afrikaans FAL	50	58	80	45	60	65	98	75	71	58



4

(4)

1.2 $y = A + Bx$
$y = 18,04 + 0,77x$ ✓ ✓ ✓ 3

(3)

1.3 $r = 0,88$ ✓✓ 2

(2)

1.4 Strong positive linear correlation ✓ 1

(1)

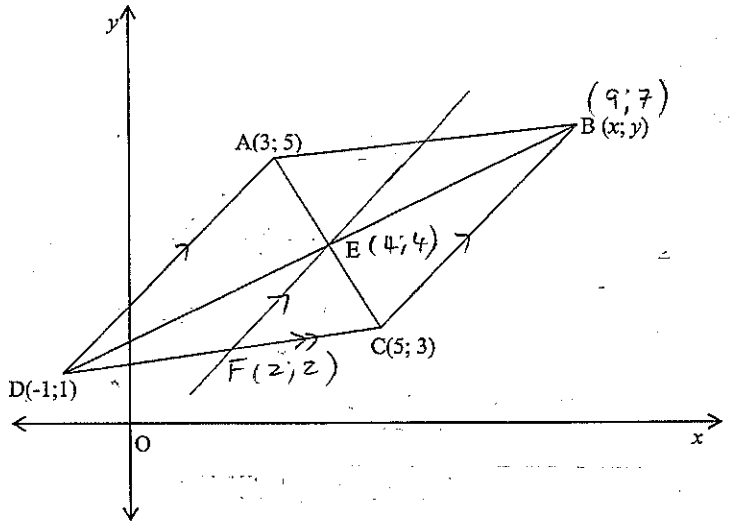
1.5 $y = 18,04 + 0,77x$
$74 = 18,04 + 0,77x$ ✓
$72,68\% = x$ ✓ 2

(2)
[12]

QUESTION 2

		Solution	Marks
2.1	A	$\bar{x} = 57,75$ kg ✓ $\sigma = 6,737\ldots$ ✓ $\therefore$ variance $= \sigma^2$ $= 45,39$ kg^2 ✓	3
			(3)
B	2.2.1	$n = 22$ boys ✓	1
			(1)
B	2.2.2	$\bar{x} = \frac{1320}{22}$ ✓ $= 60$ kg ✓	2
			(2)
B	2.2.3	$\sigma = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n}} = \sqrt{\frac{1012}{22}}$ ✓ $= \sqrt{46}$ $= 6,78$ kg ✓	2
			(2)
2.3		$m_{22,A} = 57,75 \times 20$ $m_{22,B} = 1320$ $= 1155$ $\frac{5x + 1155}{25} = 60$ ✓ $5x + 1155 = 60,25$ $x = 69$ kg ✓	2
			(2)
			[10]

QUESTION 3



	Solution	Marks
3.1	3.1.1 A(3;5) C(5;3) $x_E = \frac{3+5}{2}$ $y_E = \frac{5+3}{2}$ $= 4$ $= 4$ ✓✓ ∴ E(4; 4)	2
		(2)
	3.1.2 D(-1;1) E(4;4) $4 = \frac{x+(-1)}{2}$ ✓ $4 = \frac{y+1}{2}$ ✓ $8 = x-1$ $8 = y+1$ $9 = x$ $7 = y$ ∴ B(9; 7) ✓	3
		(3)
	3.1.3 $x_F = \frac{-1+5}{2}$ $y_F = \frac{1+3}{2}$ D(-1;1) C(5;3) $= 2$ $= 2$ ∴ F(2; 2) ✓ $m_{AD} = \frac{5-1}{3-(-1)} = 1$ ✓ D(-1;1) A(3;5) ∴ $y = x + c$ ✓ ∥ lines = grad Sub F(2;2) $2 = 2 + c$ ✓ $0 = c$ ∴ $y = x$ ✓	5
		(5)

3.2	G(t+1; 2,5) D(-1;1) E(4;4) $m_{GD} = m_{DE}$ $\frac{2,5-1}{t+1-(-1)} = \frac{4-1}{4-(-1)}$ ✓ $\frac{1,5}{t+2} = \frac{3}{5}$ ✓ $3(t+2) = 5.1,5$ ∴ $t = \frac{1}{2}$ ✓ D	4
		(4)
3.3	A(3;5) C(5;3) $m_{AC} = \frac{3-5}{5-3} = -1$ ✓ $m_{DE} = \frac{3}{5}$ (3.2) $m_{AC} \cdot m_{DE} = -1 \times \frac{3}{5} = -3/5$ ✓ $\neq -1$ ✓ ∴ AC ⊥ DE ∴ ABCD not rhombus ✓ (diags not ⊥)	5
		(5)
		[19]

OR

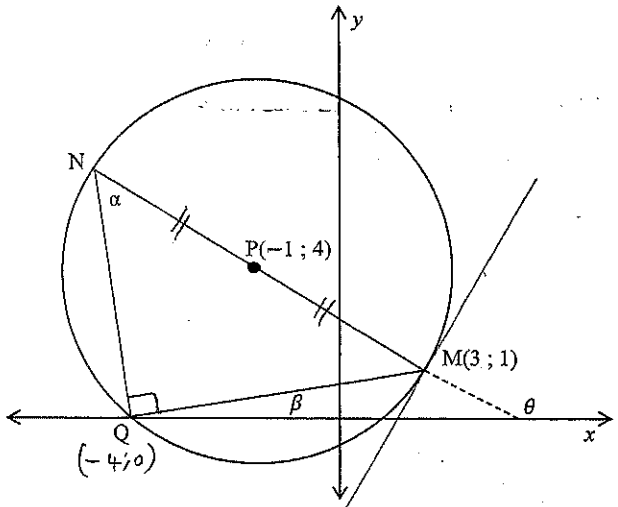
$d_{AD} = \sqrt{(5-1)^2 + (3-(-1))^2} = \sqrt{32}$ ✓

$d_{DC} = \sqrt{(3-1)^2 + (5-(-1))^2} = \sqrt{40}$ ✓

$d_{AD} \neq d_{DC}$

∴ ABCD not rhombus ✓ adj sides ≠ ✓

QUESTION 4



	Solution	Marks
4.1	$(x+1)^2+(y-4)^2=r^2$ ✓ sub $M(3;1)$ $(3+1)^2+(1-4)^2=r^2$ ✓ $25=$ ✓ $\therefore (x+1)^2+(y-4)^2=25$ ✓	4
		(4)
4.2	$\hat{}$ in semi ⊙ $=90°$ ✓	1
		(1)
4.3	$Q(x;0)$ on x-axis $(x+1)^2+(0-4)^2=25$ ✓ $(x+1)^2=9$ ✓ $x+1=\pm 3$ ✓ $x=-1\pm 3$ reject $=-4$ or ~~2~~ $\therefore Q(-4;0)$	3
		(3)
4.4	$m_{MN}=m_{MP}$ $M(3;1)$ $P(-1;4)$ N $=\frac{4-1}{-1-3}$ ✓ $=-\frac{3}{4}$ ✓	2
		(2)

4.5	$\tan\theta=-\frac{3}{4}$ ✓ ref $\hat{}=36,86\ldots°$ $\tan^{-1}$ II: $\theta=143,13\ldots°$ ✓ $Q(-4;0)$ $M(3;1)$ $m_{QM}=\frac{1-0}{3-(-4)}=\frac{1}{7}$ $\tan\beta=\frac{1}{7}$ ✓ ref $\hat{}=8,13\ldots°$ $\tan^{-1}$	I: $\beta=8,13\ldots°$ ✓ $143,13\ldots°=\alpha+90°+8,13\ldots°$ Ext $\hat{}\triangle$ $45°=\alpha$ ✓	5
			(5)
4.6	$m_{MP}=-\frac{3}{4}$ ✓ sign ✓ invert $\therefore m_{tan}=\frac{4}{3}$ tan ⊥ rad ✓ $\therefore y=\frac{4}{3}x+c$ sub $M(3;1)$ $1=\frac{4}{3}(3)+c$ ✓ $-3=c$ $\therefore y=\frac{4}{3}x-3$ ✓	(4.4)	5
			(5)
			[20]

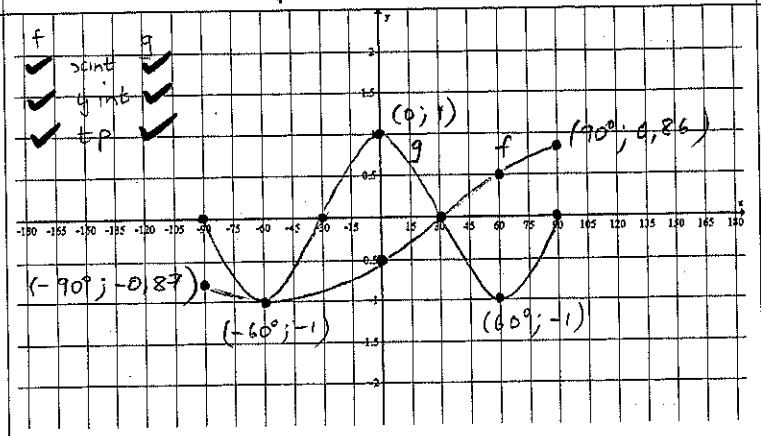
QUESTION 5

	Solution	Marks
5.1	LHS = $\cos 75° + \cos 15°$ = $\cos(45° + 30°) + \cos(45° - 30°)$ ✓ = $\cos 45° \cos 30° - \sin 45° \sin 30° + (\cos 45° \cos 30° + \sin 45° \sin 30°)$ = $\cos 45° \cos 30° - \sin 45° \sin 30° + \cos 45° \cos 30° + \sin 45° \sin 30°$ = $2 \cos 45° \cos 30°$ ✓ = $2\left(\frac{1}{\sqrt{2}}\right)\left(\frac{\sqrt{3}}{2}\right)$ ✓* = $\frac{2\sqrt{3}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ ✓ = $\frac{\sqrt{6}}{2}$ = RHS diagrams must be shown for *	4
		(4)
5.2	$1 + 4\sin^2 x - 5\sin x + \cos 2x = 0$ $1 + 4\sin^2 x - 5\sin x + (1 - 2\sin^2 x) = 0$ ✓ $1 + 4\sin^2 x - 5\sin x + 1 - 2\sin^2 x = 0$ $2\sin^2 x - 5\sin x + 2 = 0$ ✓ $(2\sin x - 1)(\sin x - 2) = 0$ ✓ $\therefore \sin x = \frac{1}{2}$ or $\sin x = 2$ ✓ ref ∠ = 30° no soln ✓ sin + in I: $x = 30° + k360°$ ✓ II: $x = 150° + k360°$ ✓ $(k \in \mathbb{Z})$ −1 ✓ no $k \in \mathbb{Z}$	7
		(7)
5.3	LHS = $\frac{\sin 2A}{1 + \cos 2A}$ = $\frac{2\sin A \cos A}{1 + (2\cos^2 A - 1)}$ ✓✓ = $\frac{2\sin A \cos A}{1 + 2\cos^2 A - 1}$ = $\frac{2\sin A \cos A}{2\cos^2 A}$ = $\frac{\sin A}{\cos A}$ ✓ = $\tan A$ = RHS	3
		(3)

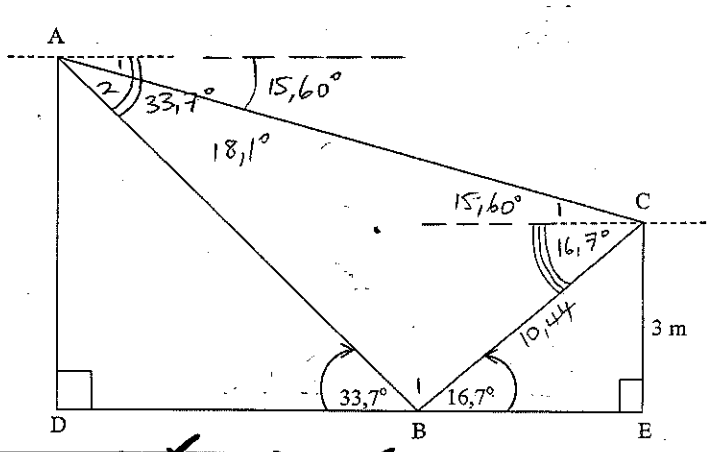
5.4	• $\sin(450° - x)$ = $\sin(90° - x)$ = $\cos x$ ✓ • $\tan(x - 180°)$ = $\tan(x + 180°)$ = $\tan(180° + x)$ = $\tan x$ ✓ • $\sin 23° \cos 23°$ = $\frac{1}{2}\sin 46°$ ✓ • $\cos 44°$ = $\cos(90° - 46°)$ = $\sin 46°$ ✓ • $\sin(-x)$ = $-\sin x$ ✓ $\therefore \frac{(\cos x)(\tan x)(\frac{1}{2}\sin 46°)}{(\sin 46°)(-\sin x)}$ = $-\frac{1}{2}\frac{\cos x}{\sin x} \cdot \tan x$ = $-\frac{1}{2}\frac{\cos x}{\sin x} \cdot \frac{\sin x}{\cos x}$ = $-\frac{1}{2}$ ✓	6
		(6)
		[20]

WOC not stated ∴ award relevant marks if calculator used

QUESTION 6

	Solution	Marks
6.1	$np = \frac{360°}{3}$ ✓ $= 120°$ ▷	1 (1)
6.2		6 (6)
6.3 6.3.1	$f(x) > g(x)$ ✓✓ $y_f > y_g$ f above g $\therefore x \in (30°; 90°]$ ▷	2 (2)
6.3.2	$f(x) \cdot g(x) > 0$ $y_f \cdot y_g +$ $\therefore x \in (-90°; -30°)$ ✓✓ ▷	2 (2)
6.4	$f: y \in [-1; 1]$ $3f: y \in [-3; 3]$ $3f-1: y \in [-4; 2]$ ▷ ✓✓	2 (2) [13]

QUESTION 7

	Solution	Marks
7.1	 $BC: \frac{BC}{\sin 90°} = \frac{3}{\sin 16,7°}$ ✓ ✓ $BC = 10,44$ m ✓ ▷	3 (3)

7.2 $\hat{C}_1 = 15,60°$ alt ^'s =, II lines

$\hat{A}_2 = 18,1°$

AB: $\frac{AB}{\sin 33,3} = \frac{10,44}{\sin 18,1}$ ✓✓ $16,7° + 15,6° = 32,3°$

$AB = 17,96$ m ✓ 3

(3)

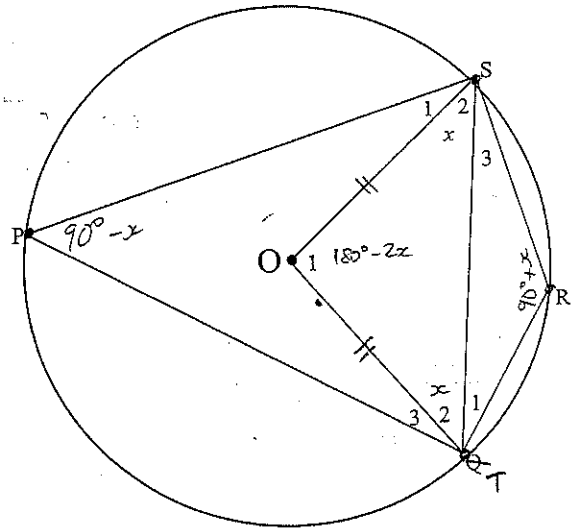
7.3 AD: $\frac{AD}{\sin 33,7°} = \frac{17,96}{\sin 90°}$ ✓✓

$AD = 9,97$ m ✓ 3

(3)

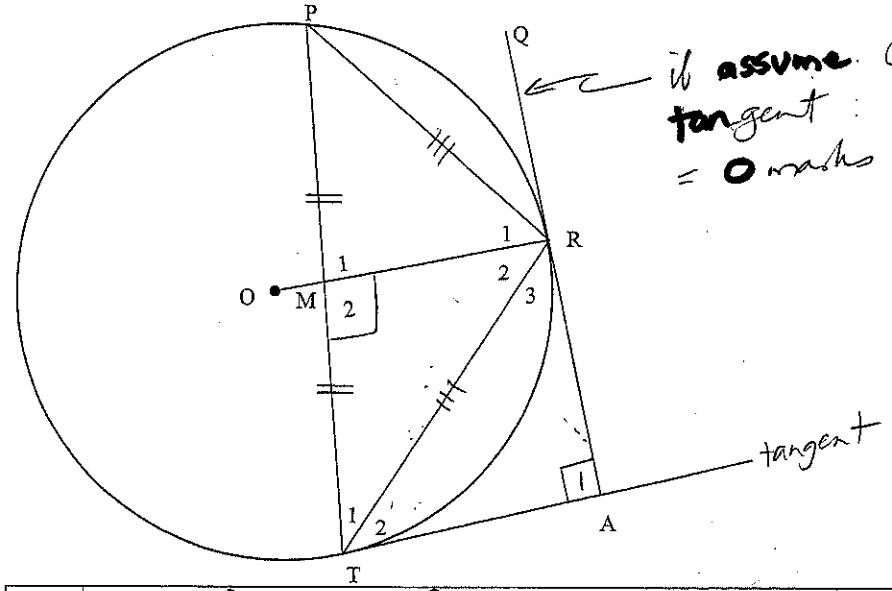
[9]

QUESTION 8



	Solution		Marks
8.1	8.1.1 $\hat{T}_2 = x$ ✓ SR ^'s opp = sides, radii		2
	$\hat{O}_1 = 180° - 2x$ ✓ SR ^'s Δ = 180°		
		(2)	
	8.1.2 $\hat{P} = 90° - x$ ✓S ✓R ^ @ centre = 2 ^ @ circle		2
		(2)	
	8.1.3 $R + 90° - x = 180°$ ✓R opp ^'s cyclic quad = 180°		2
	$\therefore \hat{R} = 90° + x$ ✓S		
		(2)	
8.2	$180° - 2x = 90° + x$ ✓S opp ^'s ||gm = ✓R		3
	$90° = 3x$		
	$30° = x$ ✓		
		(3)	
		[9]	

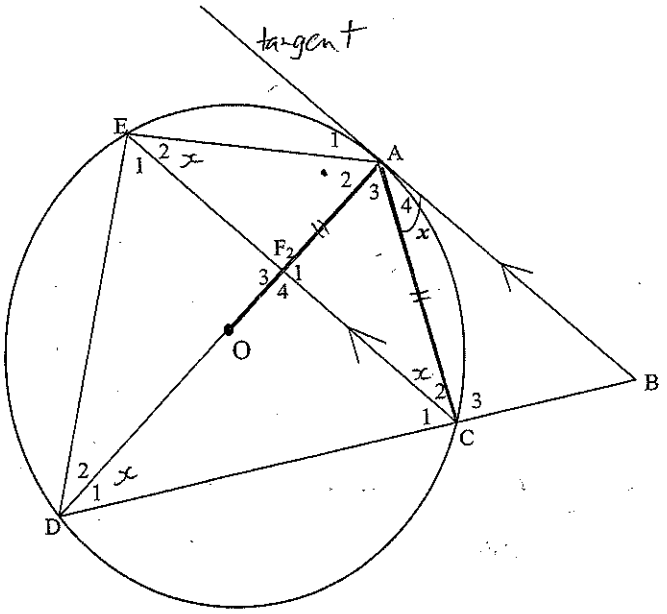
QUESTION 9



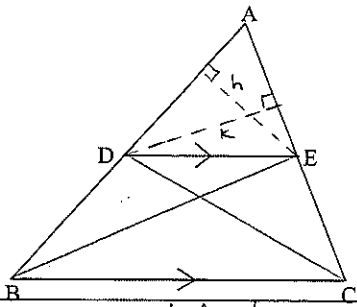
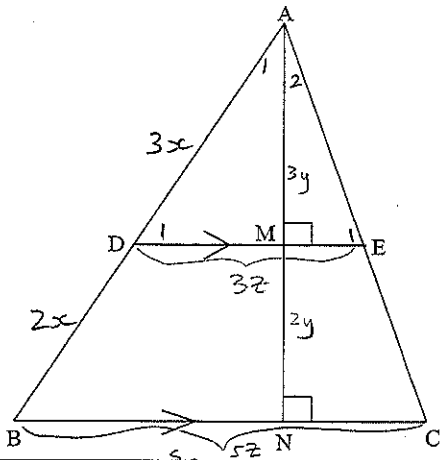
if assume QRA tangent = 0 marks!

	Solution	Marks
9.1	$\hat{M}_2 = 90°$ ✓ line centre ⊙ to mdpt chord is ⊥ $\hat{A}_1 = 90°$ ✓ given $\therefore \hat{M}_2 + \hat{A}_1$ $= 90° + 90°$ $= 180°$ ✓ $\therefore$ MTAR is cyclic ✓ conv opp ∠'s cyclic quad = 180°	4
		(4)
9.2	In △'S PMR, TMR 1. PM = MT ✓SR given 2. $\hat{M}_1 = \hat{M}_2$ ✓SR (9.1.) 3. MR = MR ✓SR common $\therefore$ ✓△ PMR ≡ △ TMR SAS ✓R $\therefore$ PR = TR ≡ △	5
		(5)
9.3	$\hat{T}_2 = \hat{P}_1$ ✓S ✓R ∠ tan chord but $\hat{P} = \hat{T}_1$ ✓SR ∠'s opp = sides $\therefore T_1 = T_2$ both = $\hat{P}$	3
		(3)
		[12]

QUESTION 10

	Solution	Marks
10.1	Proportional ✓	1
		(1)
10.2		
10.2.1	$\hat{D}_1 = x$ ✓SR ∠ tan chord $\hat{C}_2 = x$ ✓SR alt ∠'s =, AB ∥ EC $\hat{E}_2 = x$ ✓SR ∠ tan chord ... or others ✓SR.	3
		(3)
10.2.2	In △'S $A_3 C_2 F_1$, $A_3 D C_{1+2}$ 1. $\hat{A}_3 = A_3$ common ✓SR 2. $\hat{C}_2 = \hat{D}_1$ both = x ✓SR $\therefore$ △ ACF ⫻ △ ADC AAA ✓R	3
		(3)
10.2.3	$\frac{AF}{AC} = \frac{AC}{AD}$ △ACF ⫻ △ADC $\therefore AF = \frac{AC^2}{AD}$ • 0 no attempt • 4 attempt but AC = OA given $\therefore AF = \frac{AO^2}{AD}$	
		(4)
		[11]

QUESTION 11

	Solution	Marks
11.1	 Constr: • heights h, k • DC, BE ✓ Constr on diagram	
	✓ $\frac{\text{area } \Delta ADE}{\text{area } \Delta DBE} = \frac{\frac{1}{2}AD.h}{\frac{1}{2}DB.h} = \frac{AD}{DB}$	
	✓ $\frac{\text{area } \Delta AED}{\text{area } \Delta ECD} = \frac{\frac{1}{2}AE.k}{\frac{1}{2}EC.k} = \frac{AE}{EC}$	
	but area ΔADE = area ΔAED (same Δ)	
	✓S area ΔDBE = area ΔECD (same b, DE; same h, DE ∥ BC) ✓R	6
	$\therefore \frac{\text{area } \Delta ADE}{\text{area } \Delta DBE} = \frac{\text{area } \Delta AED}{\text{area } \Delta ECD}$ ✓	
	$\therefore \frac{AD}{DB} = \frac{AE}{EC}$	
		(6)
11.2		
11.2.1	$\frac{AM}{MN} = \frac{3}{2}$ (S) ✓ line ∥ 1 side Δ ✓R	2
	∴ D fill in 3y 2y	(2)

	11.2.2	In Δ's $A_{1+2}DE$ and $A_{1+2}BC$	
		1. $\hat{A}_{1+2} = \hat{A}_{1+2}$ ✓SR common	
		2. $\hat{D}_1 = \hat{B}$ ✓SR Corresponding $\angle$'s =, DE ∥ BC	
		∴ $\Delta ADE \sim\!\!\sim \Delta ABC$ ✓SR AAA	4
		∴ $\frac{DE}{BC} = \frac{AD}{AB}$ $\Delta ADE \sim\!\!\sim \Delta ABC$	
		$= \frac{3z}{5z}$	
		$= \frac{3}{5}$ ✓ fill in 3z 5z	
			(4)
	11.2.3	$\frac{\text{area } \Delta ADE}{\text{area } \Delta ABC}$	
		$\frac{\frac{1}{2}(3z)(3y)}{\frac{1}{2}(5z)(5y)}$ ✓ ✓ $A = \frac{1}{2}bh$	3
		$= \frac{9}{25}$ ✓	
			(3)
			[15]
		TOTAL:	150