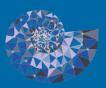
Modelling in mechanics



Gold

A boat is searching for a wreck starting from point A and then travelling to points B and C before finding the wreck at D.

The displacement from A to B is 3i + 4j km

The displacement from B to C is 5i + 4jkm

The displacement from C to D is 12i + 5j km

- **a** Find the magnitude of the displacement from *A* to *D* giving your answer to one decimal place.
- **b** Find the distance travelled by the boat from *A* to *D* giving your answer to one decimal place and explain why this is not equal to the magnitude of the displacement from *A* to *D*.

Silver

In this question, the unit vector **j** is directed due north and the unit vector **i** is directed due east.

Two particles A and B are moving relative to a fixed origin O in straight lines and with constant velocities.

The velocity of particle A is (5j + 12i) m s⁻¹ and the velocity of particle B is (8j - 6i) m s⁻¹.

- **a** Find the direction of motion of particle *A* as an angle to the unit vector **i** giving your answer in degrees to the nearest whole number.
- **b** Find the speed of particle B giving your answer in km h^{-1} to 1 one decimal place.

Bronze

A boy walks to school in a straight line from his home at a constant speed of 6 km h⁻¹. He returns home taking the same route but walking with a constant speed of 5 km h⁻¹. If the distance he travels to school is 1.8 km and the direction towards the school is taken as positive, find his:

- a velocity in m s⁻¹ for the journey from school to home
- **b** displacement in m from home to school
- c total distance in m to school and back
- d displacement in m when he arrives back home after going to school
- e time taken walking to school and back to the nearest minute

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Modelling in mechanics



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