8 In this question, **i** is a unit vector due east and **j** is a unit vector due north. Distances are measured in kilometres and time is measured in hours.

At 09 00, ship A leaves a point P with position vector $5\mathbf{i}+16\mathbf{j}$ relative to an origin O. It sails with a constant speed of $6\sqrt{3}$ on a bearing of 120°.

(a) Show that the velocity vector of A is $9\mathbf{i}-3\sqrt{3}\,\mathbf{j}$. [2]

(b) Find the position vector of A at 12 00. [1]

(c) At 11 00 ship B leaves a point Q with position vector $29\mathbf{i}+16\mathbf{j}$. It sails with constant velocity $-12\sqrt{3}\,\mathbf{j}$. Write down the position vector of B, t hours after it starts sailing. [1]

(d) Find the distance between the two ships at 12 00. [3]

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