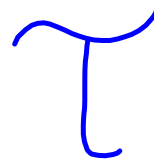


Torque

Static Equilibrium: TWO conditions must be met.

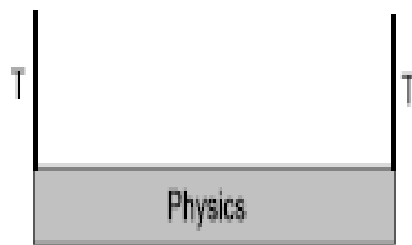
$F_{\text{net}} = 0$ (no acceleration and no velocity) and $\tau_{\text{NET}} = 0$ (no rotation)

1st Condition $F_{\text{net}} = 0$



1.

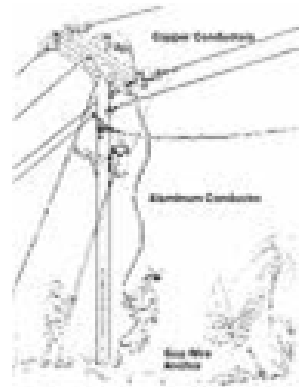
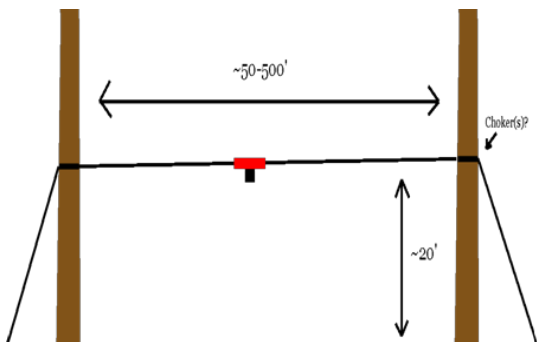
What is the tension in each wire that supports the 10.0 kg sign shown?



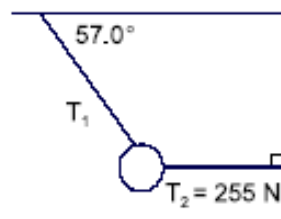
- #2 If the weight of the wet clothes is 49N and the angle is 49° , what is the tension in the clothesline?



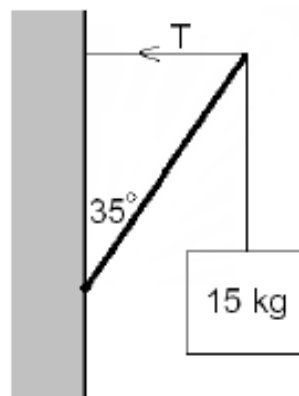
Page 237 # 1,



An object is suspended by two ropes from a ceiling and a wall as shown. What is the tension, T_1 , in the rope connected to the ceiling?

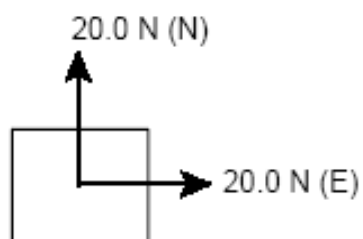


A 15.0 kg sign is hung from a 3.0 m long beam of negligible mass and supported by a cable as shown. What tension is required in the cable to support the sign?



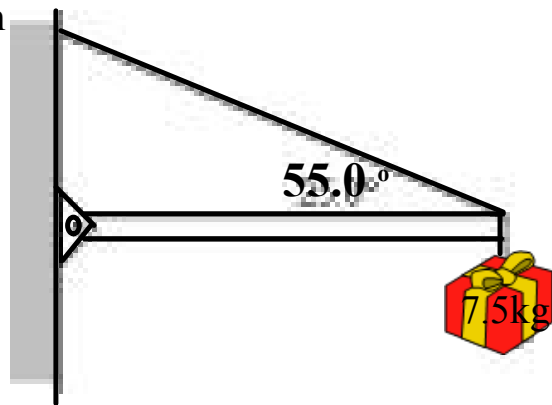
Which additional force is necessary for the object shown to be in static equilibrium?

*'equilibrant
force'*



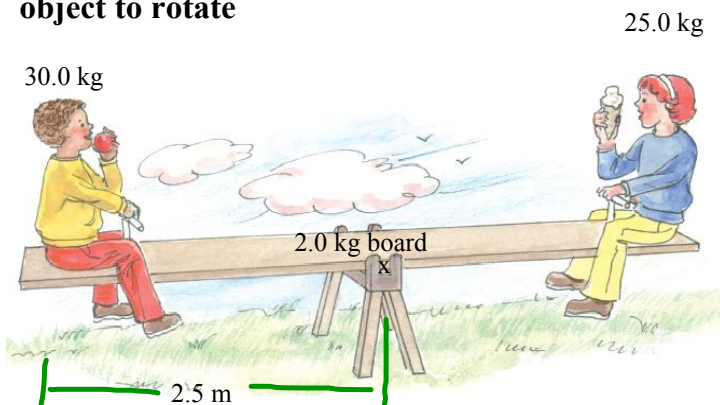
- (A) 20.0 N [NE]
- (B) 20.0 N [SW]
- (C) 28.3 N [NE]
- (D) 28.3 N [SW]

What tension keeps the massless beam in equilibrium?



2nd Condition $\text{TORQUE}_{\text{net}} = 0$

Torque is a measure of how much a force acting on an object causes that object to rotate



Example 1:

At what distance from the pivot must the girl sit in order to balance the see saw? Find the normal force exerted on the board by the pivot.

1. Draw a FBD, see if we can solve the problem with 1st condition.
2. Since we are in static equilibrium, we can use $\text{F}_{\text{NET}} = 0$ to find the normal force of the fulcrum.

3. This does not allow us to find the distance, so we must use torques.
4. To solve torques, we must pick **apivot point or axis of rotation.**

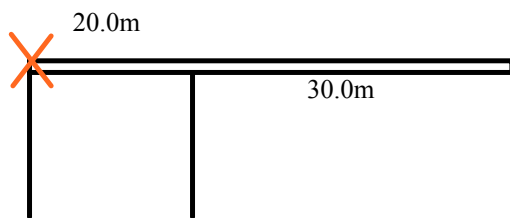
2. A 15 kg desk top, 1.50 m long, supports a 3.0 kg laptop. The laptop is 0.30m from the left end of the desk. Calculate the force provided by each desk leg.



$$F_1 = 110 \text{ N}$$

A cantilever is a beam that extends beyond its support

The beam has a mass of 1200 kg. Calculate the force exerted by each support.

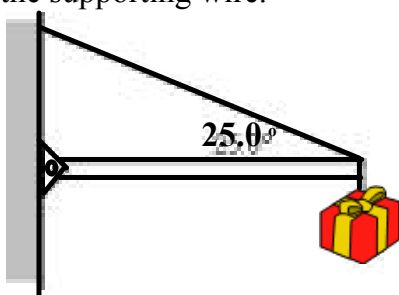


(Cantilever page 233 Giancoli)



A uniform beam, 2.20m long with a mass of 25.0kg , is mounted by a hinge on a wall as shown. The beam is held in place by a wire that makes an angle of 25.0° . The beam supports a 280kg mass suspended from its end.

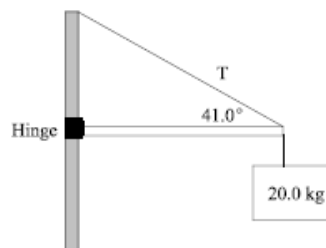
Determine the components of the force \mathbf{F} that the hinge exerts on the beam and the tension in the supporting wire.



(Giancol

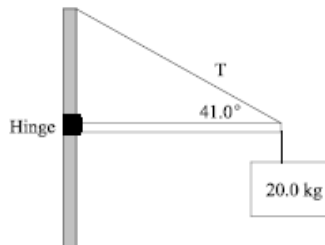
A 20.0 kg sign is supported at the end of a 2.50 m horizontal beam of mass 21.0 kg that is hinged to a pole as shown.

i) Calculate the magnitude of the tension in the cable

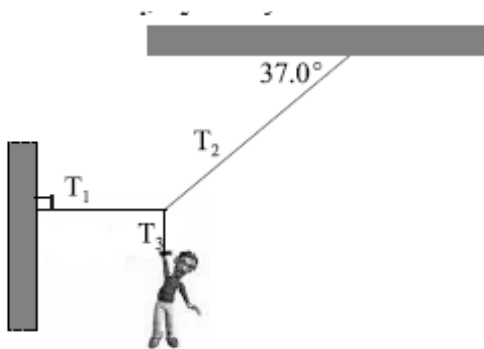


i

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

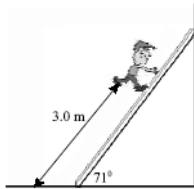


A 56.0 kg person suspended by cables hangs motionless as shown. Calculate the magnitude of the tension T_1 , T_2 and T_3 in each cable.



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?



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If a traffic light is suspended by two wires as shown below, what is the tension in each wire?

