6. **In this question you must show all stages of your working.**

Solutions relying entirely on calculator technology are not acceptable.

$$z_1 = 3 + 2\mathrm{i} \qquad z_2 = 2 + 3\mathrm{i} \qquad z_3 = a + b\mathrm{i} \qquad a,b \in \mathbb{R}$$

(a) Determine the exact value of $|z_1 + z_2|$

(2)

Given that $w = \dfrac{z_2 z_3}{z_1}$

(b) determine w in terms of a and b, giving your answer in the form $x + \mathrm{i}y$, where $x, y \in \mathbb{R}$

(4)

Given also that $w = \dfrac{4}{13} + \dfrac{58}{13}\mathrm{i}$

(c) determine the value of a and the value of b

(2)

(d) determine arg w, giving your answer in radians to 4 significant figures.

(2)

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Question 6 continued

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Question 6 continued

(Total for Question 6 is 10 marks)