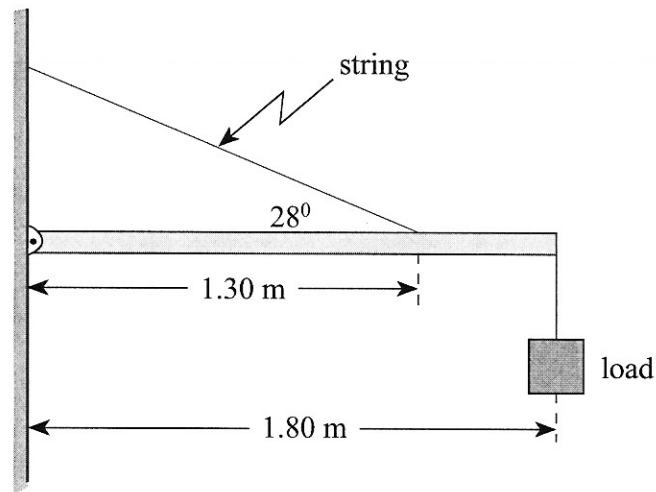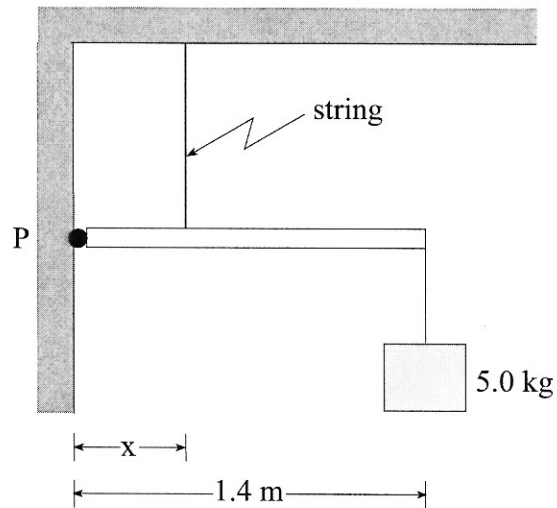26. The diagram shows a horizontal beam of negligible mass. The wall exerts a 42.0 N horizontal force on the lever. Find the weight of the load.



    A.   16.1 N
    B.   22.3 N
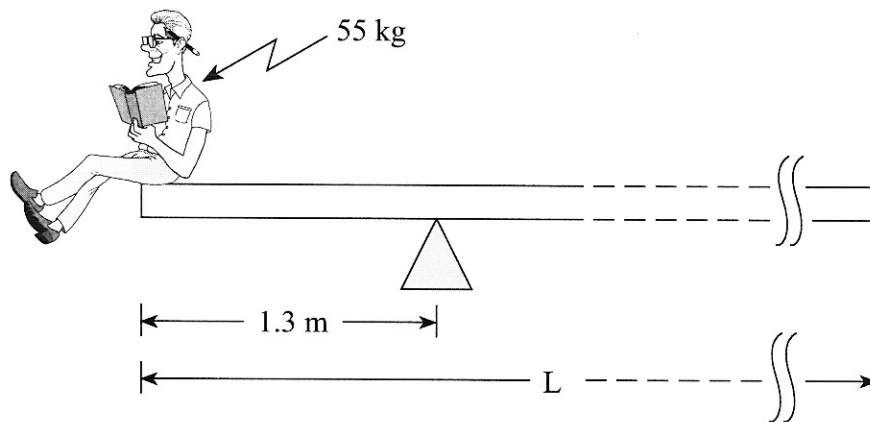    C.   34.4 N
    D.   47.6 N

27. A uniform 18 kg beam hinged at P is held horizontal by a vertical string that can withstand a maximum tension of 350 N. A 5.0 kg mass is suspended from the end of the beam as shown.



At what minimum distance, x, can the string be attached without breaking?

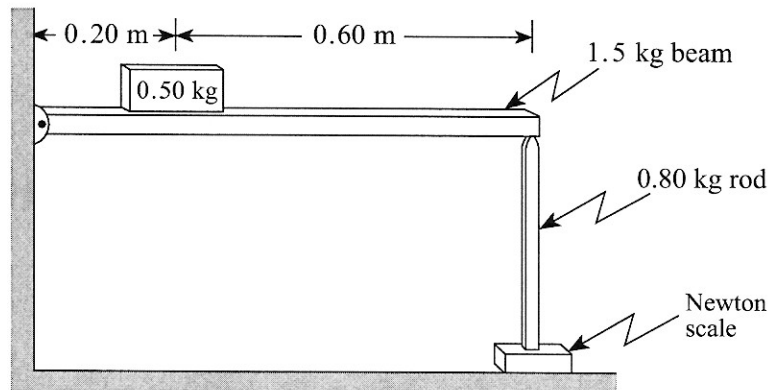    A.   0.16 m
    B.   0.20 m
    C.   0.55 m
    D.   0.70 m

28. A 35 kg uniform plank is balanced at one end by a 55 kg student as shown.



55 kg

1.3 m

L

What is the overall length of this plank?

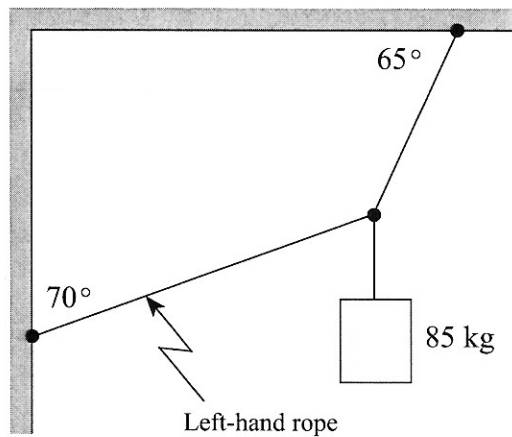A. 2.6 m
B. 3.3 m
C. 5.4 m
D. 6.7 m

29. A uniform 1.5 kg beam hinged at one end supports a 0.50 kg block. The beam is held level by a vertical 0.80 kg rod resting on a Newton scale at the other end.



0.20 m

0.60 m

0.50 kg

1.5 kg beam

0.80 kg rod

Newton scale

What is the reading on the scale?

A. 8.6 N
B. 9.1 N
C. 16 N
D. 27 N

30. An 85 kg object is suspended from a ceiling and attached to a wall.



65°

70°

85 kg

Left-hand rope

What is the tension in the left-hand rope?

A. 280 N
B. 350 N
C. 500 N
D. 1100 N


31. A uniform 2.5 kg beam, pivoted at its right end, is held in a horizontal position by a cable as shown in the diagram.



$T = 24$ N

center of mass

$50^\theta$

2.5 kg
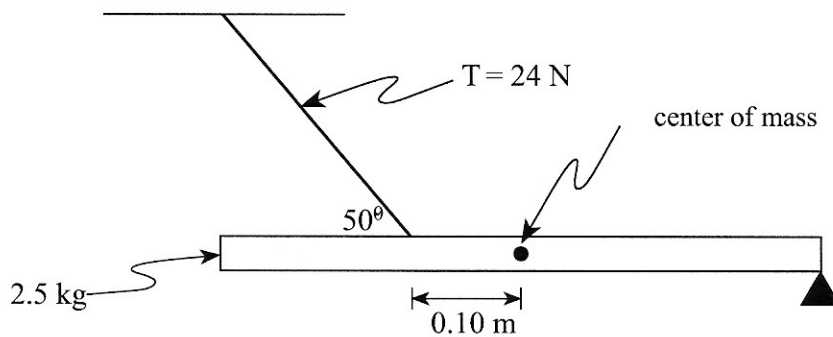
0.10 m

If the cable is attached 0.10 m to the left of the beam's centre of gravity, how long is the beam?

A. 0.34 m
B. 0.60 m
C. 1.2 m
D. 9.6 m

32.  The diagram shows the forces acting on a massless ladder resting on the floor and a frictionless
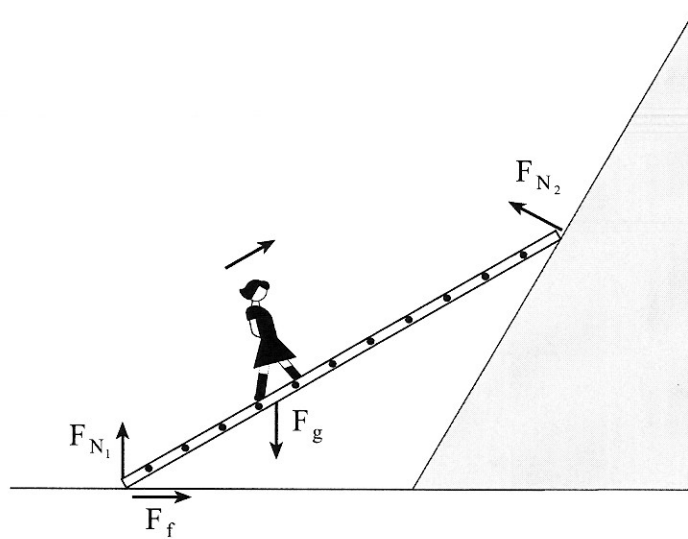


As a person walks up the stationary ladder, what happens to the magnitude of the forces $F_{N_1}$ and $F_{N_2}$?

|     | MAGNITUDE OF $F_{N_1}$ | MAGNITUDE OF $F_{N_2}$ |
| --- | --- | --- |
| A. | Decreases | Decreases |
| B. | Decreases | Increases |
| C. | Increases | Decreases |
| D. | Increases | Increases |

33.  A trailer carrying a boat is supported by a scale which initially reads 48 kg.  The boat (and therefore its centre of gravity) is moved 0.15 m further back on the trailer.  The scale now reads 37 kg.  Find the mass of the boat.
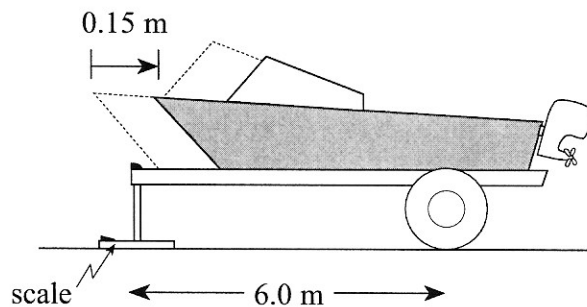


A.  440 kg
B.  1600 kg
C.  1700 kg
D.  3400 kg

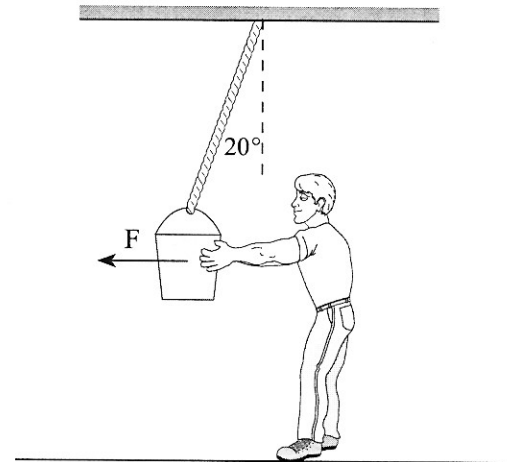1. A 25 kg droid rests on a 5.0 m long shelf supported by two cables as shown. The mass of the shelf is 12 kg.
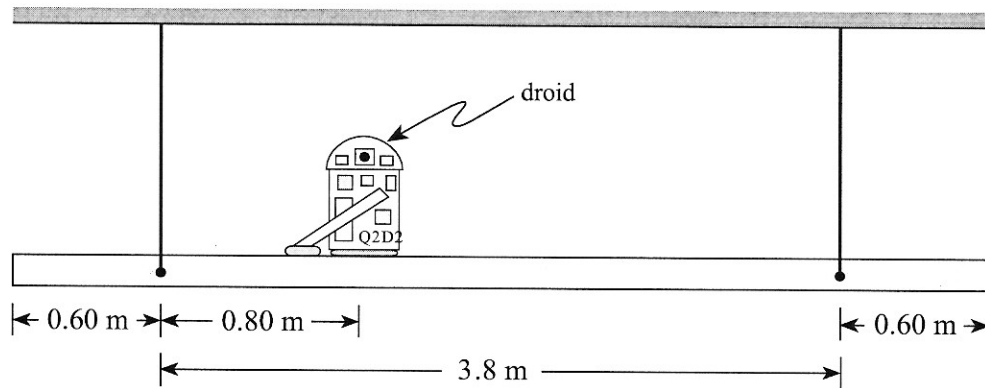


Find the tension in each cable.                                    **(7 marks)**

2. Peter exerts a horizontal force F on a  12 kg  bucket of concrete so that the supporting rope makes an angle of  20°  with the vertical.

   a) Find the tension force in the supporting rope.   **(3 marks)**

   

   b) Peter now exerts a new force which causes the rope to make a greater angle with the vertical.  How will the tension force in the supporting rope change?

   ☐ The tension force will increase.
   ☐ The tension force will decrease.
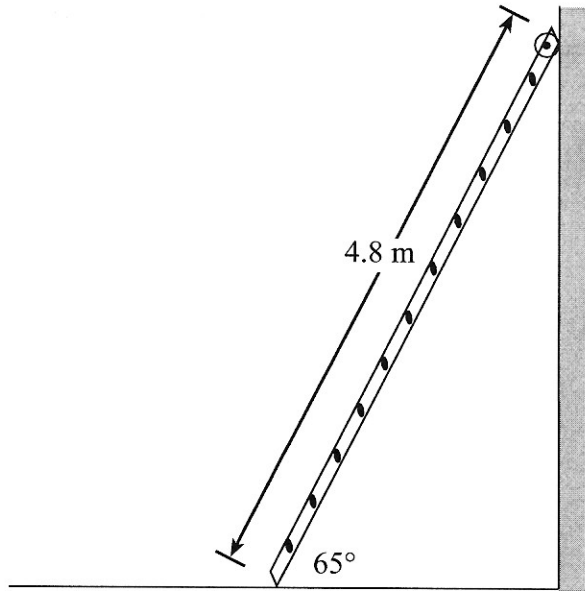   ☐ The tension force will remain the same.

   (Check one response.)                                    **(1 mark)**

   c) Using principles of physics, explain your answer to b).      **(3 marks)**

   _____

   _____

   _____

   _____

   _____

   _____

3. A uniform 4.8 m long ladder of mass 16 kg leans against a frictionless vertical wall as shown in the diagram below.



4.8 m

65°

a) Draw and label a free body diagram showing the forces acting on the ladder.      **(2 marks)**

b) What minimum force of friction is needed at the base of the ladder to keep it from sliding?

**(5 marks)**

4. A uniform beam 6.0 m long, and with a mass of 75 kg, is hinged at A. The supporting cable keeps the beam horizontal.
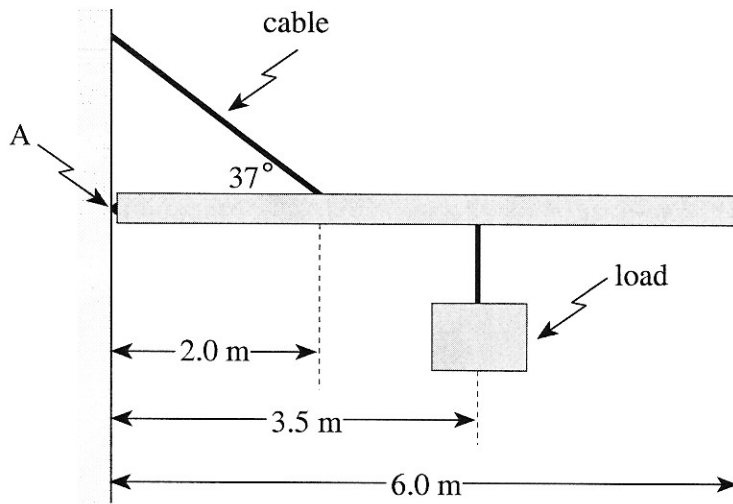


If the maximum tension the cable can withstand is $2.4 \times 10^3$ N, what is the maximum mass of the load? **(7 marks)**

5. A 6.0 m uniform beam of mass 25 kg is suspended by a cable as shown. An 85 kg object hangs from one end.



Cable

Beam (25 kg, 6.0 m)

67°

75°

4.0 m

85 kg
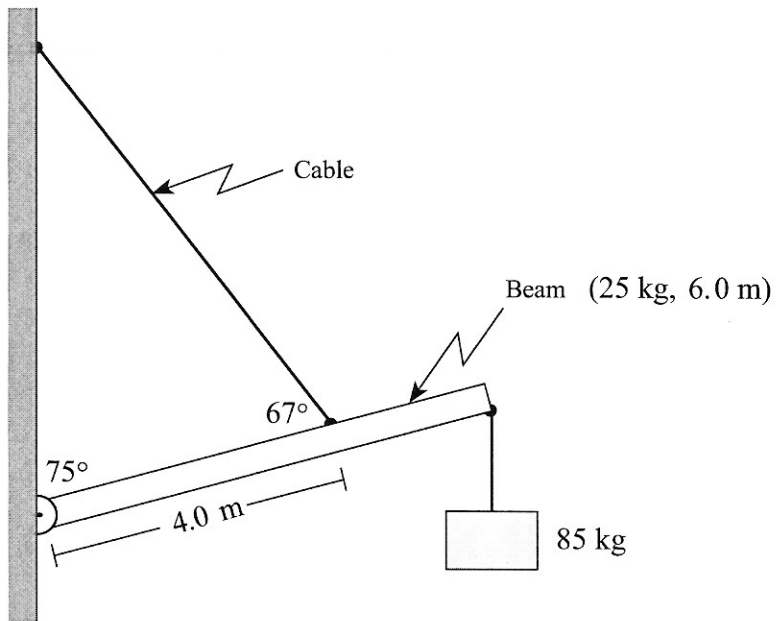
What is the tension in the cable?

(7 marks)

6. The diagram shows the rear door of a station wagon supported horizontally by a strut. The mass of the door is 18 kg and the compression force in the strut is 450 N.
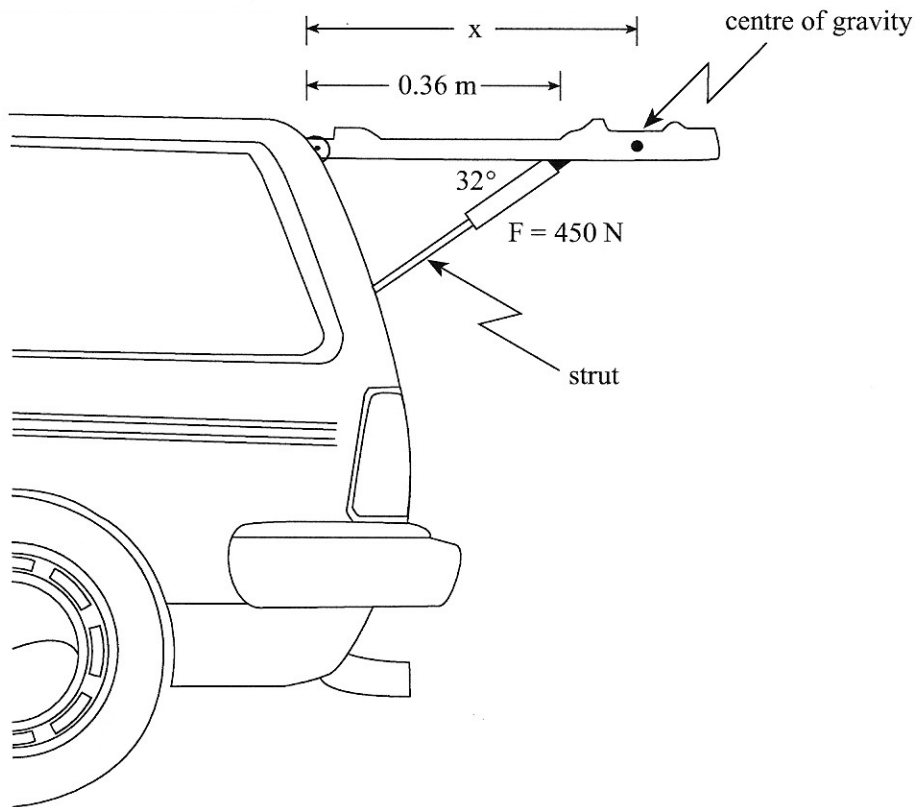


b) At what distance, x, from the hinge is the centre of gravity of the door located? **(7 marks)**