



## Workshop problem sheet 3: vectors

- A.** A bear walks northeast for 12 m and then east for 12 m. Show the displacement graphically and find the resultant displacement approximately from the graph. Confirm the displacement using trigonometry. Finally, confirm your result using vectors in components.
- B.** A wall clock has a minute hand that has a length of 0.5 m and an hour hand that has a length of 0.25 m. Taking the centre of the clock as the origin, and choosing an appropriate coordinate system, write the position of the hour and minute hands as vectors when the time reads
1. 12:00,
  2. 3:30,
  3. 6:30,
  4. 7:15.

Call the position of the tip of the minute hand  $\mathbf{m}$  and the position of the tip of the hour hand  $\mathbf{h}$ . Find  $\mathbf{m} - \mathbf{h}$  for the times given above.

- C.** The bear swims directly across a river, at 1.6 m/s relative to the water. She arrives at a point 40 m downstream from the point directly across the river, which is 80 m wide.
1. What is the speed of the river current?
  2. What is the bear's speed relative to the shore?
  3. In what direction should the bear head to arrive at the point directly opposite to her starting point?
  4. Her cub follows. What is the minimum swimming speed the cub must manage to be able to cross the river?