Inclined Plane Forces

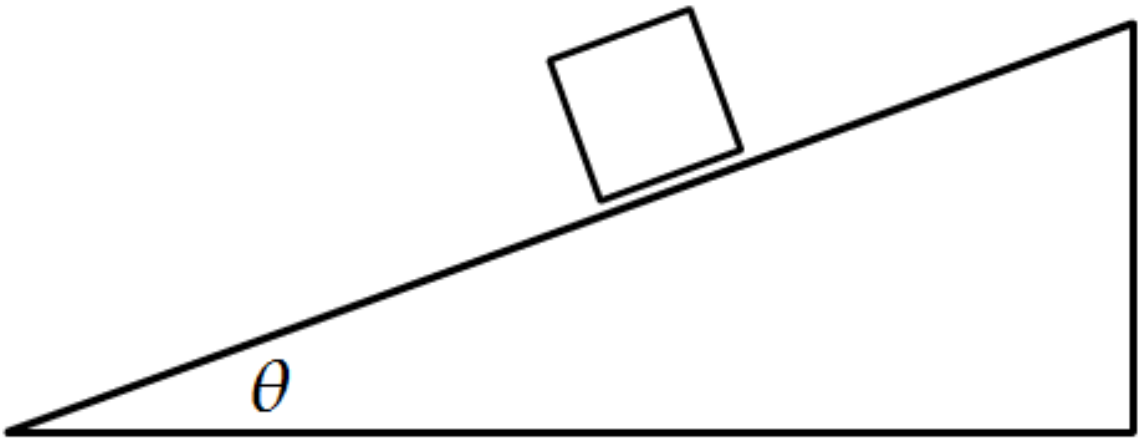
Group #:

You may use your textbook to assist you with this activity. Assume that the mass on the incline is in contact with the incline and is accelerating downward and to the left in the diagram, that positive x is to the right, parallel to the surface of the incline, and that positive y is upward, perpendicular to the incline. **Measure angles from the y-axis, and use *mg* for weight, not *W*.**

Your team will be provided with values for the mass, the angle, and the coefficient of kinetic friction, which you will write in Table 1. You will need to calculate the weight of the block.

Table 1 Problem Parameters

block mass *m* in kg	
block weight *mg* in N	
angle Θ in degrees	
coefficient of kinetic friction μ_k	



1. Is the block moving in the y direction? Hint: read the instructions.

2. Is the block accelerating in the positive or negative x direction? Hint: read the instructions.

3. What is the equation that expresses the relationship among the kinetic frictional force, the coefficient of friction, and the normal force? Hint: use your textbook.

4. In which direction is the frictional force applied in this problem? Explain.

5. Complete the following table. Write the correct **equations required to calculate the values and the correct numerical results**. You must include the correct equations, the correct signs for the equations, and the correct numerical results to receive credit. If a quantity is 0, you must include it. The final equation for the sum of the forces in the x direction must include **only** the variables μ_k, m, g, Θ, and a_x. Hint: what is the equation for F_N? Be sure that you have substituted the correct equation for F_N in all of the equations in the table in which it is used.

Table 2 Force Equations and Numerical Results

A	B	C
Force	x-component in N	y-component in N
W	equation: value:	equation: value:
F_N	value:	equation: value:
f_k	equation: value:	value:
$\sum F$	equation: value:	equation: value:

6. In the drawing above, correctly draw the axes, label all of the forces (W, W_x, W_y, F_N , and f_k), the angles, and the mass of the block. You must include the weight of the block, the magnitudes for x and y components of the weight, the magnitude of the normal force, and the magnitude of the kinetic frictional force.

7. Calculate the acceleration of the block and explain why, *in this particular problem*, it is negative.

8. Explain why changing the mass of the block has no effect on the acceleration. Hint: simplify the equation for the sum of the forces in the x direction.

9. Using the given angle Θ, calculate the required coefficient of kinetic friction μ_k that would be required in this problem that would result in an acceleration for your block in the x direction of 0 m/s^2. Show your work and simplify the equation that you used as much as possible. No credit for incorrect equation or answer.

10. Does this value for μ_k depend on the mass m of the block or the value of g? Explain your answer.