

VII. Discussion Questions

1. Explain why we are using $\sin \theta$ in the equation for $\sum F_x$ and $\cos \theta$ in the equation for $\sum F_y$.

We are measuring the angles from the y-axis.

2. How do we know that $\sum F_y = 0 \text{ N}$?

Because the mass is not moving in the y direction

3. What variable does acceleration a_x not depend on? Explain.

Mass because it cancels out of the equation $\sum F_x = \mu_k mg \cos \theta - mg \sin \theta = ma_x$

4. Calculate the acceleration a_x of the block and write the answer in the last row of Table 1. Explain why, in *this particular problem*, a_x is negative.

We are using -9.81 m/s^2 for g .

5. Now assume that you can change the angle θ . What is the *maximum* angle at which the incline could be set and at which the acceleration a_x would be 0 m/s^2 ? Assume that μ_k does not change. Show your work.

$$a_x = g(\mu_k \cos \theta - \sin \theta)$$

$$0 \text{ m/s}^2 = g(\mu_k \cos \theta - \sin \theta)$$

$$0 = \mu_k \cos \theta - \sin \theta$$

$$\sin \theta = \mu_k \cos \theta$$

$$\frac{\sin \theta}{\cos \theta} = \mu_k$$

$$\tan \theta = \mu_k$$

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