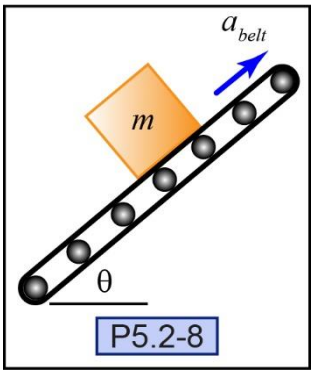
P5.2-8) A block is placed on a conveyer belt as shown in the figure. The coefficient of static and kinetic friction between the block and belt are 0.9 and 0.6, respectively. If the conveyer belt is not moving, determine the maximum angle θ for which the block will not slide. If the conveyer belt is set at an angle of 20°, determine the belt's maximum acceleration that can be achieved before the block slips relative to the belt. If the conveyer belt is accelerating at 20 ft/s^2, determine the acceleration of the block.



P5.2-8

Given:

Find:

Solution:

FBD

Draw a free-body diagram of the block.

Friction force

Calculate the normal force between the block and the belt as a function of the block's mass and belt angle.

N = _____

Calculate the maximum static and kinetic friction forces between the block and the belt as a function of the block's mass and belt angle.

$F_{fs,max}$ = _____

F_{fk} = _____

Equation of Motion

For the static case, determine the maximum angle of the belt before slip occurs.

θ = _____

For the case where the angle of the belt is set to 20^o, determine the belt's maximum acceleration before slip occurs.

a_{belt} = _____

For a belt acceleration of 20 ft/s^2, determine the acceleration of the block. Note, the belt angle is still 20^o.

a = _____