1 **(a)** A loose uniform wooden floorboard weighs 160 N and rests symmetrically on four supports P, Q, R and S.

The supports are 0.50 m apart, as shown in Fig. 2.1.

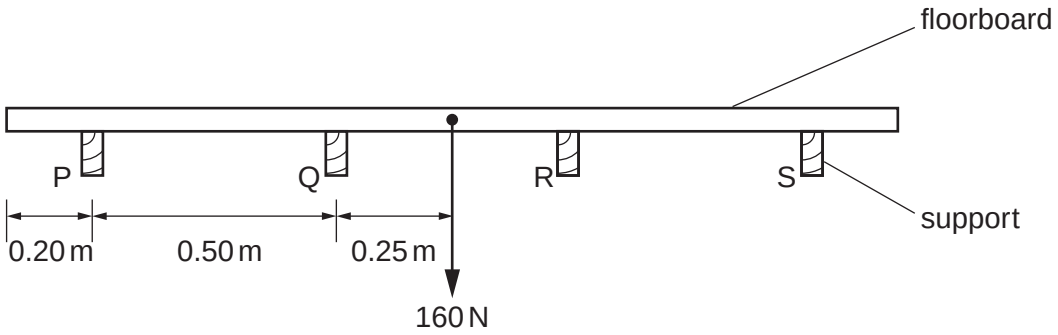

Fig. 2.1

Calculate the force exerted on the floorboard by each of the supports, and state the direction of these forces. One value is already given for you.

force exerted by P = ...

force exerted by Q = 40 N

force exerted by R = ...

force exerted by S = ...

direction = ... [2]

(b) A workman of weight *W* stands on the end of the floorboard described in **(a)**.

This just causes the floorboard to tip up, as shown in Fig. 2.2.

The supports are each 0.060 m thick.

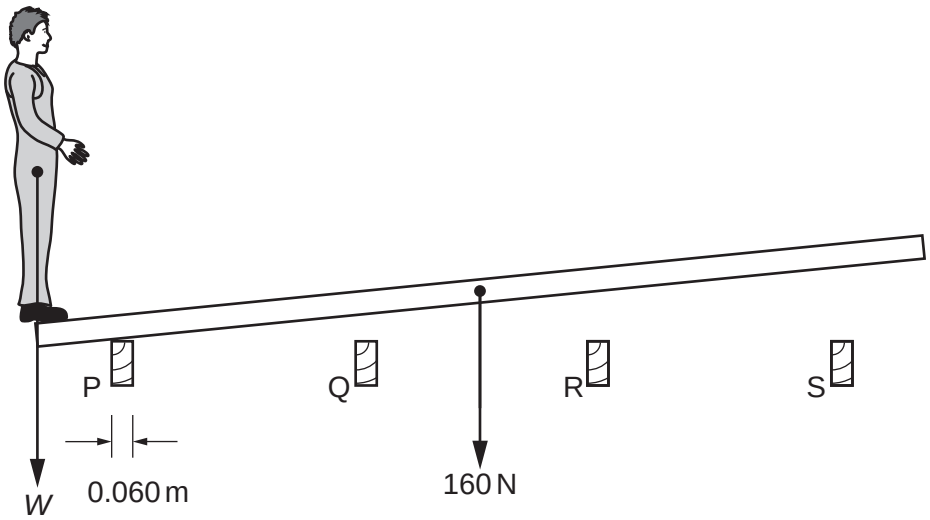

Fig. 2.2

(i) Calculate the weight *W* of the workman.

weight *W* = ... [3]

(ii) Calculate the force that each of the supports now exerts on the floorboard.

force exerted by P = ...

force exerted by Q = ...

force exerted by R = ...

force exerted by S = ... [2]

[Total: 7]

2 **(a)** In an accident, a truck goes off the road and into a ditch. Two breakdown vehicles A and B are used to pull the truck out of the ditch, as shown in Fig. 4.1.

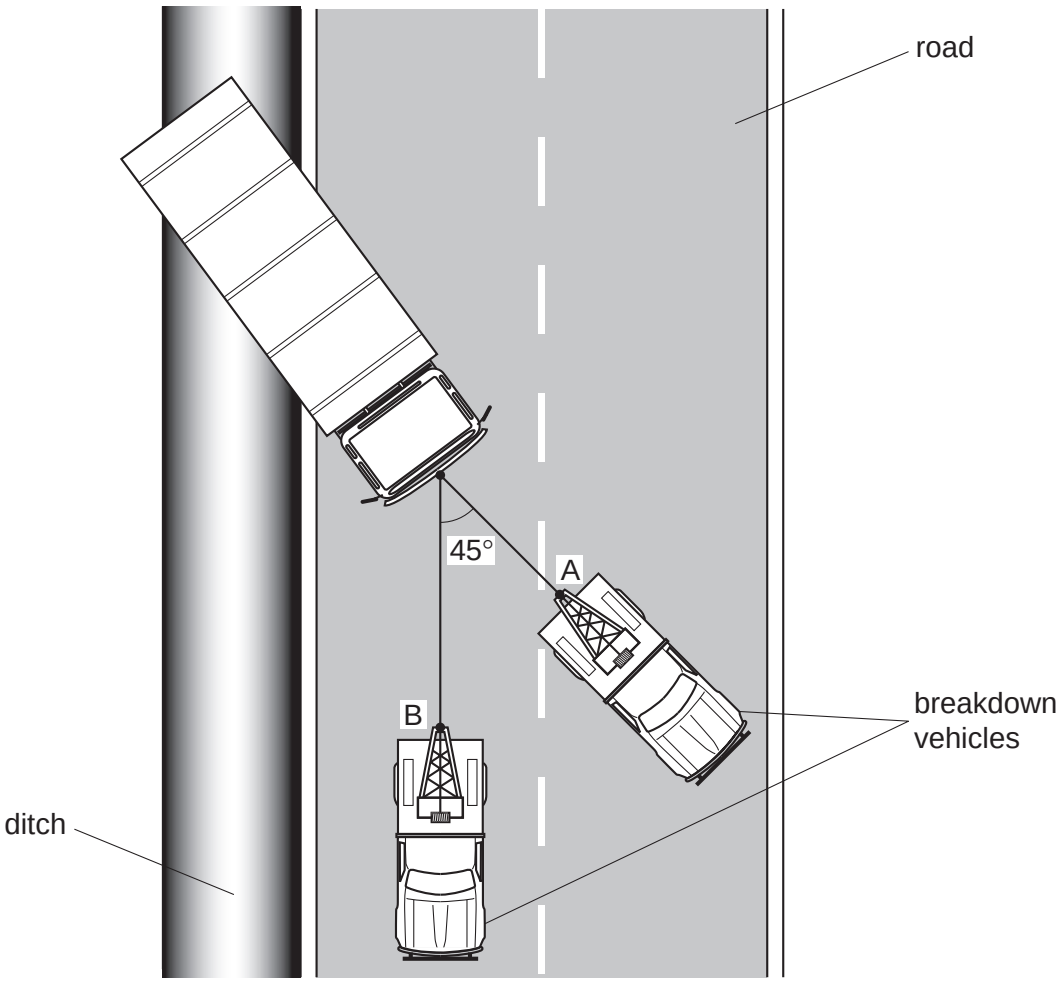

Fig. 4.1

At one point in the rescue operation, breakdown vehicle A is exerting a force of 4000 N and breakdown vehicle B is exerting a force of 2000 N.

(i) Using a scale of 1 cm = 500 N, make a scale drawing to show the resultant force on the truck.

[4]

(ii) Use your diagram to find the magnitude and direction of the resultant force on the truck.

magnitude of resultant force = ...

direction of resultant force = ... to direction of road [2]

(b) (i) State why the resultant force is an example of a vector quantity.

..... [1]

(ii) Give an example of a vector quantity that is not a force.

..... [1]

[Total: 8]

3 A student investigated the stretching of a spring by hanging various weights from it and measuring the corresponding extensions. The results are shown below.

weight / N	0	1				
extension / mm	0	21	40	51	82	103

(a) On Fig. 3.1, plot the points from these results. Do not draw a line through the points yet. [2]

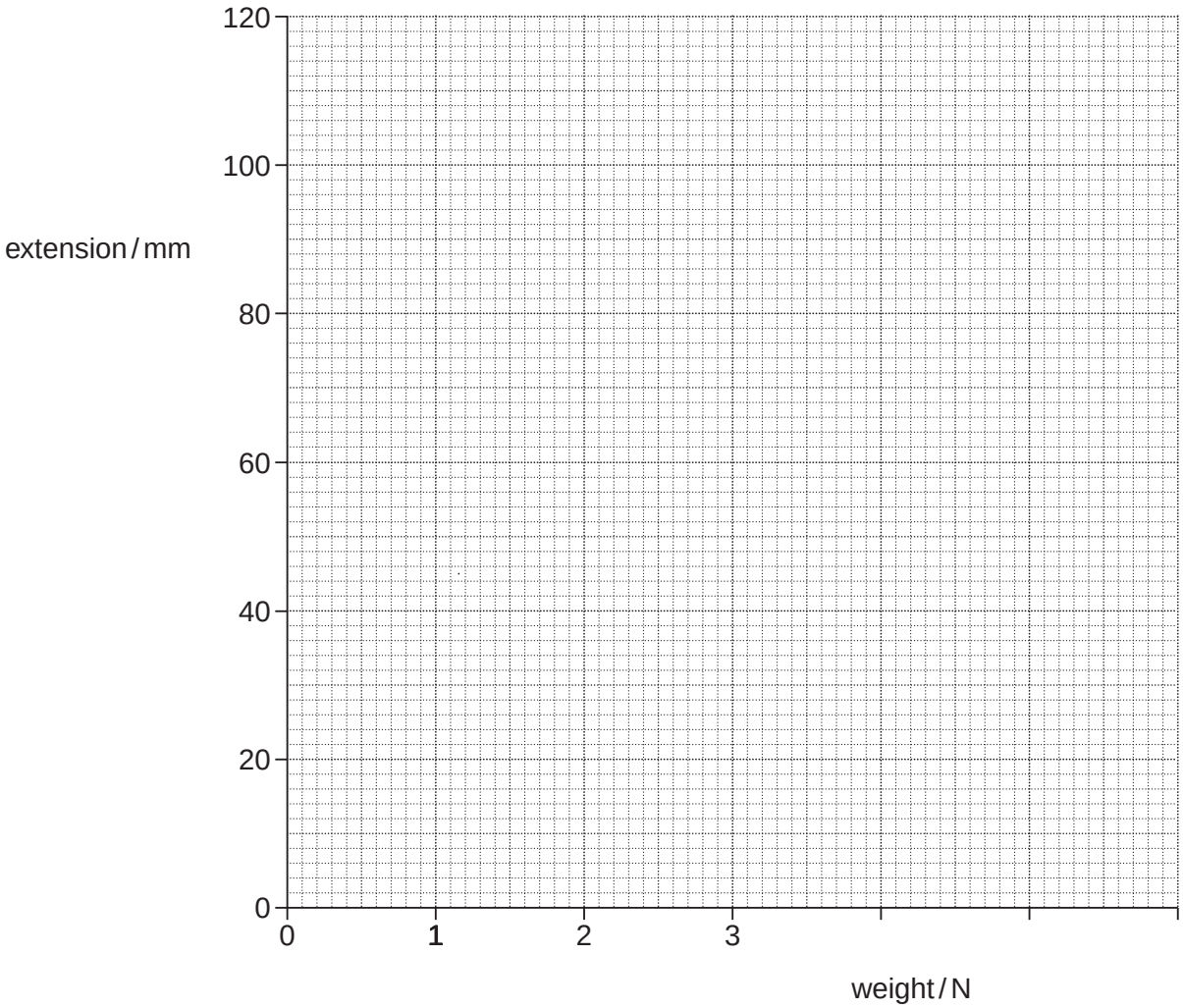

Fig. 3.1

(b) The student appears to have made an error in recording one of the results.

Which result is this?

..... [1]

(c) Ignoring the incorrect result, draw the best straight line through the remaining points.

[1]

(d) State and explain whether this spring is obeying Hooke's Law.

.....

.....

.....

.....

..... [2]

(e) Describe how the graph might be shaped if the student continued to add several more weights to the spring.

.....

.....

.....

..... [1]

(f) The student estimates that if he hangs a 45 N load on the spring, the extension will be 920 mm.

Explain why this estimate may be unrealistic.

.....

.....

.....

..... [1]

[Total: 8]

4 **(a)** A force acting on an object causes the object to accelerate.

In which direction is the acceleration?

..... [1]

(b) Any object moving in a circle has a force acting on it towards the centre of the circle.

What does this force do to the object?

..... [1]

(c) A woman of mass 60 kg is standing in a lift at a shopping centre.

(i) The lift is at rest.

1. State the value of the weight of the woman.

..... [1]

2. State the value of the force exerted on the woman by the floor of the lift.

..... [1]

(ii) Calculate the force required to accelerate a mass of 60 kg at 2.5 m/s^2.

force = ... [2]

(iii) The lift accelerates upwards at 2.5 m/s^2.

Calculate the force exerted on the woman by the floor when the lift is accelerating.

force = ... [1]

(iv) The lift reaches a steady upward speed.

State the value of the force exerted on the woman by the floor at this steady speed.

..... [1]

[Total: 8]