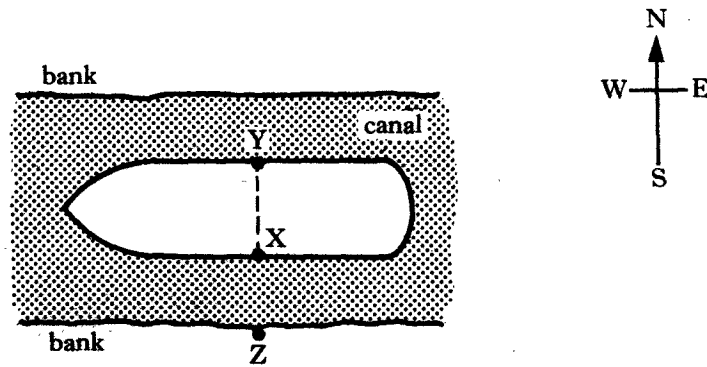


1992 Q31

A barge is travelling, with a velocity of 2.0 ms^{-1} due west, along a canal.

A girl runs, with a speed of 4.8 ms^{-1} , from X to Y across the deck of the barge as shown below.

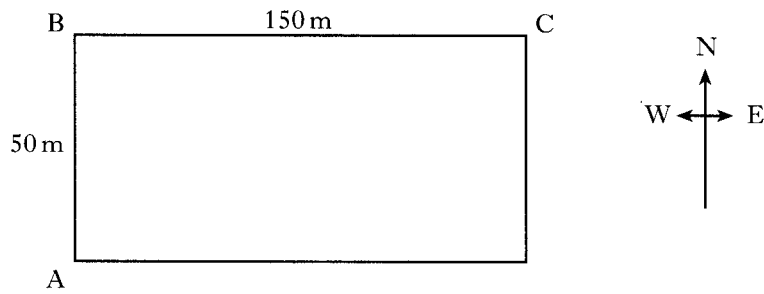


By drawing a scale diagram or otherwise, find the resultant velocity of the girl relative to someone at point Z on the bank of the canal.

1998 Q31

A spectator at A walks to C, the opposite corner of a playing field, by walking from A to B and then from B to C as shown in the diagram below.

The distance from A to B is 50 m. The distance from B to C is 150 m.

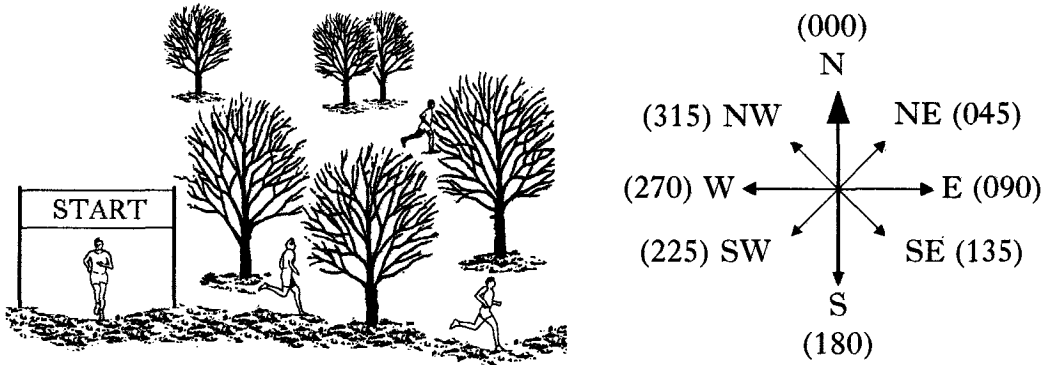


By scale drawing or otherwise, find the resultant displacement. Magnitude and direction are required.

1995 Q1

- (a) State the difference between vector and scalar quantities.
- (b) In an orienteering event, competitors navigate from the start to control points around a set course.

Two orienteers, Andy and Paul, take part in a race in a flat area. Andy can run faster than Paul, but Paul is a better navigator.

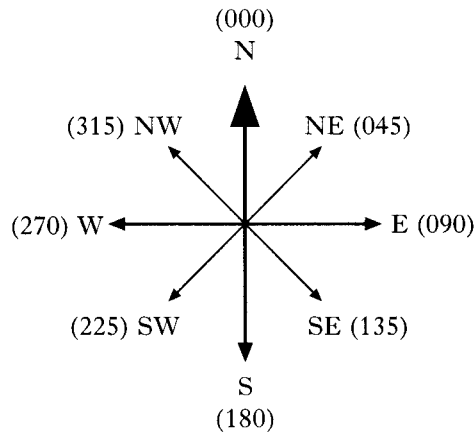


From the start, Andy runs 700 m north (000) then 700 m south-east (135) to arrive at the first control point. He has an average running speed of 3 ms^{-1} .

- (i) By scale drawing or otherwise, find the displacement of Andy, from the starting point, when he reaches the first control point.
- (ii) Calculate the average velocity of Andy between the start and the first control point.
- (iii) Paul runs directly from the start to the first control point with an average running speed of 2.5 ms^{-1} .
Determine the average velocity of Paul.
- (iv) Paul leaves the starting point 5 minutes after Andy.
Show by calculation who is first to arrive at this control point.

1997 Q1

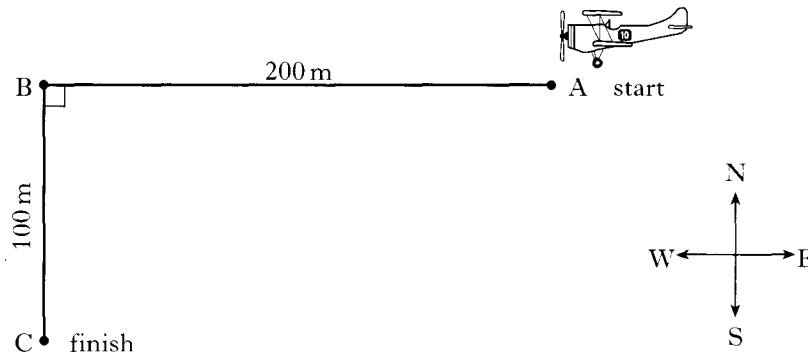
- (c) During a flight the aircraft is travelling with a velocity of 36 ms^{-1} due north (000). A wind with a speed of 12 ms^{-1} starts to blow **towards** the direction 40° west of north (320).



Find the magnitude and direction of the resultant velocity of the aircraft.

2000 Q1

A radio controlled aircraft is flown over a course from A to B and then to C as shown below.

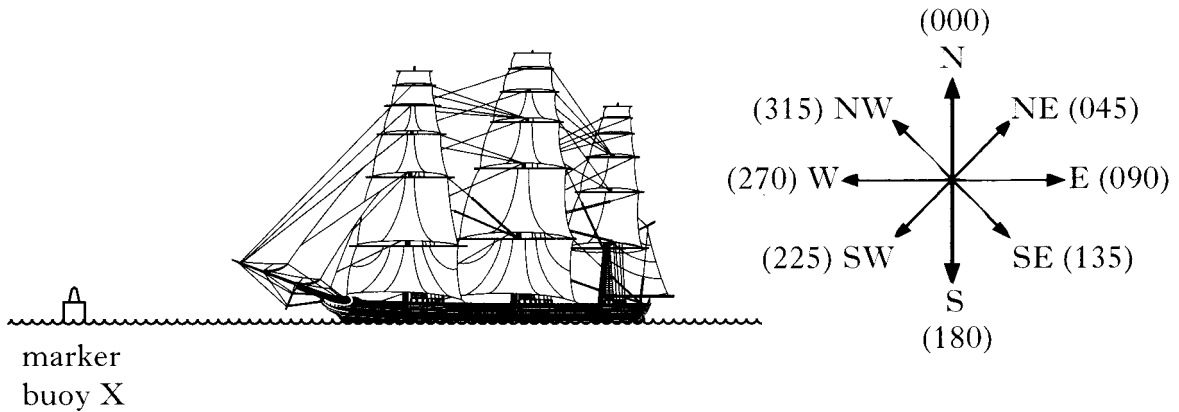


- (a) During one run there is no wind and the aircraft is flown at a constant speed of 25 ms^{-1} .
- Calculate the time the aircraft takes to complete the course.
 - When it reaches C, what is the resultant displacement of the aircraft relative to its starting position?
 - Calculate the average velocity of the aircraft over the complete course.
- (b) During a second run the aircraft is flying due south from B at a speed of 25 ms^{-1} . A wind starts to blow from east to west with a speed of 10 ms^{-1} . The aircraft is blown off course. By scale drawing or otherwise, find the magnitude **and** direction of the resultant velocity of the aircraft when the wind is blowing.

2004 Q21.

- (a) State the difference between speed and velocity.
(b) During a tall ships race, a ship called the Mir passes a marker buoy X and sails due West (270).

It sails on this course for 30 minutes at a speed of 10.0 kmh^{-1} , then changes course to 20° West of North (340). The Mir continues on this new course for $1\frac{1}{2}$ hours at a speed of 8.0 kmh^{-1} until it passes marker buoy Y.

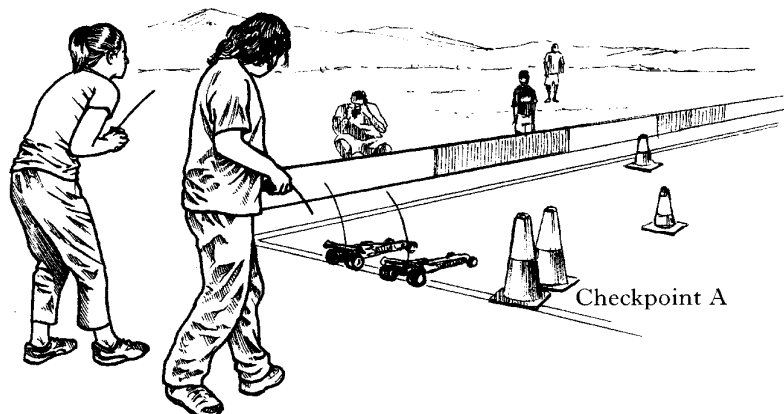


- (i) Show that the Mir travels a total distance of 17 km between marker buoys X and Y.
(ii) By scale drawing or otherwise, find the displacement from marker buoy X to marker buoy Y.
(iii) Calculate the average velocity, in kmh^{-1} , of the Mir between marker buoys X and Y.
(c) A second ship, the Leeuvin, passes marker buoy X 15 minutes after the Mir and sails directly for marker buoy Y at a speed of 7.5 kmh^{-1} .
Show by calculation which ship first passes marker buoy Y.

2007 Q21.

Competitors are racing remote control cars.

The cars have to be driven over a precise route between checkpoints.



Each car is to travel from checkpoint A to checkpoint B by following these instructions.

"Drive 150 m due North, then drive 250 m on a bearing of 60° East of North (060)."

Car X takes 1 minute 6 seconds to follow these instructions exactly.

- By scale drawing or otherwise, find the displacement of checkpoint B from checkpoint A.
- Calculate the average velocity of car X from checkpoint A to checkpoint B.
- Car Y leaves A at the same time as car X.

Car Y follows exactly the same route at an average speed of 65 ms^{-1} .

Which car arrives first at checkpoint B?

Justify your answer with a calculation.

- State the displacement of checkpoint A from checkpoint B.

