# Resolving Vectors into Components

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Exercise A

1 A force of 10 N acts on an object at an angle θ to the horizontal. Calculate the horizontal
   component of the force when $\theta = 0$, $\theta = 45°$, and $\theta = 90°$. Comment on your answers.   (*4 marks*)

2 A parascender is attached by a rope to a boat travelling at a constant velocity (Figure 5a).
   The rope is angled at 35° to the surface of the sea, and the tension in the rope is 1650 N.
   Calculate the horizontal and vertical components of the tension in the rope.   (*2 marks*)

3 A sailing boat is travelling north. It is moving because of a force due to the wind, which is 350 N
   blowing towards 40° east of north (Figure 5b). Calculate the components of the force from the wind:
   a towards the north (the direction in which the boat is moving);   (*1 mark*)
   b towards the east (perpendicular to the direction in which the boat is moving).   (*1 mark*)
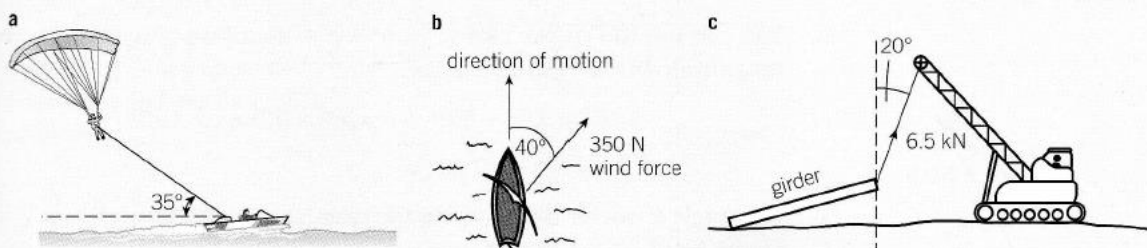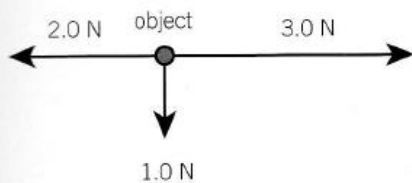

▲ Figure 5

4 One end of a steel girder is lifted off the ground by a crane. The cable is at 20° from the
   vertical and the tension in the cable is 6.5 kN (Figure 5c). Calculate the vertical and
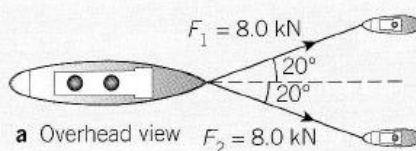   horizontal components of this force.   (*2 marks*)

Exercise B

1 Three forces act on an object (Figure 7). Calculate the magnitude and
   direction of the resultant force.   (*4 marks*)
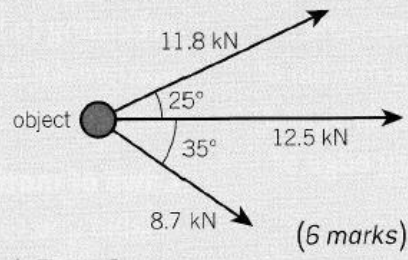

◀ Figure 7

2 Two tugboats are pulling a ship,
   each with a force of 8.0 kN, and
   with an angle of 40° between the
   cables (Figure 8). Calculate the
   magnitude and direction of the
   resultant force.

a Overhead view

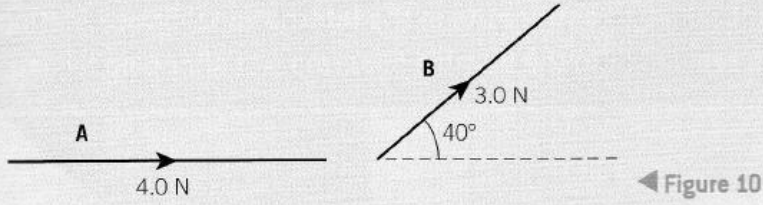▲ Figure 8   (*4 marks*)

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3 Three tugboats are towing an object at sea. The forces and angles between the cables are shown in Figure 9. Calculate the magnitude and direction of the resultant force on the object.

11.8 kN

object

25°

35°

12.5 kN

8.7 kN

(6 marks)

▲ Figure 9

4 Figure 10 shows two vectors, **A** and **B**. Determine the magnitude and the direction of the resultant vector **A − B**. (4 marks)

B

3.0 N

40°

A

4.0 N

◀ Figure 10