

QQQ – Pure Year 1 – Chapter 11 – Vectors (Version 1)

Total Marks: 23

(23 = Platinum, 21 = Gold, 18 = Silver, 16 = Bronze)

1. Given that the point A has position vector $4\mathbf{i} - 5\mathbf{j}$ and the point B has position vector $-5\mathbf{i} - 2\mathbf{j}$,

(a) find the vector $\overrightarrow{AB}$, (2)

(b) find $|\overrightarrow{AB}|$.
Give your answer as a simplified surd. (2)

(Total 4 marks)

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2. Relative to a fixed origin O

- the point A has coordinates $(3, -8)$
- the point B is such that $\overrightarrow{AB} = -5\mathbf{i} + 2\mathbf{j}$

(a) Find the exact value of $|\overrightarrow{OB}|$ (3)

(b) Find the size of angle OAB , giving your answer in degrees to one decimal place. (3)

(Total 6 marks)

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3. [In this question the unit vectors $\mathbf{i}$ and $\mathbf{j}$ are due east and due north respectively.]

A coastguard station O monitors the movements of a small boat.

At 10:00 the boat is at the point $(4\mathbf{i} - 2\mathbf{j})$ km relative to O .

At 12:45 the boat is at the point $(-3\mathbf{i} - 5\mathbf{j})$ km relative to O .

The motion of the boat is modelled as that of a particle moving in a straight line at constant speed.

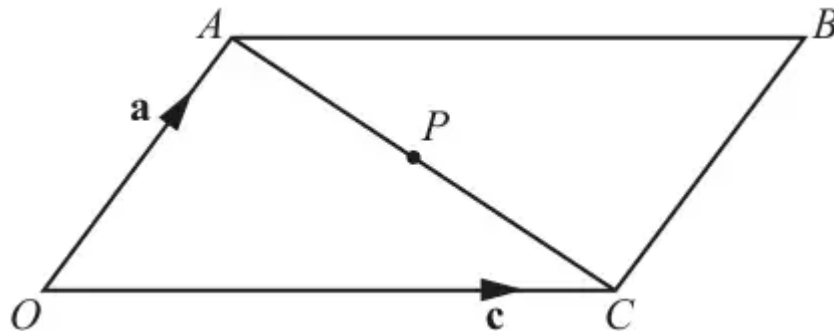
(a) Calculate the bearing on which the boat is moving, giving your answer in degrees to one decimal place. (3)

(b) Calculate the speed of the boat, giving your answer in km h^{-1} (3)

(Total 6 marks)

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4. $OABC$ is a parallelogram with $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$. P is the midpoint of AC .



(i) Find the following in terms of $\mathbf{a}$ and $\mathbf{c}$, simplifying your answers.

(a) $\overrightarrow{AC}$ [1]

(b) $\overrightarrow{OP}$ [2]

(ii) Hence prove that the diagonals of a parallelogram bisect one another. [4]

(Total 7 marks)

OCR A June 2018 Paper 1 Q7