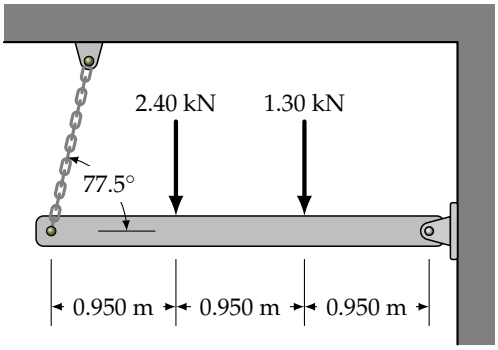
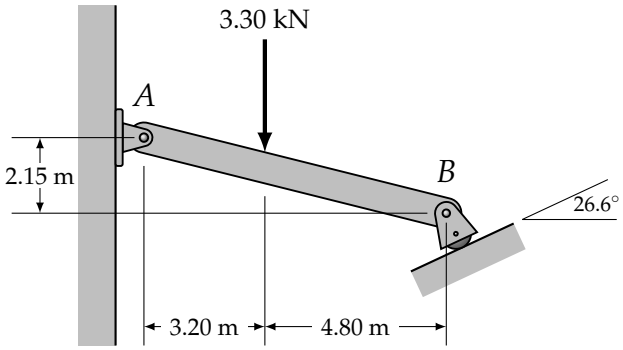
Engineering Statics - 06 Equilibrium of Rigid Bodies

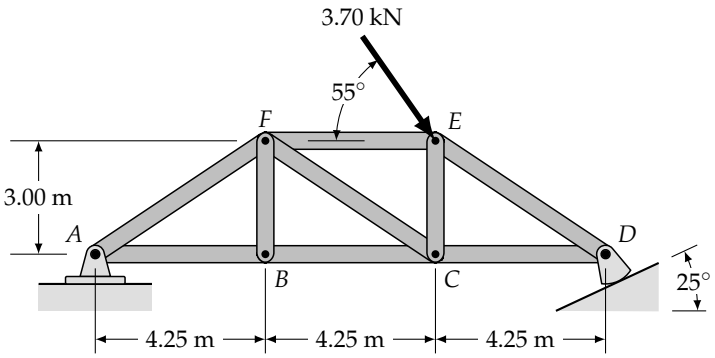
Example 1: Determine the tension in the chain and the reaction at A.



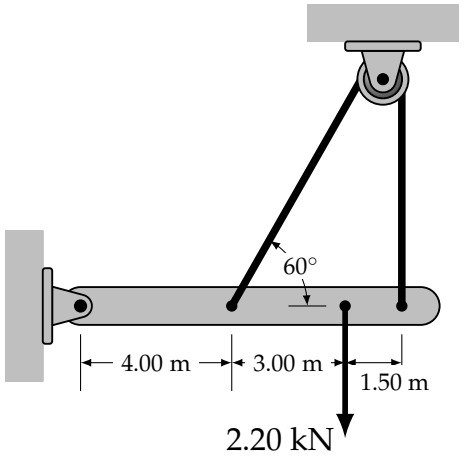
Example 2: Determine the reactions at A and B.



Exercise 1: Determine the reactions at A and D.

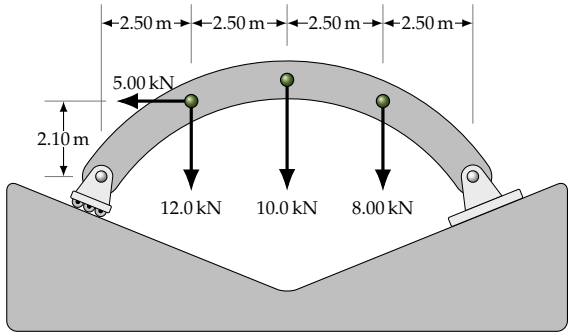


Exercise 2: Determine the reactions at the pinned connection and the tension in the cable.



Example 3: The roller and the pinned connection are on slopes inclined at 21° to the horizontal; they are both at the same elevation.

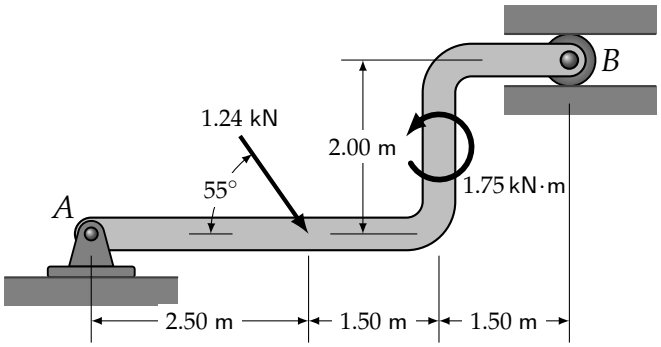
Determine the reactions at the pinned connection and the tension in the cable.



Example 4:

The roller at B is in a smooth slot.

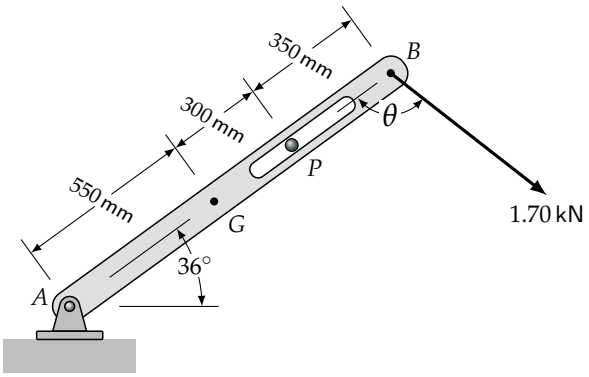
Determine the reactions at A and B.



Example 5:

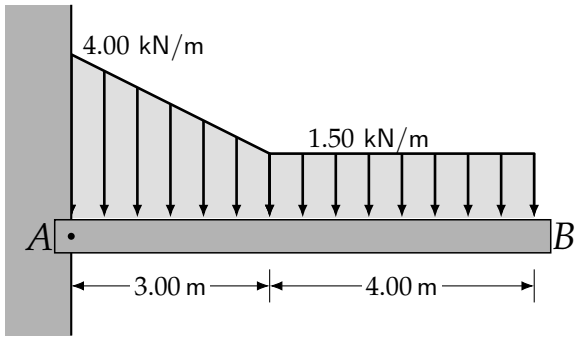
55 − kg bar AB has its centre of gravity at G. It is supported by a pinned connection at A and a smooth peg at C. A cable is attached at B and has a tensile force of 1.70 kN. The direction of the cable varies between $\theta = 60°$ and $\theta = 135°$.

What is the maximum reaction at P? Determine the reaction at A for this reaction at P.

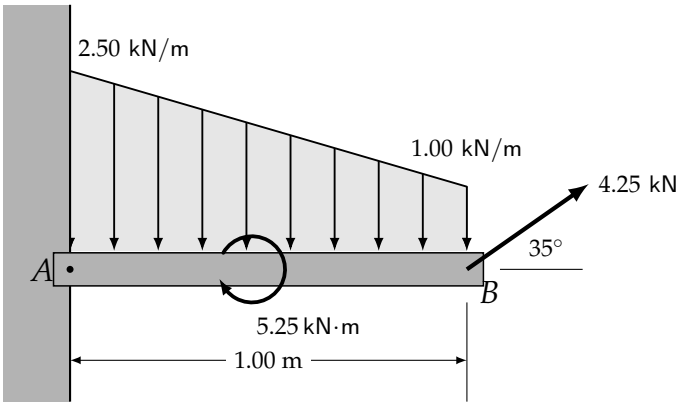


Example 6: Beam AB has a fixed support at A. (Fixed supports offer resistance to rotation in the form of a reacting couple at A; clearly, without this, equilibrium would not be possible.)

Determine the reaction and the reacting couple at A.

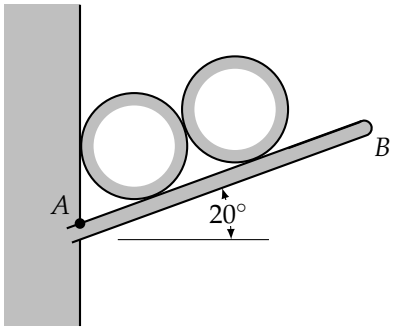


Exercise 3: Determine the reaction and the reacting moment at A.



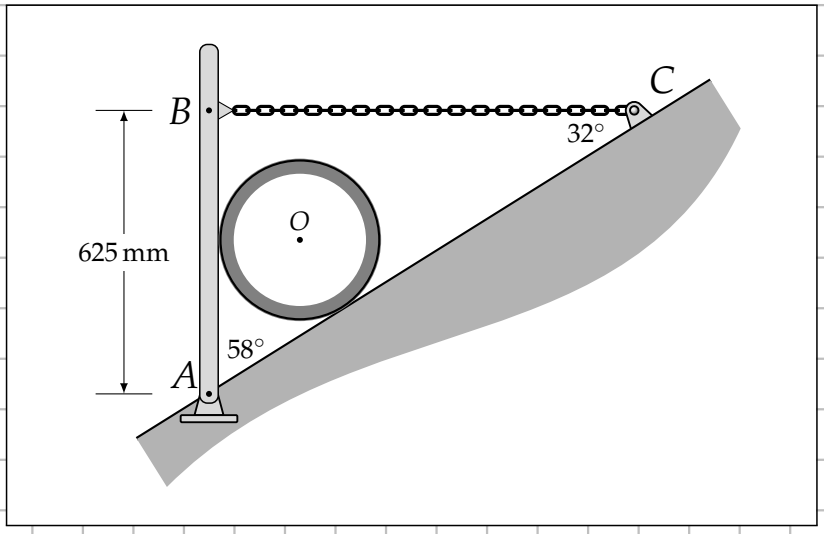
Example 5: Pipe racks (AB, and two hidden behind it) support two smooth Schedule 40 pipes, with an outside diameter of 508 mm, as shown. The pipes are 10 m in length with a mass of 78.5 kg/m. Each rack supports one-third of the weight of each pipe.

Determine the reaction at the fixed connection A.



Exercise 4: A section of smooth pipe, centred at O, has a diameter of 457 mm and a mass of 186 kg. It is secured by vertical structural member AB, hinged with a pinned connection at A and held in place by chain BC.

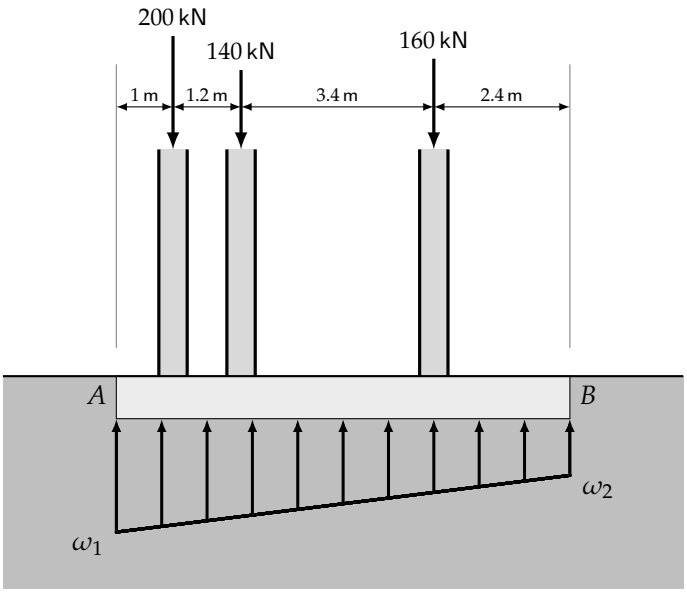
Determine the tension in the chain, and the reaction at A.



Example 8:

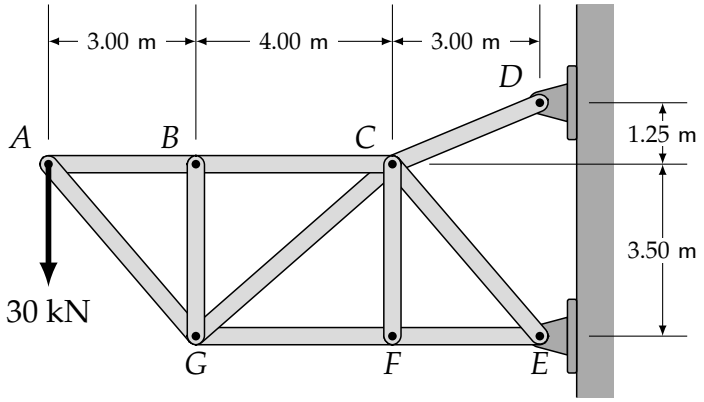
Soil exerts a trapezoidal distributed load on the bottom of the footing AB.

Determine the values of ω_1 and ω_2 that support the column loadings in static equilibrium.



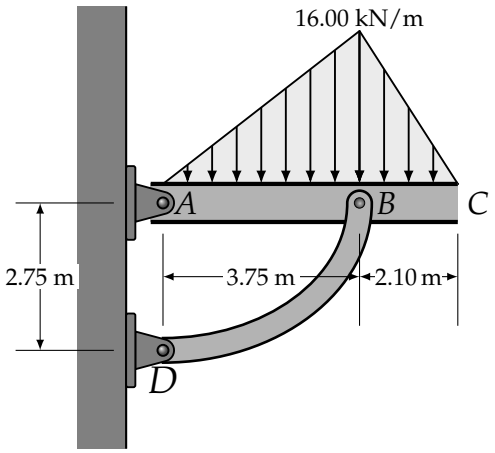
Example 9:

Determine the reactions at D and E.



Exercise 5:

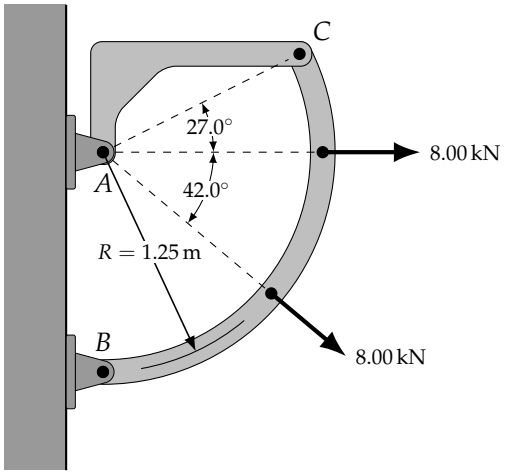
Determine the reactions at A and D.



Exercise 6:

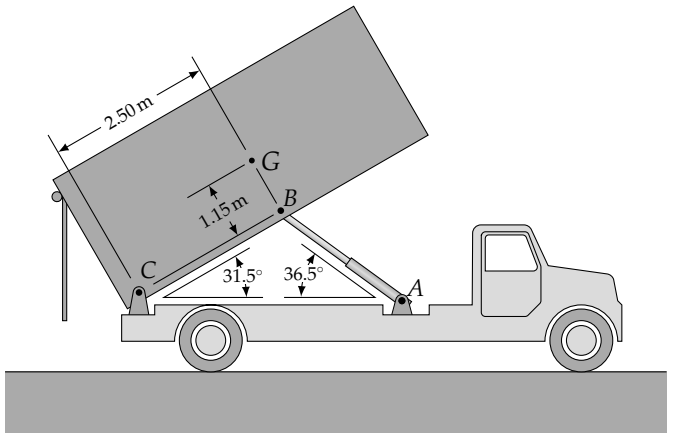
Member CD is a circular arc, centred at A

Determine the reactions at A and B.



Example 10:

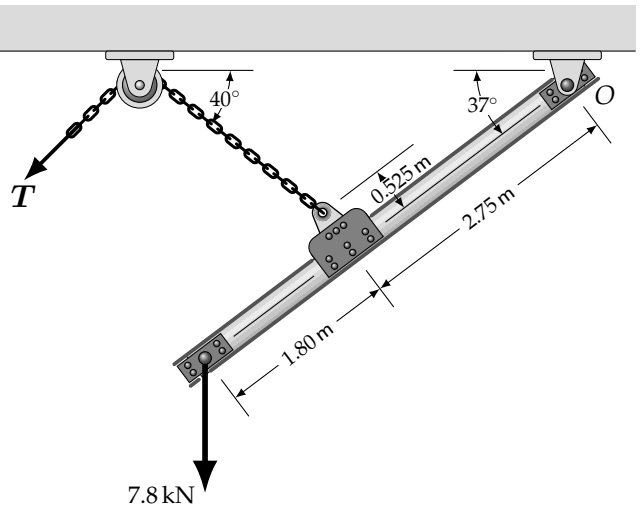
The bin of a dump-truck is being tipped by hydraulic lift AB. (AB can be considered a two-force member.) The bin rotates about a pin at C. Determine the force in the lift AB and find the reaction at C. The bin has a mass of 880 kg and G marks its centre of mass.



Method 2: By rotation of our axes of reference.

Exercise 7:

The pulley is frictionless. Determine the tension T and the reaction at the pinned connection O.



Method 1:

Method 2: Rotation of axes by 37° ccw.