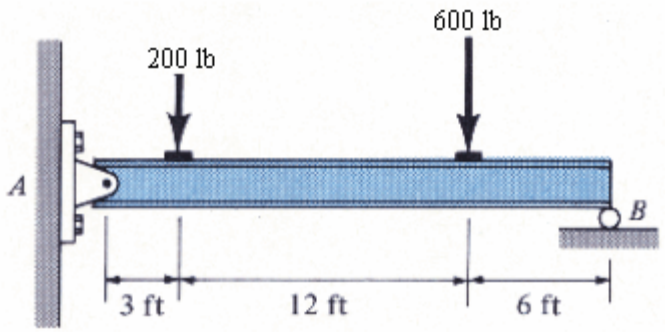
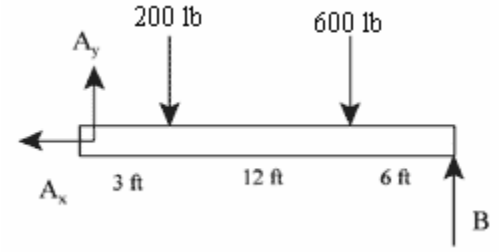
Engineering Statics
Homework 3

1.
Determine the reactions at the pin and roller supports.



Below is the free body diagram:

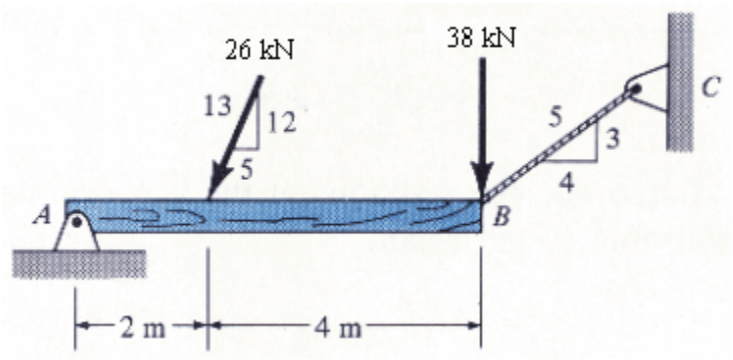


(a) What is the magnitude of A_x?

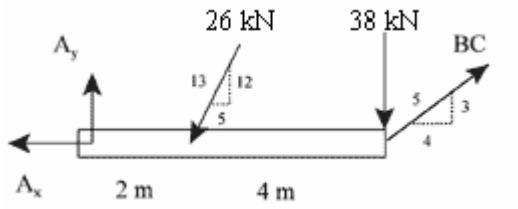
(b) What is the magnitude of A_y?

(c) What is the magnitude of B?

2.
Determine the reactions at the pin *A* and the tension in cord *BC*.



Below is the free body diagram:

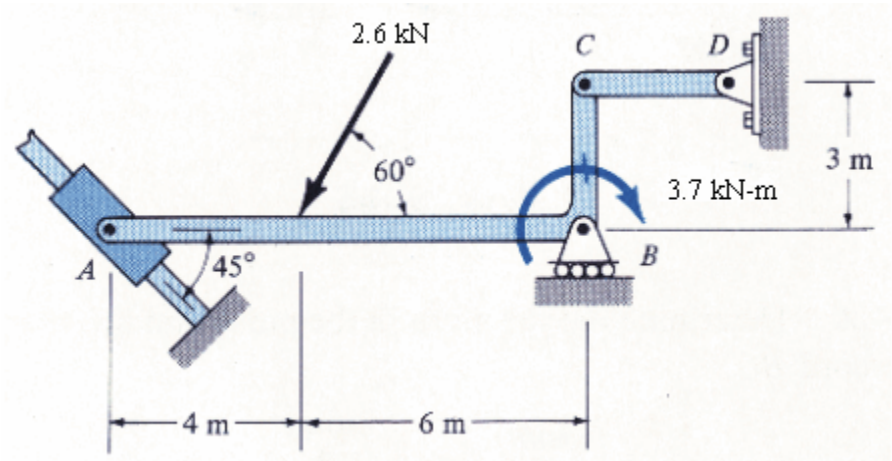


(a) What is the magnitude of A_x?

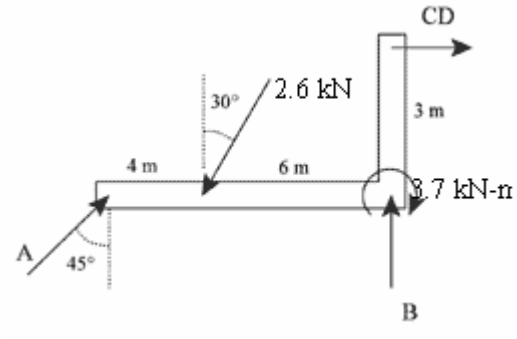
(b) What is the magnitude of A_y?

(c) What is the magnitude of *BC*?

3.
Determine the reactions at the smooth collar *A*, roller *B*, and short link *CD*.



Below is the free body diagram:



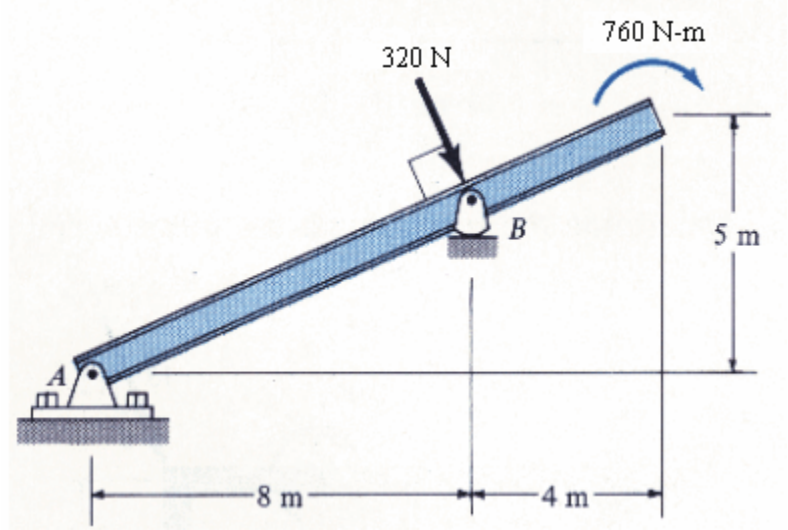
(a) What is the magnitude of *A*?

(b) What is the magnitude of *B*?

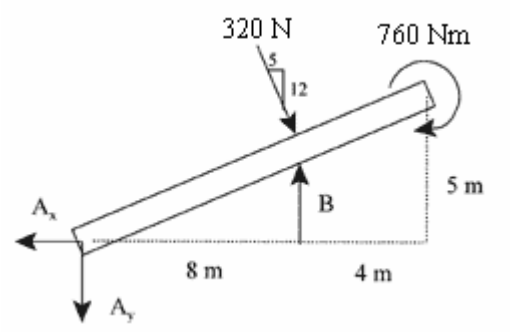
(c) What is the magnitude of *CD*?

4.

Determine the reactions at the supports necessary for equilibrium of the beam.



Below is the free body diagram:

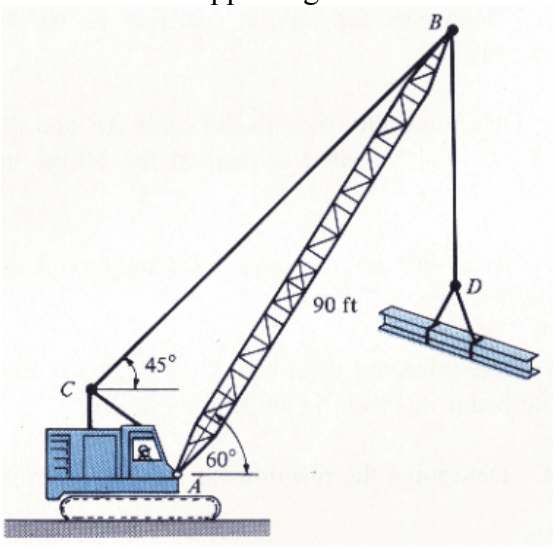


(a) What is the magnitude of A_x?

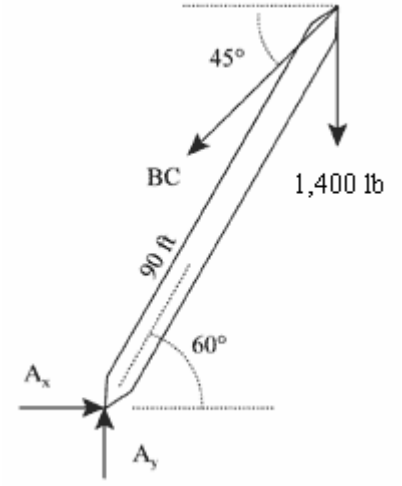
(b) What is the magnitude of A_y?

(c) What is the magnitude of B?

5.
The crane supports a load of 1,400 lb which is suspended from cable *BD*. Determine the horizontal and vertical components of force acting on the pin *A* of the crane and the tension in the supporting cable *BC*. Note that *BC* and *BD* are separate cables.



Below is the free body diagram:



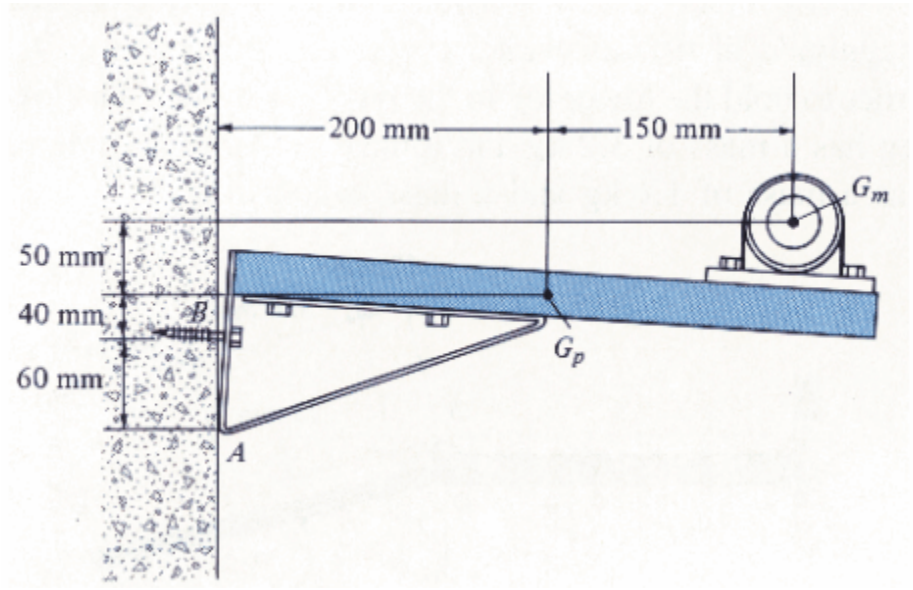
(a) What is the magnitude of A_x, in kip? _____ kip

(b) What is the magnitude of A_y, in kip? _____ kip

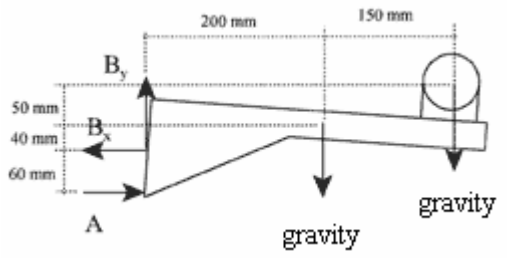
(c) What is the magnitude of BC, in kip? _____ kip

(Note: A kip is 1000 pounds force.)

6.
The shelf supports the electric motor which has a mass of 17 kg and mass center at G_m. The platform upon which it rests has a mass of 5 kg and mass center at G_p .Assuming that a single bolt B holds the shelf up and the bracket bears against the smooth wall at A, determine this normal force at A and the horizontal and vertical components of reaction of the bolt on the bracket.



Below is the free body diagram:



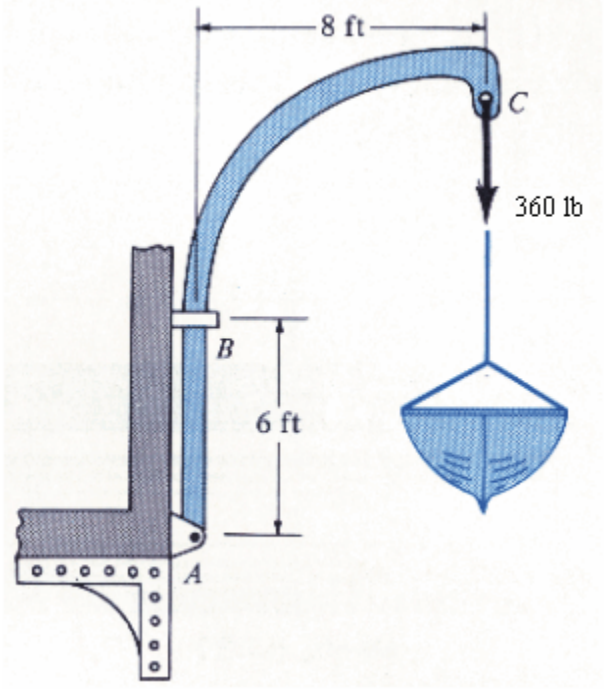
(a) What is the magnitude of A?

(b) What is the magnitude of B_x?

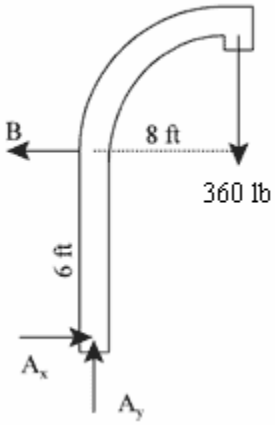
(c) What is the magnitude of B_y?

7.

Davit *ABC* is subjected to a 360-lb force caused by the boat. If it is supported by a pin at *A*and a smooth collar at *B*, determine the components of reactions at these supports.



Below is the free body diagram:

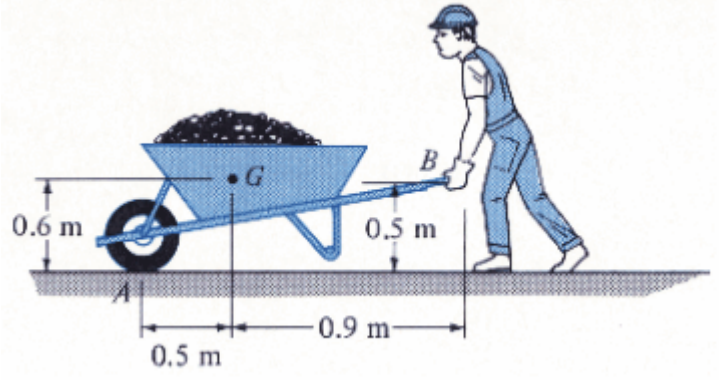


(a) What is the magnitude of *B*?

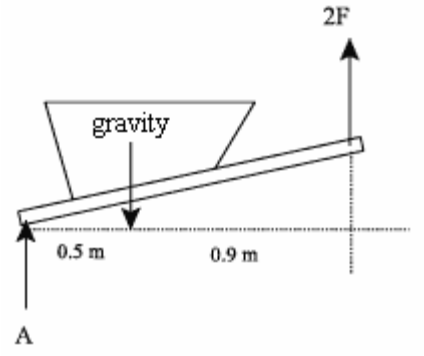
(b) What is the magnitude of A_x?

(c) What is the magnitude of A_y?

8.
If the wheelbarrow and its contents have a mass of 45 kg and center of mass at *G*, determine the magnitude of the resultant force which the man must exert on each of the two handles in order to hold the wheelbarrow in equilibrium.

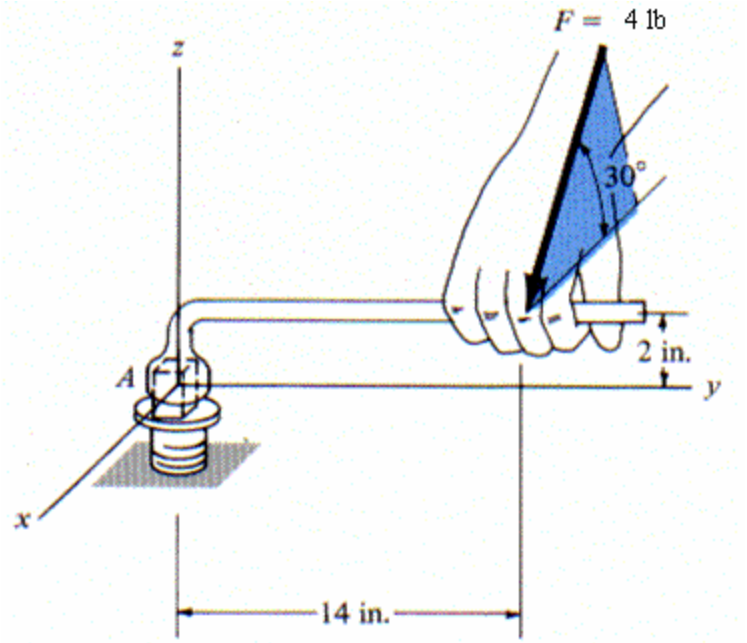


Below is the free body diagram:

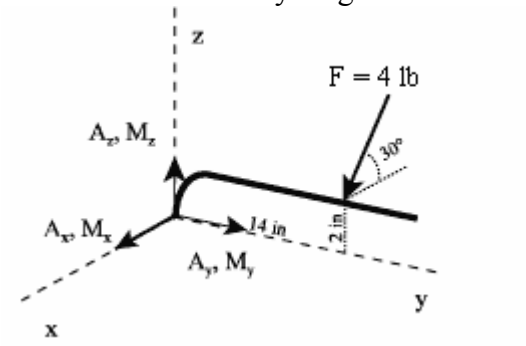


F = _____ N

9.
The wrench is used to turn the square bolt at *A* about the *z* axis. If the force **F** = 4 lb is applied to the handle as shown, determine the magnitudes of the resultant force and moment that the bolt head exerts on the wrench. The force **F** is in a plane parallel to the *x*-*z* plane.



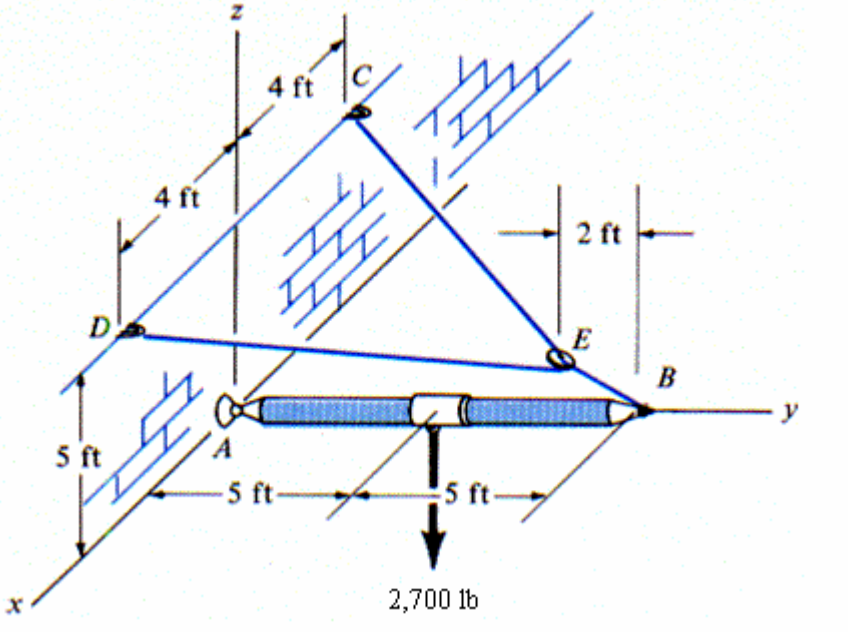
Below is the free body diagram:



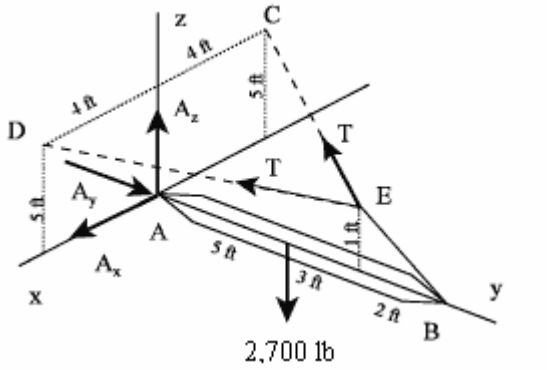
(a) What is the magnitude of the resultant force on the wrench?

(b) What is the magnitude of moment M_z, in lb-in?

10.
The boom *AB* is held in equilibrium by a ball-and-socket joint *A* and a pulley and cord system shown. Determine the reaction components at *A* and the tension in cable *DEC*.



Below is the free body diagram:



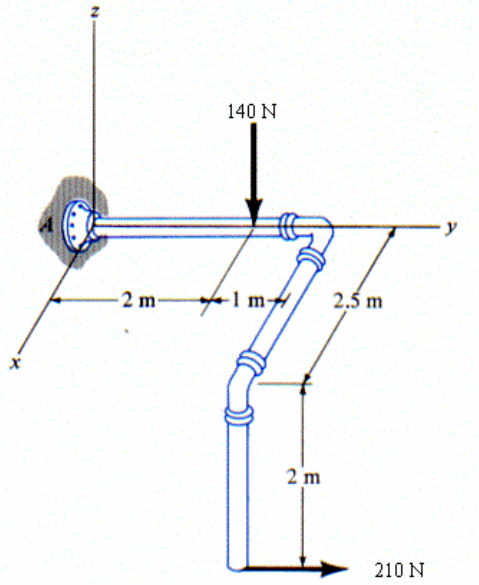
(a) What is the magnitude of the component force A_x?

(b) What is the magnitude of the component force A_y?

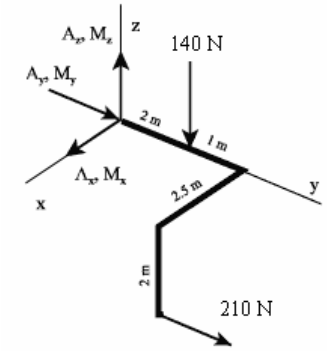
(c) What is the magnitude of the component force A_z?

(d) What is the tension in cable *DEC*?

11.
Determine the *x, y, z* components of reaction at the fixed wall *A*. The 140-N force is parallel to the *z*-axis and the 210-N force is parallel to the *y*-axis.



Below is the free body diagram:



(a) What is the magnitude of the component force A_x?

(b) What is the magnitude of the component force A_y?

(c) What is the magnitude of the component force A_z?

(d) What is the magnitude of the component moment M_x in Nm?

(e) What is the magnitude of the component moment M_y in Nm?

(f) What is the magnitude of the component moment M_z in Nm?