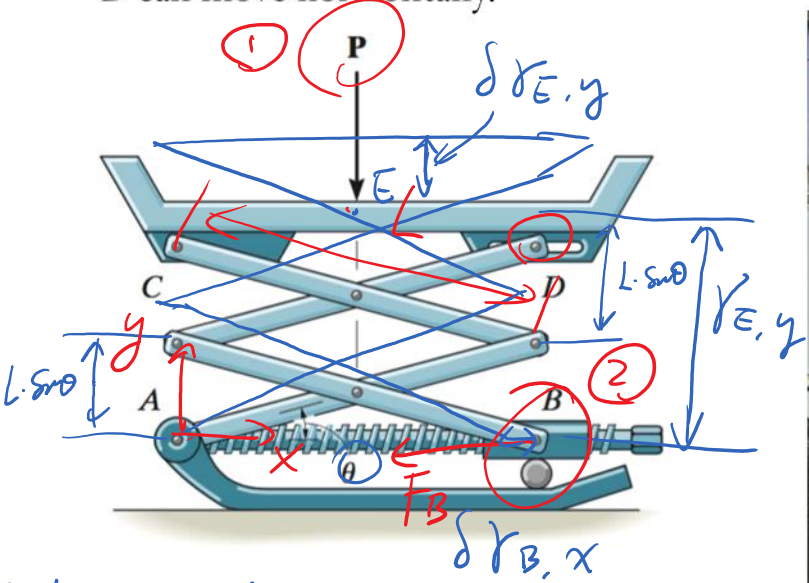
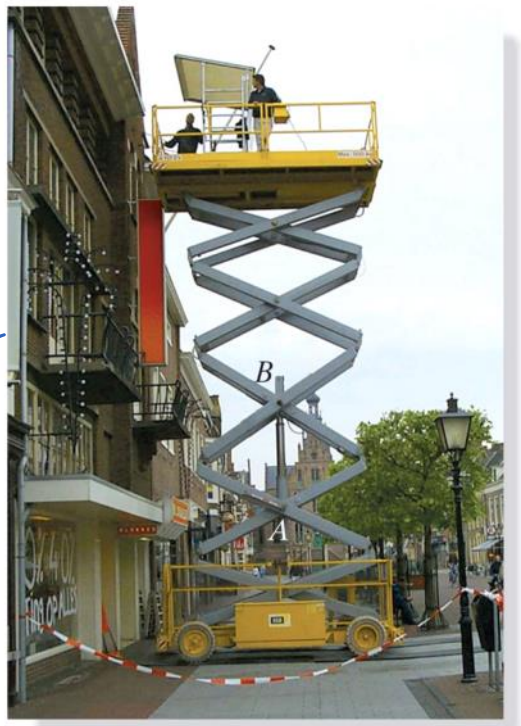
The scissors jack supports a load **P**. Determine the axial force in the screw necessary for equilibrium when the jack is in the position shown. Each of the four links has a length L and is pin-connected at its center. Points B and D can move horizontally.





$\gamma_{B,x} = L\cdot\cos\theta$

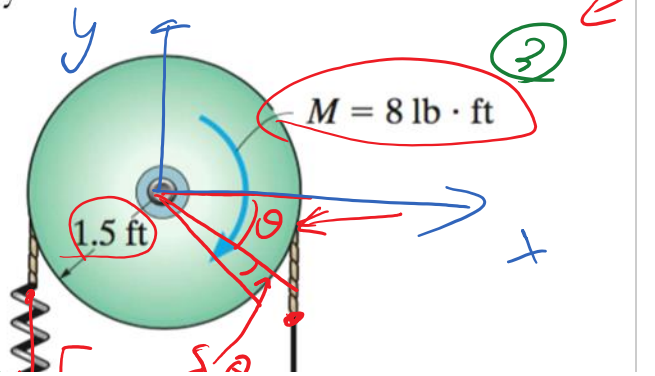
$\gamma_{E,y} = 2L\cdot\sin\theta$

$\Sigma \delta V = F_B\cdot\delta\gamma_{B,x} - P\cdot\delta\gamma_{E,y} = 0$

$\delta\gamma_{B,x}$

$\delta\gamma_{E,y}$

The disk has a weight of 10 lb and is subjected to a vertical force P = 8 lb and a couple moment M = 8 lb ft. Determine the disk's rotation θ if the end of the spring wraps around the periphery of the disk as the disk turns. The spring is originally unstretched.



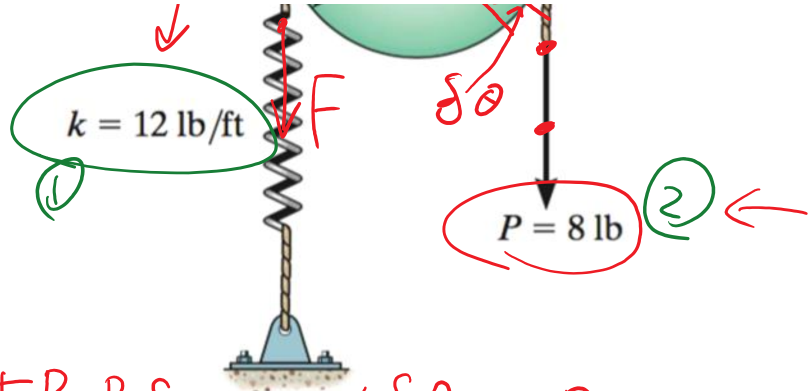
$\delta S = R\delta\theta$

$\delta\gamma_2 = R\delta\theta$

$\delta\theta_2 = k\delta\ldots$

$\delta\theta$

$\delta W_M = M \cdot \delta\theta$

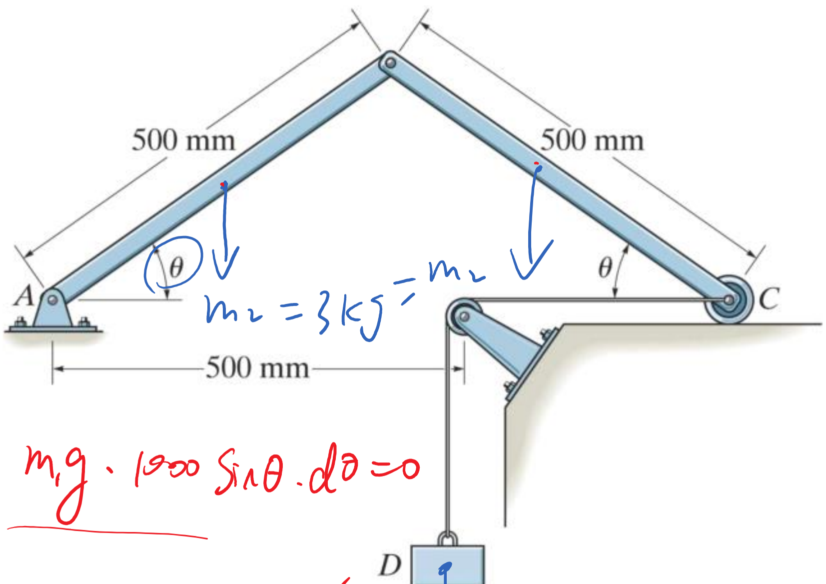


$\Sigma \delta V = -F_s \cdot R \cdot \delta\theta + P \cdot R \cdot \delta\theta + M\delta\theta = 0$

$F_s = kS \Rightarrow \theta$

Determine the angel of equilibrium, θ, given that block D has a mass of 7 kg and the links each have a mass of 3 kg.

$\Sigma \delta V = 0$



$m_2 = 3kg = m_2$

$2 m_2 g\, 250 \cos\theta \cdot d\theta - m_1 g \cdot 1000 \sin\theta \cdot d\theta = 0$

$2 m_2 g \cdot 250 \cos\theta \cdot d\theta + m_1 g \cdot (-1000 \sin\theta\, d\theta) = 0$ $\quad m_1 = 7\,kg$

$\tan\theta = \frac{500 m_2}{1000 m_1} = \frac{m_2}{2 m_1} = \frac{3}{14}$

$\theta = \tan^{-1}\left(\frac{3}{14}\right)$

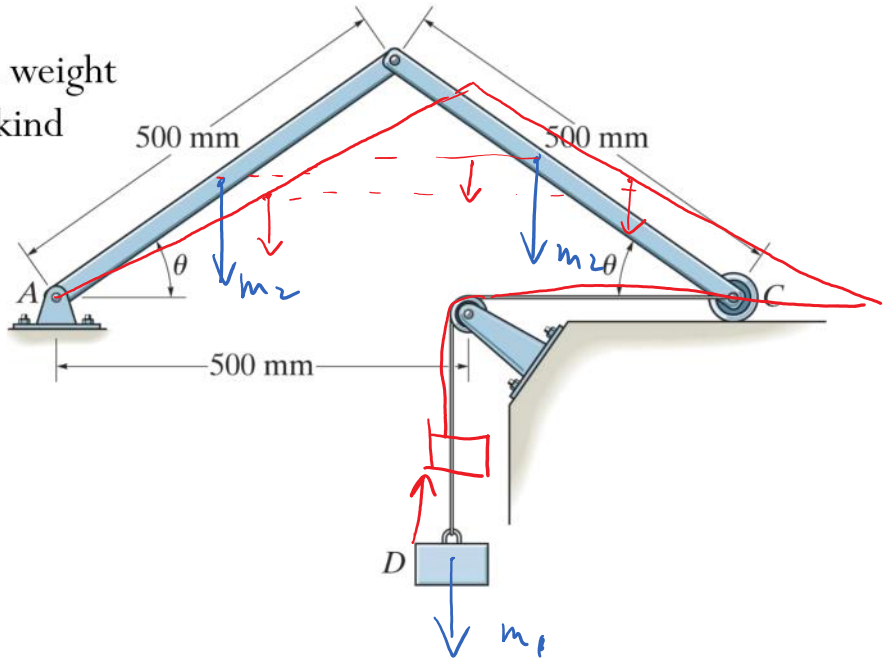
$\theta = \tan^{-1}(\frac{1}{4})$

Determine the angel of equilibrium, θ, given that block D has a mass of 7 kg and the links each have a mass of 3 kg.

Weight of the left link and weight of the block will do same kind of work (both positive or both negative).

A) True

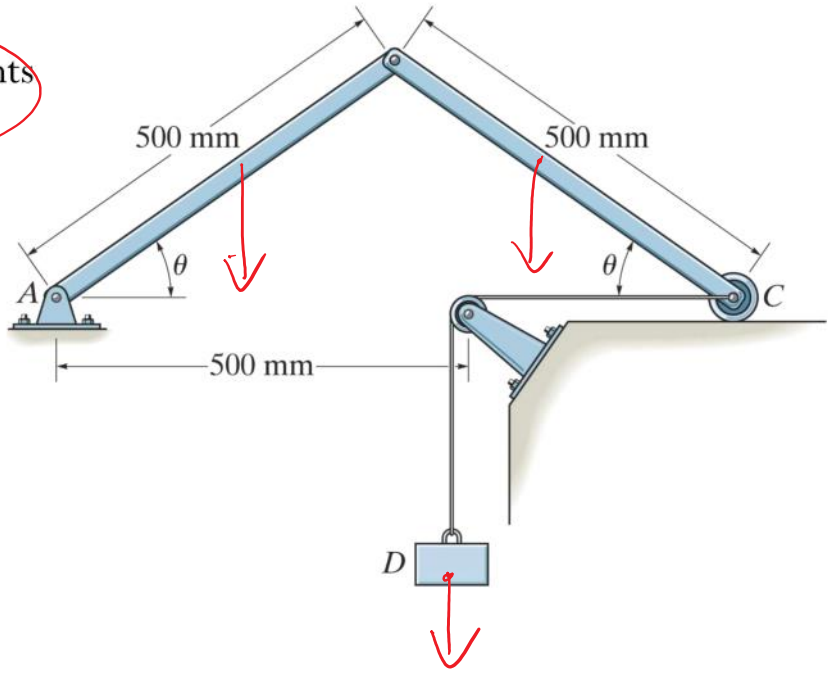
B) False



Determine the angel of equilibrium, θ, given that block D has a mass of 7 kg and the links each have a mass of 3 kg.

How many forces/moments will do work?

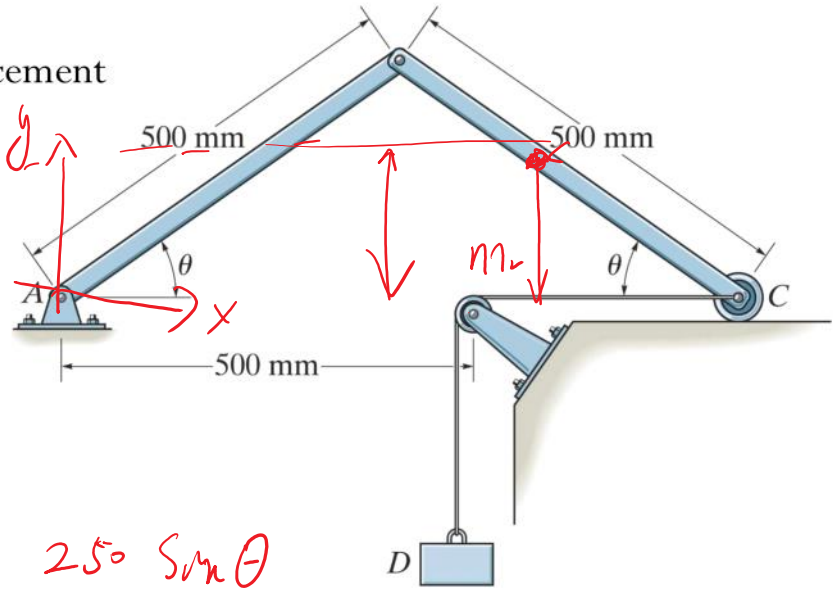
A) 3
B) 4
C) 5
D) 6
E) None of the above



Determine the angel of equilibrium, θ, given that block D has a mass of 7 kg and the links each have a mass of 3 kg.

What is the virtual displacement of the right link's weight?

A) $750 \sin\theta \, d\theta$ mm
B) $750 \cos\theta \, d\theta$ mm
C) $250 \sin\theta \, d\theta$ mm
D) $500 \cos\theta \, d\theta$ mm
E) None of the above



$250 \sin\theta$

$250 \cos\theta \cdot d\theta$

Determine the angel of equilibrium, θ, given that block D has a mass of 7 kg and the links each have a mass of 3 kg.

What is the virtual displacement of the block's weight?

A) $750 \sin\theta \, d\theta$ mm
B) $750 \cos\theta \, d\theta$ mm
C) $1000 \sin\theta \, d\theta$ mm
D) $1000 \cos\theta \, d\theta$ mm
E) None of the above