Question Number	Scheme	Notes	Marks
6(a)	$\lvert z_1+z_2\rvert\{=\lvert 3+2\text{i}+2+3\text{i}\rvert=\lvert 5+5\text{i}\rvert\}=\sqrt{5^2+5^2}$	Attempts the sum (allow one slip) and uses Pythagoras correctly	M1
	$\sqrt{50}$ or $5\sqrt{2}$	Either correct exact answer	A1
	Answer only is no marks but working can be minimal e.g., $\lvert 5+5\text{i}\rvert = 5\sqrt{2}$		**(2)**
(b)	$\frac{z_2z_3}{z_1}=\frac{(2+3\text{i})(a+b\text{i})}{(3+2\text{i})}=\frac{(2+3\text{i})(a+b\text{i})}{(3+2\text{i})}\times\frac{(3-2\text{i})}{(3-2\text{i})}$ or $\frac{z_2}{z_1}=\frac{2+3\text{i}}{3+2\text{i}}\times\frac{3-2\text{i}}{3-2\text{i}}$ or $\frac{z_3}{z_1}=\frac{a+b\text{i}}{3+2\text{i}}\times\frac{3-2\text{i}}{3-2\text{i}}$	Substitutes complex numbers and correct multiplier to rationalise the denominator seen or implied. See note below Could use $\times\frac{-3+2\text{i}}{-3+2\text{i}}$	M1
	$(3+2\text{i})(3-2\text{i})=13$	13 obtained from $(3+2\text{i})(3-2\text{i})$ Could be implied.	B1
	$\frac{z_2z_3}{z_1}=\frac{12a-5b}{13}+\frac{5a+12b}{13}\text{i}$ or $\frac{1}{13}(12a-5b)+\frac{\text{i}}{13}(5a+12b)$ or $\frac{12}{13}a-\frac{5}{13}b+\text{i}\left(\frac{5}{13}a+\frac{12}{13}b\right)$ etc. Condone $\frac{(12a-5b)+(5a+12b)\text{i}}{13}$	**d**M1: Attempts to simplify the numerator and collects terms to obtain $pa+qb+ra\text{i}+sb\text{i}$ with at least three of p, q, r and s non-zero. **Requires previous M mark**. A1: Correct answer in any form with a single "i". Correct bracketing where needed. Allow x = ..., y = ...	**d**M1 A1
	Note: The following marks are accessible if complex numbers are substituted in the wrong places: z_2 as denominator max 1010, z_3 as denominator max 1000		**(4)**
(c)	$\frac{12a-5b}{13}=\frac{4}{13},\quad\frac{5a+12b}{13}=\frac{58}{13}\quad\Rightarrow\quad a=...,\quad b=...$	Equates their x to $\frac{4}{13}$ and their y to $\frac{58}{13}$ to obtain 2 linear equations in both a and b and solves to obtain values for both a and b.	M1
	No need to check values but must be some working between equations and values. "$\frac{12a-5b}{13}=\frac{4}{13},\quad\frac{5a+12b}{13}=\frac{58}{13}\quad 12a-5b=4,\ 5a+12b=58\quad a=2,\ b=4$" is M0A0 Values can immediately follow if equations are produced with coefficients of a or b of the same magnitude		
	$a=2$ and $b=4$	Correct values for a and b from correct equations with working.	A1
	SC: Allow access to both marks for the exact $a=-\frac{242}{169}$ and $b=\frac{716}{169}$ from using $w=\frac{z_1z_3}{z_2}=\frac{12a+5b}{13}+\frac{12b-5a}{13}\text{i}$ There are no marks in (c) if z_3 was used as the denominator in (b) [leads to a = b = 0]		**(2)**
(d)	$\arctan\left(\frac{\frac{58}{13}}{\frac{4}{13}}\right)\{=1.5019...\text{ or }86.05...^\circ\}$ or $\arctan\left(\frac{\frac{4}{13}}{\frac{58}{13}}\right)\{=0.068856...\text{ or }3.945...^\circ\}$	Either correct arctan or $\tan^{-1}$ seen or implied by a correct 2sf value (awrt 1.5, 86, 0.069/0.068, 3.9) Could use equivalent trig. Note: $\tan\frac{58}{4}=-2.634$ or 0.258	M1
	1.502	1.502 only (**not** awrt) Mark final answer if 1.502 is followed by e.g., $\frac{\pi}{2}-1.502=0.06880$	A1
			(2)
			Total 10