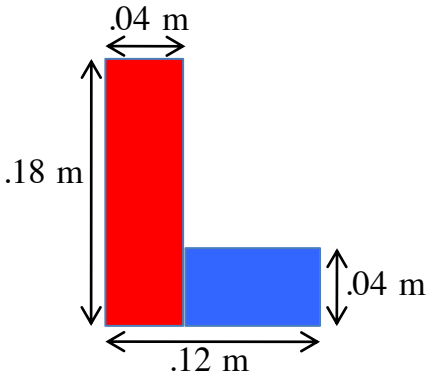
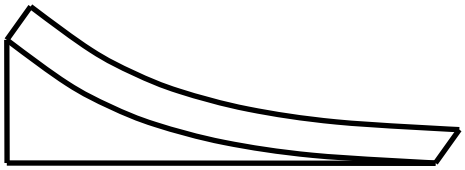
12-Series Problem

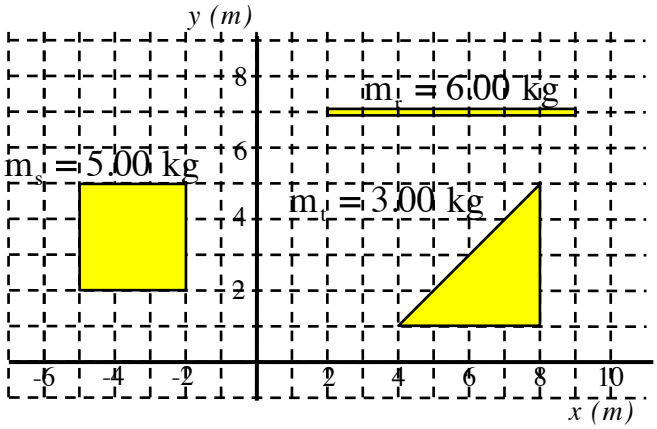
12.3) Determine the *center of gravity* of the L-shaped carpenter's square shown to the right.



12.5) The curved incline shown to the right is 5.00 cm wide, 1.00 meters high and 3.00 meters long. The equation that defines the curve is $y = \frac{(x-3)^2}{9}$. Determine the track's center of gravity along the x-axis (i.e., along the horizontal).



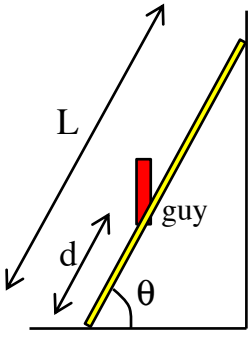
12.7) For the three object system shown, determine the new center of gravity.

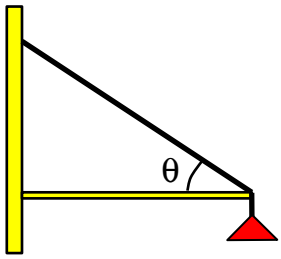


12.13) A ladder sits at an angle of $\theta = 60^\circ$ against a "frictionless" wall. If the ladder weights 500 N and is 15.0 meters long, and if an 800 N man climbs the ladder:

a.) What are the horizontal and vertical forces acting at the ground when the man is d = 4.00 meters up the ladder?

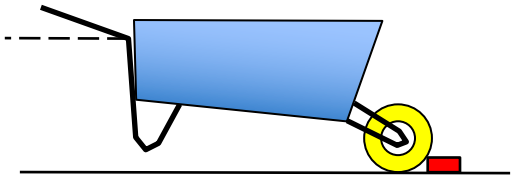
b.) The man continues to climb until he reaches d = 9.00 meters above the ground at which point the ladder is just barely able to keep from breaking free and slipping at its ground contact. What is its coefficient of static friction?





12.18) A lamp of mass $m_L = 20\ kg$ hangs at the end of a pinned rod of mass $m_r = 80\ kg$ and length L. The rod is supported by a cable that comes off the rod at an angle $\theta = 30^o$, as shown in the sketch to the right.

a.) Draw a free body diagram for the forces acting on the rod.
b.) Determine the tension in the cable.
c.) Determine the horizontal component of the force acting at the pin.
d.) Determine the vertical component of the force acting at the pin.
e.) Determine the vertical component of the force acting at the pin by summing the torques about the contact point between the lantern and the rod. Does this result match the value you determine in *Part d*?



12.21). A wheel barrel with a 20.0 cm radius wheel tries to roll over an 8.00 cm high brick, as shown in the sketch. If the wheel barrel's handle makes an angle of 15^o with the horizontal:

a.) Assuming the force is applied along the line of the handle, what is the minimum force required to just barely get the wheel barrel to start to move up and over the brick. (Note: The force applied to the handle will *act* through the center of mass of the wheel.)
b.) What is the vertical and horizontal component of forces at the brick just as the wheel barrel begins to lift off the ground.