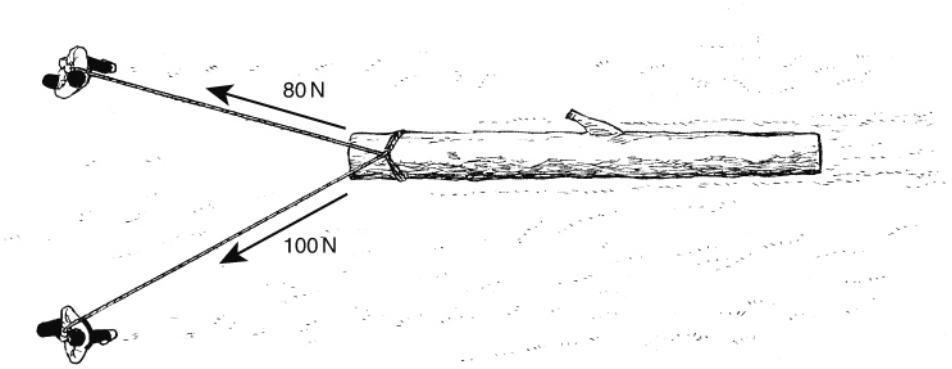
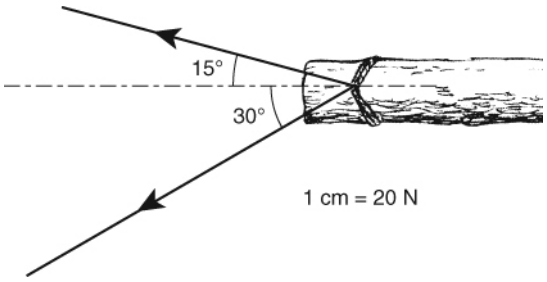
If there are several forces acting on an object, they can be combined to give a resultant force. If the forces all act along the same line, working out the resultant is easy – you just add up the forces in each direction and subtract the backwards forces from the forwards forces. However, it is slightly more complicated if the forces are not acting along the same line.

This drawing shows two people pulling a log across a field.

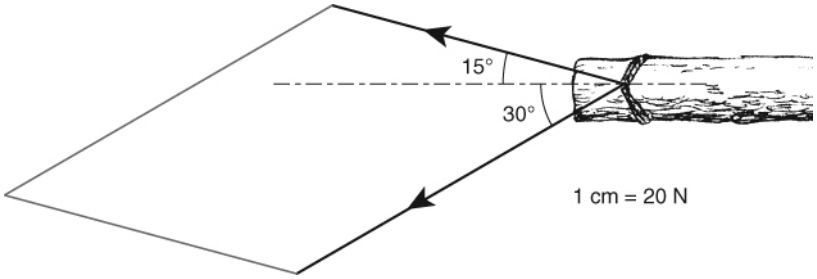


In situations like this, you can work out the resultant force using a scale drawing.

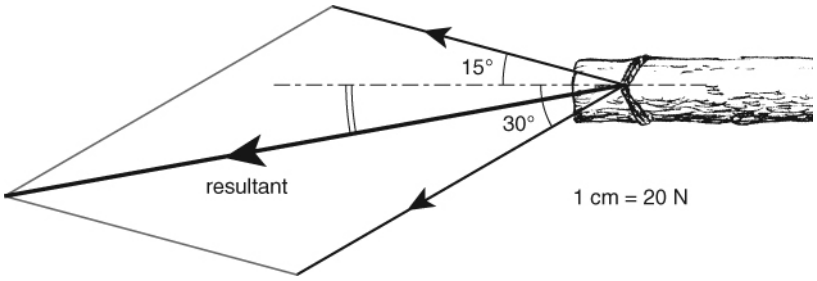
A Draw the forces at the correct angles and make the lengths of the lines proportional to the force. You can do this by choosing a scale. For example, if 1 cm represents 20 N, then 5 cm will represent 100 N.



B Draw lines parallel to the two forces to make a parallelogram.



C Draw in the diagonal. The angle of this line is the angle of the resultant force and its length represents the size of the resultant force.



1 **a** What is the size of the resultant force? (*Hint*: measure the diagram and use the scale to convert the distance to a force.)

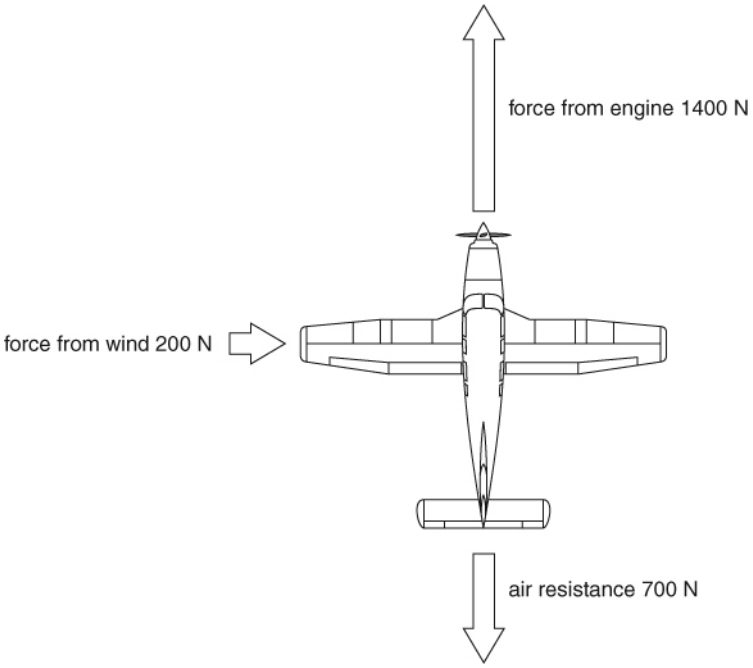
b Why is this smaller than the sum of the two forces (180 N)?

c At what angle is the resultant force acting?

d What will happen to the log?

2 Both people pull the log with a force of 80 N at an angle of 20° from the centreline of the log, one on each side of the centreline. Draw a diagram like the one above to work out the size of the resultant force.

3 This aeroplane has just taken off. What is the resultant force on it? (*Hint*: work out the resultant force in the forwards/backwards direction first, then draw a diagram to work out the overall resultant.)



I can…

- work out a resultant force from two forces at an angle
- explain the effects of a resultant force.