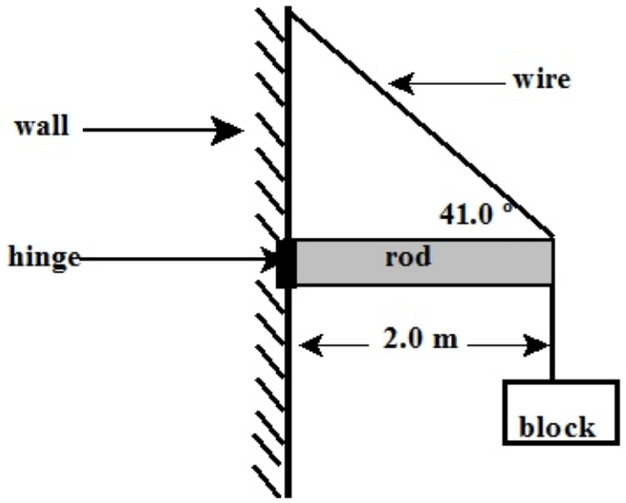
Physics 3204

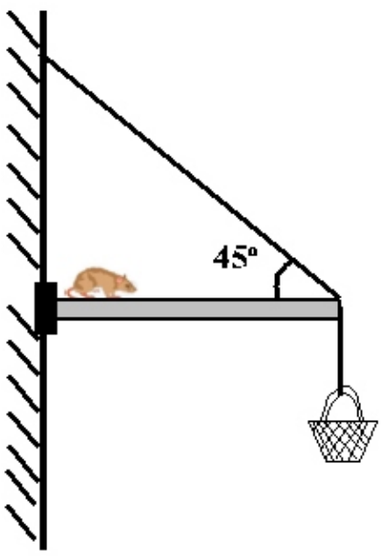
Static Equilibrium Worksheet: Putting It Altogether

1. Sketch the free body diagram for the rod in the diagram below. Label all forces. **JUNE 2004** **[2]**



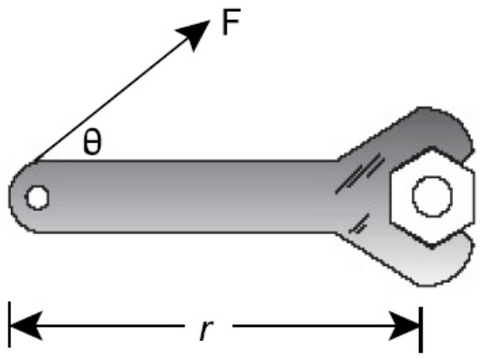
(ii) If the mass of the block is 5.0 kg and the rod is uniform with a mass of 0.40 kg, what is the magnitude of the tension in the wire? **[3]**

2. In the diagram below, a 1.5 kg rat walks on a 2.0 kg uniform beam that is 2.2 m long. It wants to reach a 1.3 kg food basket hanging at the end. A cord that can withstand 45.5 N is used to support the beam at the end. What is the maximum distance the rat can walk on the beam before the cord breaks? **AUGUST 2004** **[5]**

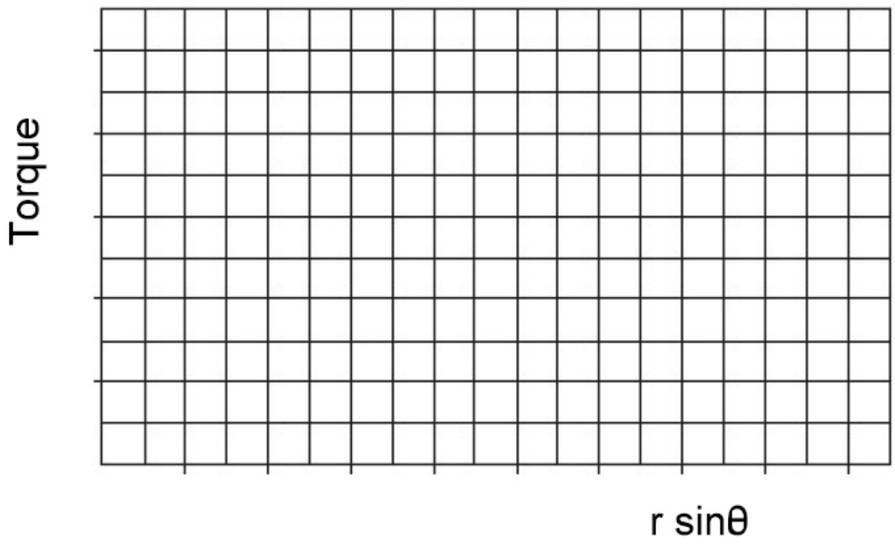


3. A student applies a constant force to a wrench of length r, in order to tighten a nut as shown. The force is applied at various angles and the measurement of torque applied is read from the wrench. The data collected are shown below. **AUGUST 2008**

$r \cdot \sin\theta$ (m)	Torque (N·m)
0.14	4
0.42	11
0.66	17
0.86	22

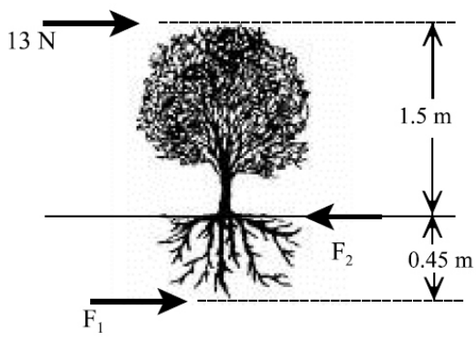


i) Graph this data on the grid below, including the line of best fit. **[1]**

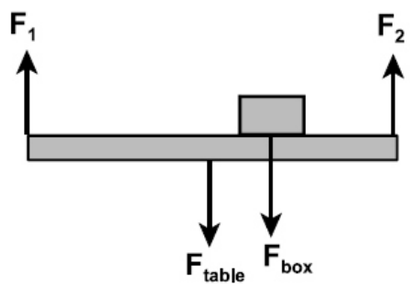


ii) Use the graph in (i) to determine the constant force that was applied to the wrench. **[2]**

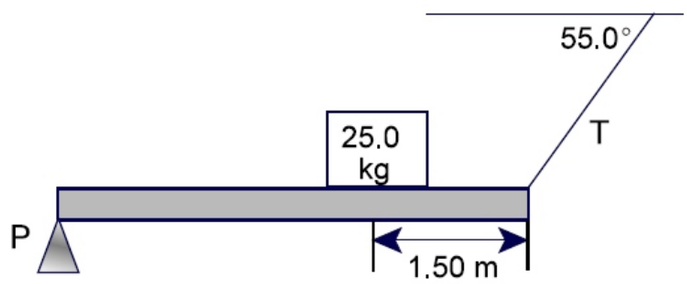
4. The wind exerts a force of 13 N on the top of the tree shown below. Calculate the forces, F_1 and F_2, required for the tree to remain in static equilibrium. **AUGUST 2007** [5]



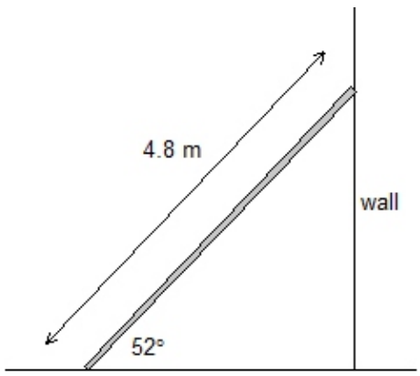
5. A 75 kg box is placed 0.60 m from the right edge of a uniform 25 kg table that is 2.0 m long. How much force is required (F_1 and F_2) to lift the table from both ends? **AUGUST 2006** **[5]**



6. A 4.00 m long uniform beam is supported by a pivot at one end and a cable at the other end. The beam has a mass of 15.0 kg and supports a 25.0 kg box as shown. Calculate the tension, T, in the cable. **JUNE 2008** [5]



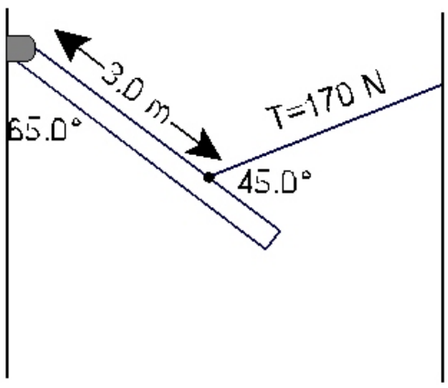
7. (f) A 12.0 kg uniform ladder that is 4.8 m long rests against a frictionless wall at an angle of 52° to the ground as shown. **JUNE 2009**



i) Calculate the force exerted on the ladder by the wall. [4]

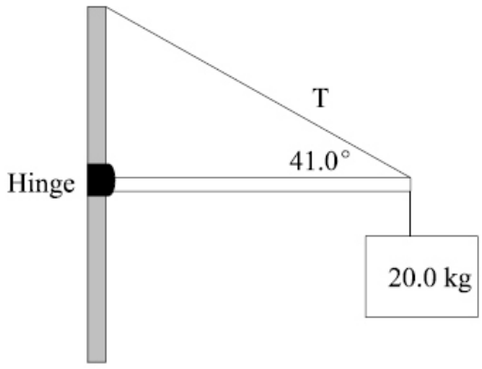
ii) Explain why the force of the wall on the ladder increases if a person stands on the ladder. [1]

8. A 4.0 m long uniform beam is supported 3.0 m from a hinge by a cable as shown. If the tension in the cable is 170 N, calculate the mass of the beam. **AUGUST 2009**



9. A 20.0 kg sign is supported at the end of a 2.50 m horizontal beam of mass 21.0 kg that is hinged to a pole as shown. **JUNE 2007**

i) Calculate the magnitude of the tension in the cable.



i) Calculate the magnitude of the horizontal component of the force exerted on the beam by the hinge.

10. The diagram below shows a uniform 7.0 kg ladder resting against a frictionless wall. The person on the ladder has a mass of 65 kg. If the ladder is 5.0 m long, what force does the wall exert on the ladder. **JUNE 2006**