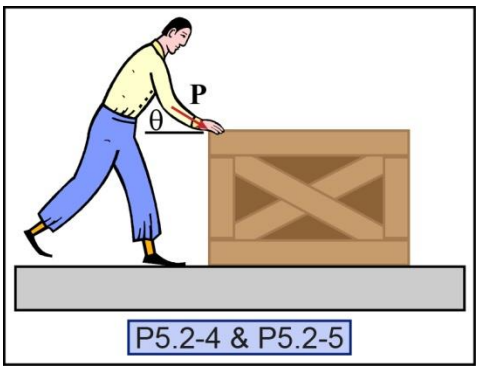
P5.2-5) A man pushes a 100-lb wood crate along a painted concrete floor. If he wishes to accelerate the crate to at least 3 mph starting from rest in the span of 5 seconds, what constant pushing force (**P**) is needed if it is applied at an angle of $\theta = 35^o$? The kinetic and static coefficients of friction are 0.2 and 0.28, respectively.



P5.2-4 & P5.2-5

Given:

Find:

Solution:

Acceleration

What is the desired acceleration of the crate?

a = _____

FBD

Draw a free-body diagram of the crate. Remember to include a coordinate system.

Friction force.

Determine the kinetic friction force between the crate and the floor as a function of P.

$F_{fk}(P)$ = _____

Equation of motion

Derive the equation of motion for the crate in the x-direction and then solve for P, assuming that the crate moves.

P = _____

Check assumptions

Determine the maximum static friction force between the crate and the floor using the value of P calculated above.

N = _____

$F_{fs,max}$ = _____

Calculate the static friction force using the P calculated above.

F_{fs} = _____

Does the crate move and why or why not?

Yes No