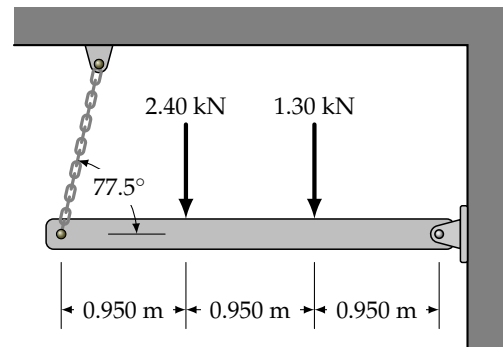
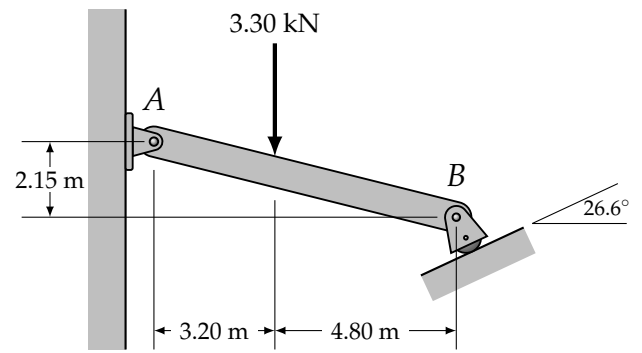


# Engineering Statics - 06 Equilibrium of Rigid Bodies

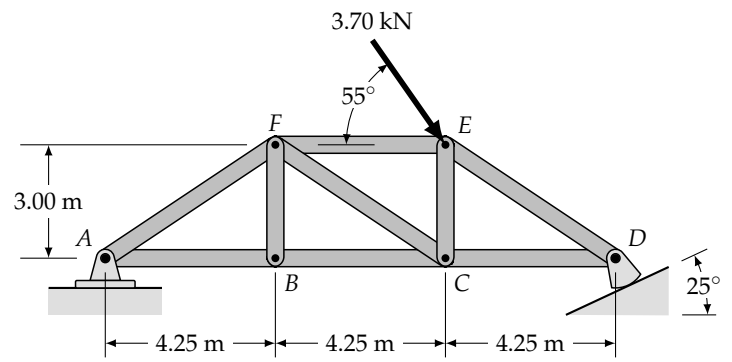
**Example 1:** Determine the tension in the chain and the reaction at  $A$ .



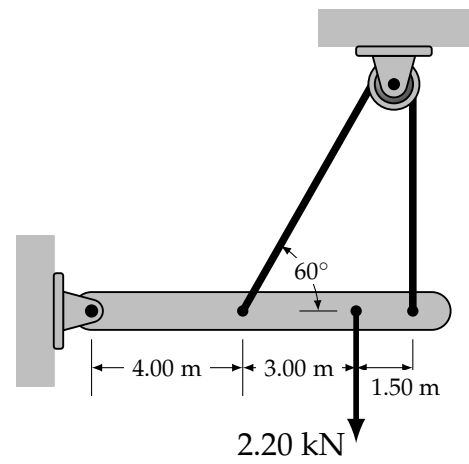
**Example 2:** Determine the reactions at  $A$  and  $B$ .



**Exercise 1:** Determine the reactions at  $A$  and  $D$ .

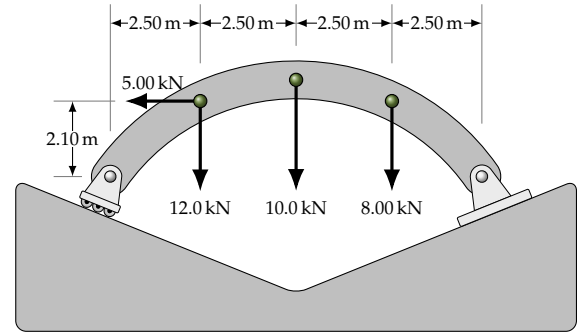


**Exercise 2:** Determine the reactions at the pinned connection and the tension in the cable.



**Example 3:** The roller and the pinned connection are on slopes inclined at  $21^\circ$  to the horizontal; they are both at the same elevation.

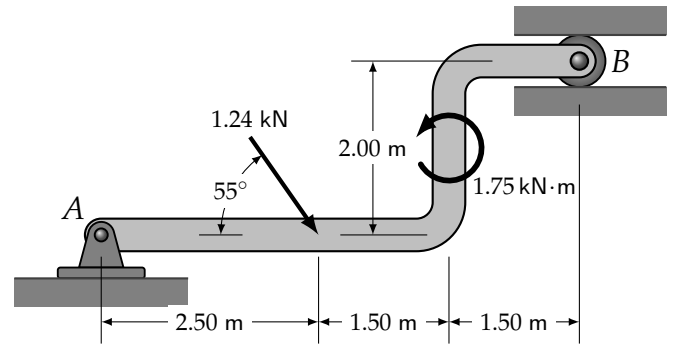
Determine the reactions at the pinned connection and the tension in the cable.



**Example 4:**

The roller at  $B$  is in a smooth slot.

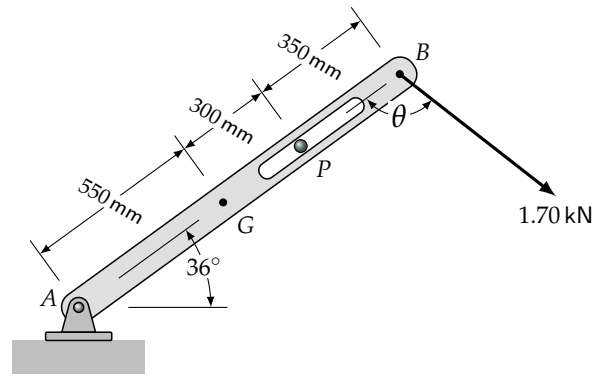
Determine the reactions at  $A$  and  $B$ .



**Example 5:**

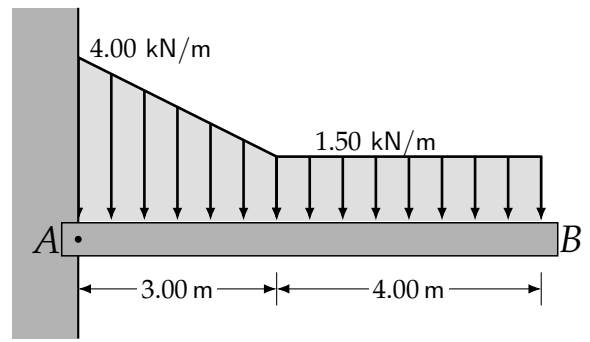
55 – kg bar  $AB$  has its centre of gravity at  $G$ . It is supported by a pinned connection at  $A$  and a smooth peg at  $C$ . A cable is attached at  $B$  and has a tensile force of 1.70 kN. The direction of the cable varies between  $\theta = 60^\circ$  and  $\theta = 135^\circ$ .

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



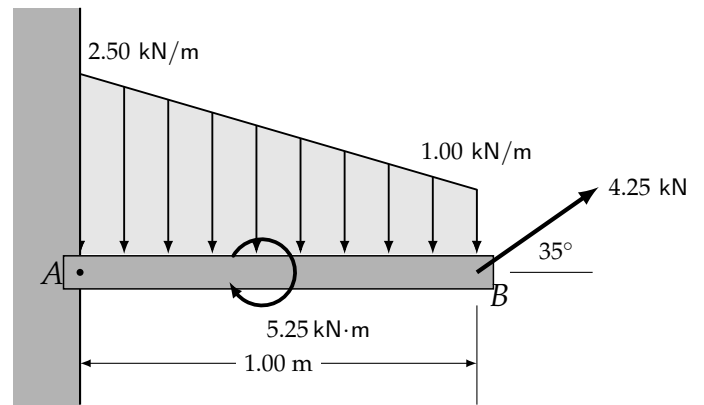
**Example 6:** Beam  $AB$  has a fixed support at  $A$ . (Fixed supports offer resistance to rotation in the form of a reacting couple at  $A$ ; clearly, without this, equilibrium would not be possible.)

Determine the reaction and the reacting couple at  $A$ .



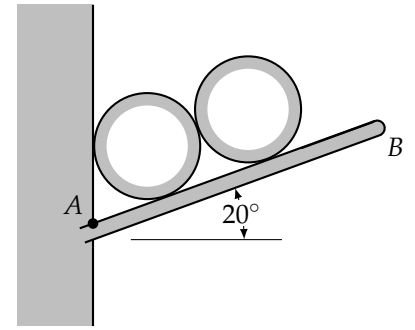


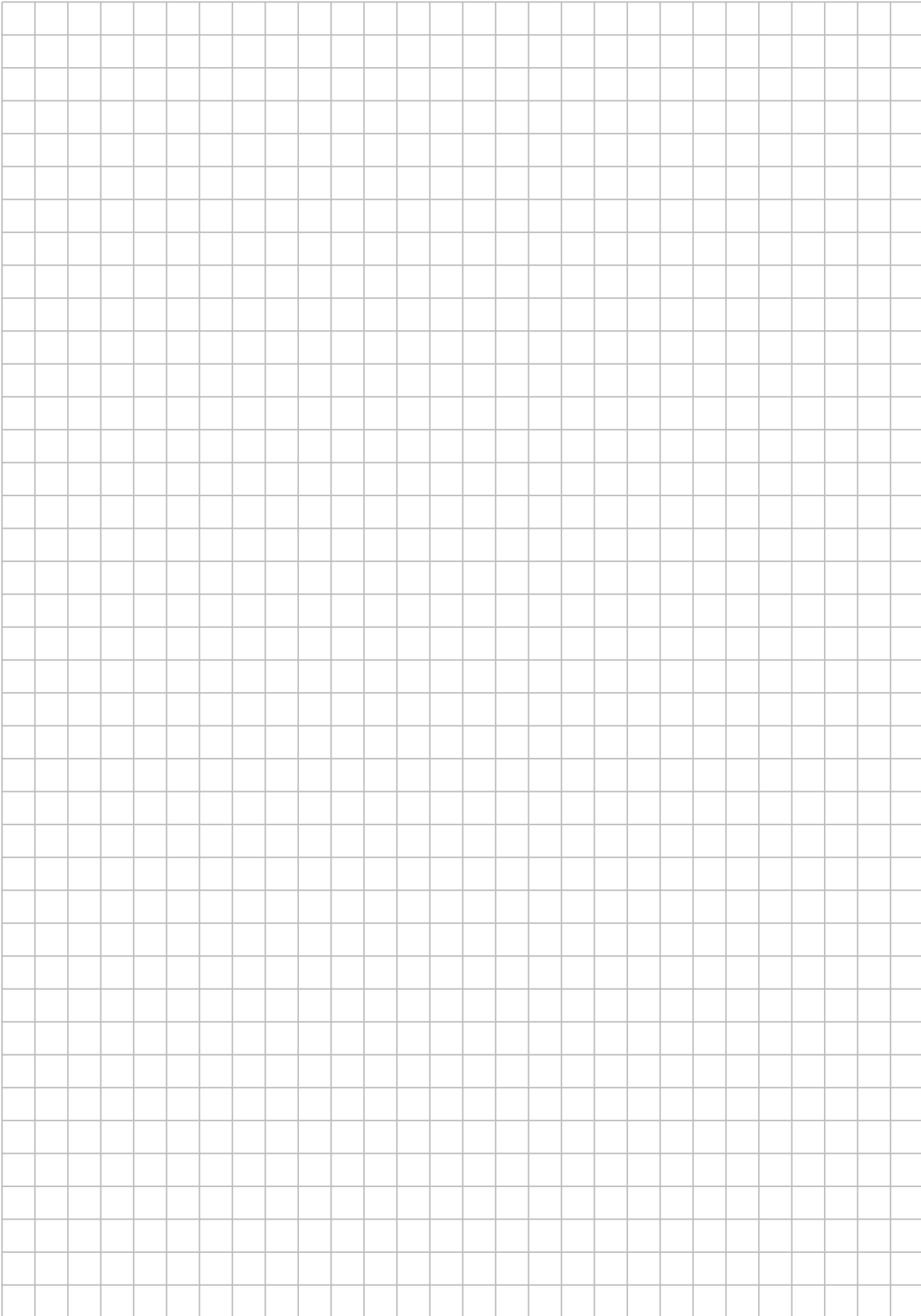
**Exercise 3:** Determine the reaction and the reacting moment at  $A$ .



**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.

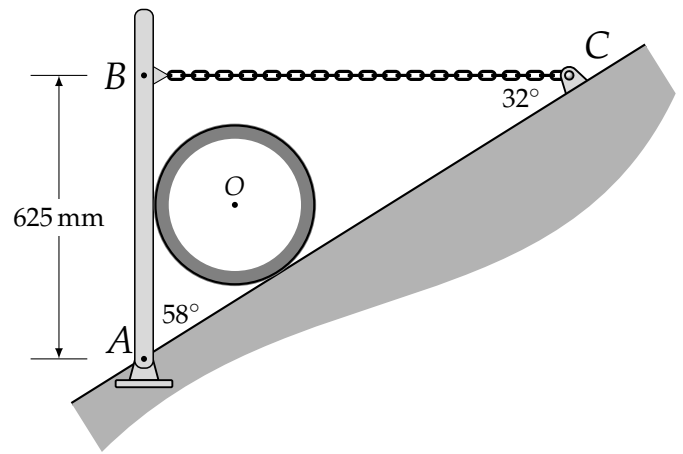
Determine the reaction at the fixed connection  $A$ .

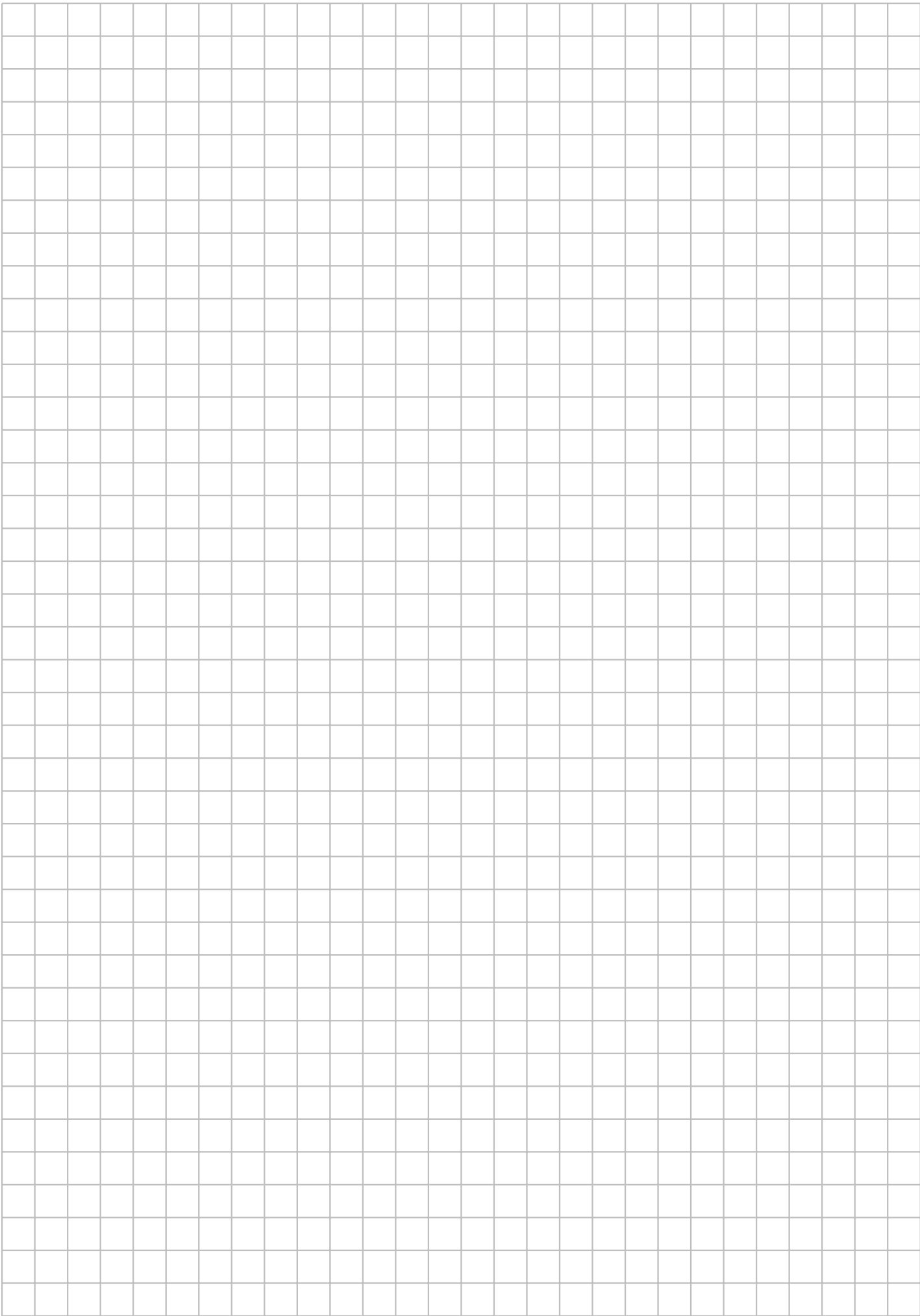




**Exercise 4:** A section of smooth pipe, centred at  $O$ , has a diameter of 457 mm and a mass of 186 kg. It is secured by vertical structural member  $AB$ , hinged with a pinned connection at  $A$  and held in place by chain  $BC$ .

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

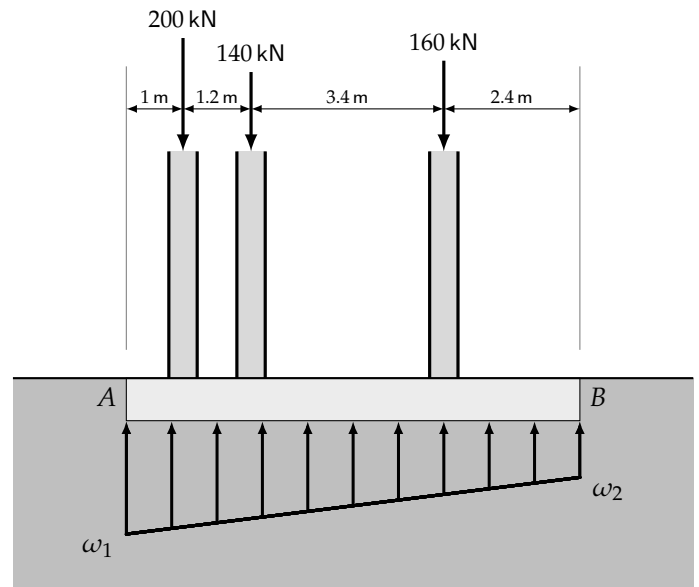




**Example 8:**

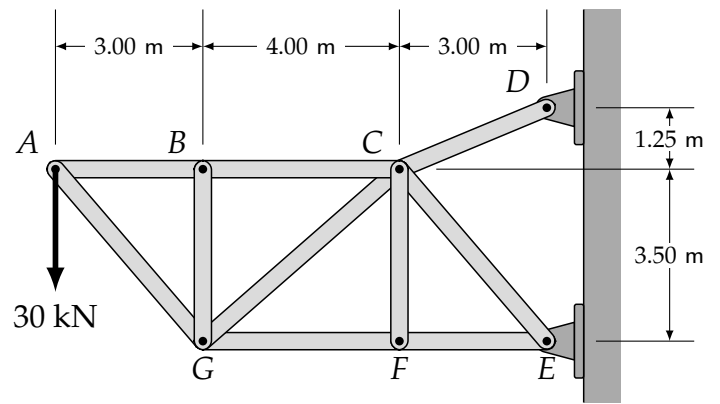
Soil exerts a trapezoidal distributed load on the bottom of the footing  $AB$ .

Determine the values of  $\omega_1$  and  $\omega_2$  that support the column loadings in static equilibrium.



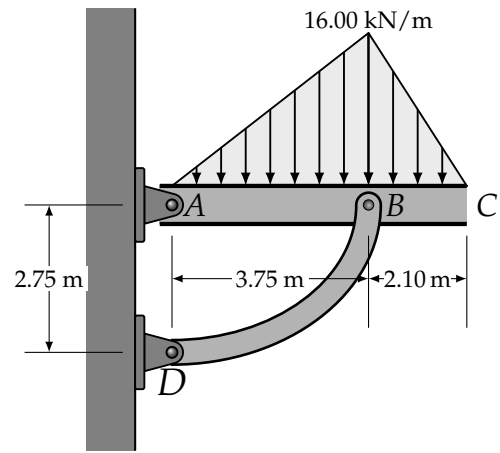
**Example 9:**

Determine the reactions at  $D$  and  $E$ .



**Exercise 5:**

Determine the reactions at *A* and *D*.

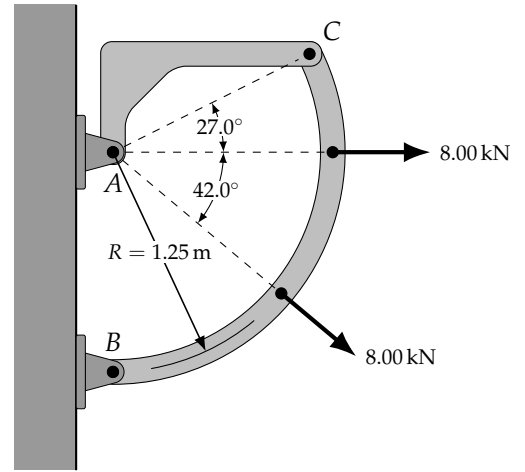




**Exercise 6:**

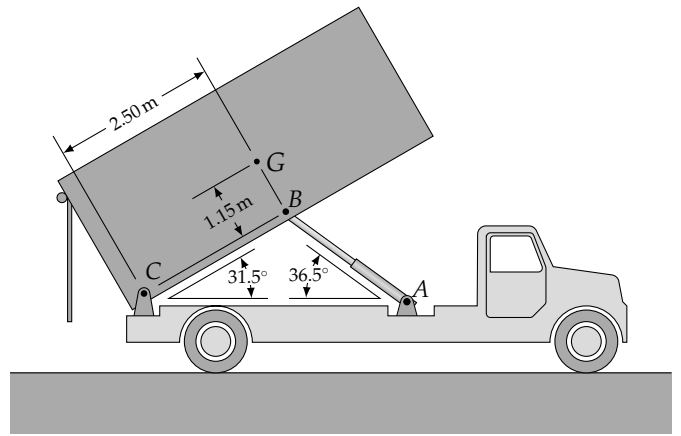
Member  $CD$  is a circular arc, centred at  $A$

Determine the reactions at  $A$  and  $B$ .



**Example 10:**

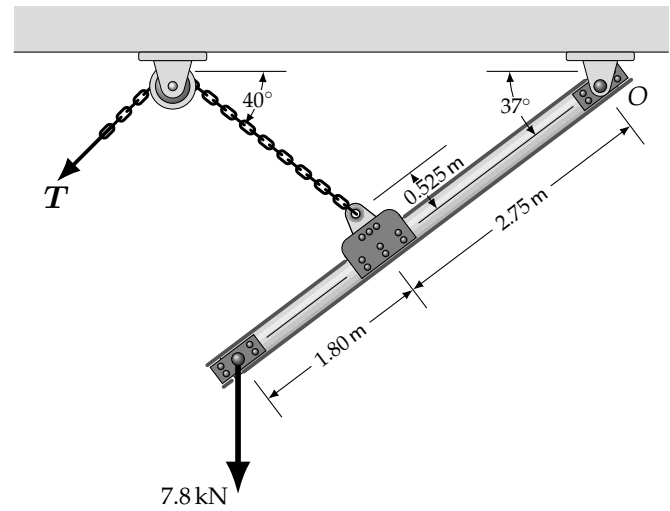
The bin of a dump-truck is being tipped by hydraulic lift  $AB$ . ( $AB$  can be considered a two-force member.) The bin rotates about a pin at  $C$ . Determine the force in the lift  $AB$  and find the reaction at  $C$ . The bin has a mass of  $880\text{ kg}$  and  $G$  marks its centre of mass.



**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  $37^\circ$  ccw.

