

8. [In this question \mathbf{i} and \mathbf{j} are horizontal unit vectors directed due east and due north respectively and position vectors are given relative to a fixed origin.]

A ship A moves with constant velocity $(3\mathbf{i} - 10\mathbf{j}) \text{ km h}^{-1}$

At time t hours, the position vector of A is \mathbf{r} km.

At time $t = 0$, A is at the point with position vector $(13\mathbf{i} + 5\mathbf{j})$ km.

(a) Find \mathbf{r} in terms of t .

(2)

Another ship B moves with constant velocity $(15\mathbf{i} + 14\mathbf{j}) \text{ km h}^{-1}$

At time $t = 0$, B is at the point with position vector $(3\mathbf{i} - 5\mathbf{j})\text{ km}$.

(b) Show that, at time t hours,

$$\overrightarrow{AB} = [(12t - 10)\mathbf{i} + (24t - 10)\mathbf{j}] \text{ km}$$

(4)

Given that the two ships do not change course,

(c) find the shortest distance between the two ships,

(6)

(d) find the bearing of ship B from ship A when the ships are closest.

(2)



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Q8

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TOTAL FOR PAPER: 75 MARKS

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