NYU Physics 1—friction

In lecture you did a problem of a block on an inclined plane, but for the somewhat complicated case of a car sliding around a banked turn. Here we consider the simpler "block on plane" problem but with friction. When we "switch on" friction, the contact force between the block and the plane is no longer purely normal but has both normal and transverse (frictional) components. For definiteness, imagine a plane or bank inclined at about 20 deg to the horizontal in what follows.

1 Work out the problem of a block on an inclined plane in the *absence of friction*. That is, compute the magnitude of the normal force and the magnitude and direction of the acceleration of the block.

2 Imagine that between the block and the plane there is a coefficient of friction $\mu = 0.05$. Draw the forces on the block, separating the contact force into its normal and transverse components.

3 Solve for the frictional (transverse) component of the contact force. Do you get a magnitude of $\mu\, m\, g\, \cos\theta$? Which way does it point?

4 What is the acceleration of the block in this case?

5 Describe a situation in which the frictional force would point *down* the plane. When you answered the previous question, you made an assumption. What was it?

6 Now imagine that $\mu = 0.9$. What is the magnitude of the frictional force? Explain why it *cannot* be $\mu\, m\, g\, \cos\theta$.