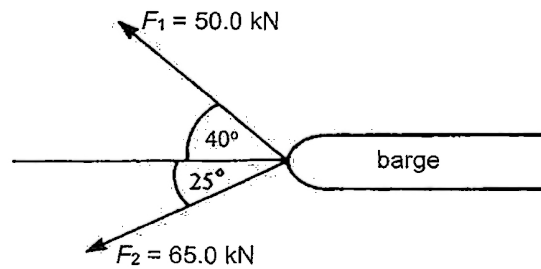


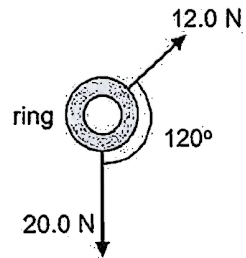
Assignment 02: Scalars and Vectors (compiled student answers)

1. A spacecraft landing on the moon has a vertical velocity of 3.0 m s^{-1} towards the surface. At the same time, it has a horizontal velocity of 5.5 m s^{-1} to the right. At what resultant velocity V does the vehicle move along the descent path? Use a suitable scale diagram to determine the resultant velocity. [4]

2. The diagram shows the top view of a barge being pulled through still water by two cables. F_1 and F_2 are the forces in the cables which act on the barge. By means of a suitable scale diagram, determine the resultant force R exerted on the barge under the action of forces F_1 and F_2 . [4]



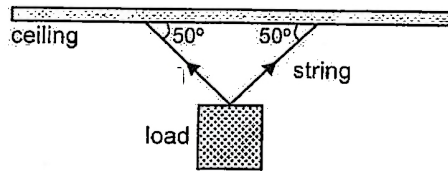
3. The diagram shows the top view of two forces 12.0 N and 20.0 N acting on a metal ring and having an angle of 120° subtended between them.



When a third force F is applied on the ring, it is in equilibrium under the action of the three forces.

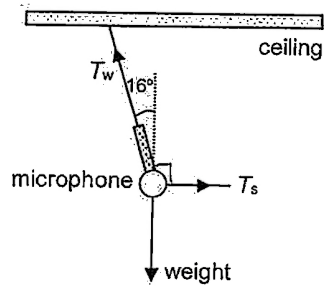
Use a suitable scale diagram to determine the force F . [4]

4. Two strings suspended from a ceiling are tied to a load as shown in the diagram below. Each string has a tensional force of 0.180 kN in it.



- (a) By means of a suitable scale diagram, determine the resultant force R exerted by the tensional force in both strings. [4]
- (b) Hence, determine the weight W of the load. [1]

5. A microphone of mass $5.0 \times 10^2 \text{ g}$ hangs from the end of a long wire fixed to the ceiling. A horizontal string attached to the microphone exerts a force that keeps it at rest with the wire at an angle of 16° to the vertical as shown in the diagram below. Using a suitable scale diagram or otherwise, determine the magnitude of the force in the string, T_s and the magnitude of the force in the wire, T_w . Assume that gravitational field strength = 10 N kg^{-1} . [4]



6. A straight river 240 m wide flows at a rate of 1.5 m s^{-1} . A man who can row at 2.5 m s^{-1} in still water wants to cross the river in the shortest possible distance.

(a) Using a suitable scale diagram or otherwise, determine the direction in which he must row. [3]

(b) How long does he take to cross the river? [2]

Hint: To cross the river in the shortest possible distance, this means the resultant velocity must act directly across the river.

