

10 The roots of a quadratic equation are α and β where

$$\alpha + \beta = -\frac{5}{2} \text{ and } \alpha^3 + \beta^3 = \frac{115}{8}$$

(a) Show that $\alpha\beta = 4$

(3)

(b) Form a quadratic equation with integer coefficients, that has roots

$$\frac{\alpha^2 + 1}{\beta} \text{ and } \frac{\beta^2 + 1}{\alpha}$$

(7)

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Question 10 continued

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Question 10 continued

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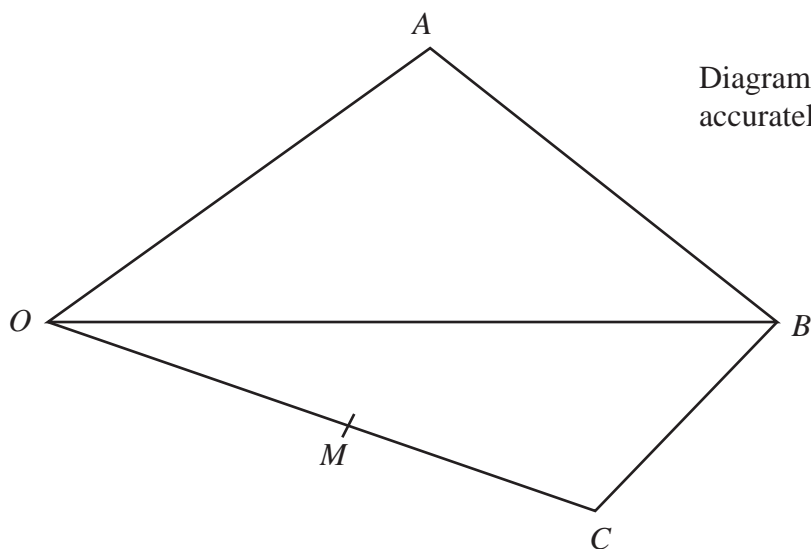
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11

Diagram **NOT**
accurately drawn**Figure 3**Figure 3 shows quadrilateral $OABC$ where

$$\vec{OA} = 4\mathbf{p} + 5\mathbf{q} \quad \vec{OB} = 3\mathbf{p} + \mathbf{q} \quad \vec{OC} = 2\mathbf{p} - 4\mathbf{q}$$

The point M is the midpoint of OC

- (a) Find
- \vec{MA}
- as a simplified expression in terms of
- \mathbf{p}
- and
- \mathbf{q}

(3)

The point N lies on OB such that M , N and A are collinear.

- (b) Find the ratio
- $MN : NA$

(6)

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Question 11 continued

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(Total for Question 11 is 9 marks)

TOTAL FOR PAPER IS 100 MARKS