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8. [*In this question,* **i** *and* **j** *are horizontal unit vectors directed due east and due north respectively and position vectors are given relative to a fixed origin O.*]

Two ships, A and B, are moving with constant velocities.
The velocity of A is $(3\mathbf{i} + 12\mathbf{j})\,\text{km h}^{-1}$ and the velocity of B is $(p\mathbf{i} + q\mathbf{j})\,\text{km h}^{-1}$

(a) Find the speed of A.

(2)

The ships are modelled as particles.
At 12 noon, A is at the point with position vector $(-9\mathbf{i} + 6\mathbf{j})$ km and B is at the point with position vector $(16\mathbf{i} + 6\mathbf{j})$ km.

At time t hours after 12 noon,

$$\overrightarrow{AB} = \left[(25 - 12t)\mathbf{i} - 9t\mathbf{j}\right]\text{km}$$

(b) Find the value of p and the value of q.

(7)

(c) Find the bearing of A from B when the ships are 15 km apart, giving your answer to the nearest degree.

(7)

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Q8

(Total 16 marks)

TOTAL FOR PAPER: 75 MARKS

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