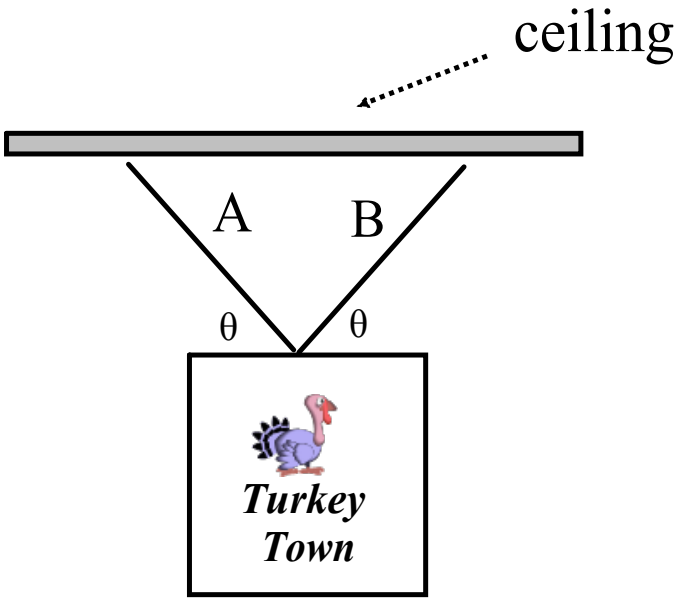
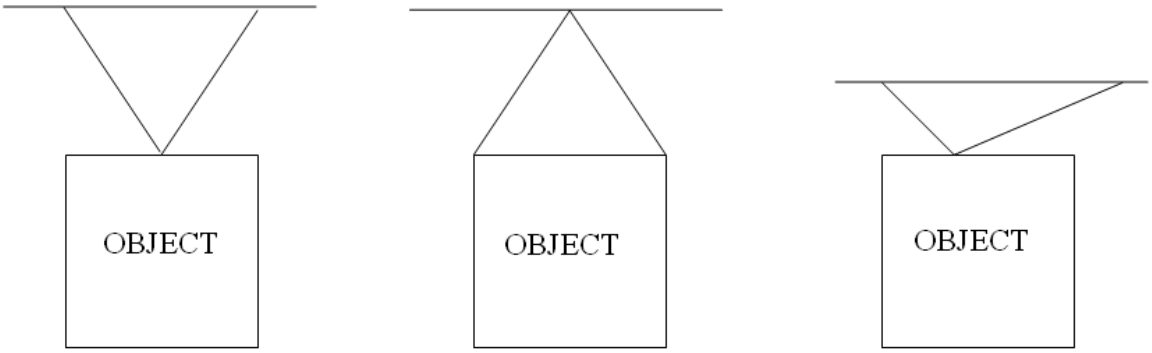
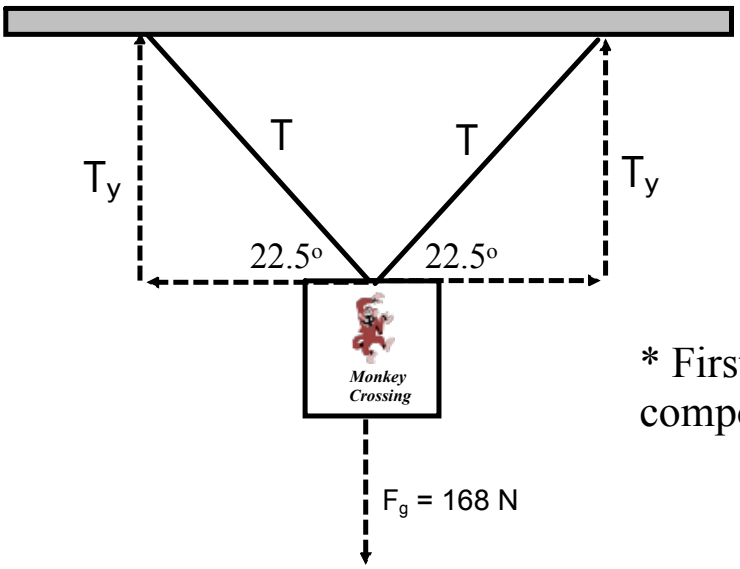
Type II - Signs/Pictures/Hanging Objects

If an object is hung by a rope (wire, chain, etc.), we can resolve the force of tension along the rope.



An object can be hung in a variety of ways.





A sign that weighs 168 N is supported by two ropes, A and B, that make 22.5° angles with the horizontal. Determine the tension along the ropes.

* First label the diagram to view the components of each rope's tension.

Determine y-component of tension:

$F_{net y} = 0$ N

$F_{net y} = 2T_y + F_g$

$0 \text{ N} = 2T_y - 168 \text{ N}$

$T_y = 84$ N

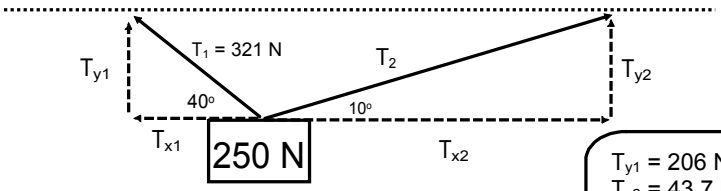
Determine tension in each rope (remember they are the same if the angles are the same):

$T = (T_y)/(\sin \theta^o)$

$T = 84 \text{ N}/\sin 22.5^o$

$\boxed{T = 220 \text{ N}}$

Determine T_{y1}, T_{y2}, T_2 , T_{x1}, and T_{x2} in the following sketch.



T_{y1} = 206 N
T_{y2} = 43.7 N
T_2 = 251 N
T_{x1} = 247 N (left)
T_{x2} = 247 N (right)

Solve for T_{y1}

$$\sin 40 = \frac{T_{y1}}{321}$$

$$321 \sin 40 = T_{y1}$$

$$206\ N = T_{y1}$$

Solve for T_{y2}

$$F_{net\,y} = \sum Forces\ -y\ dir$$

$$0 = F_g + T_{y1} + T_{y2}$$

$$0 = -250 + 206 + T_{y2}$$

$$44\ N = T_{y2}$$

Solve for T_2

$$\sin 10 = \frac{44}{T_2}$$

$$T_2 \sin 10 = 44$$

$$T_2 = \frac{44}{\sin 10}$$

$$T_2 = 251\ N$$

Attachments

ramp-forces-and-motion_en.jar