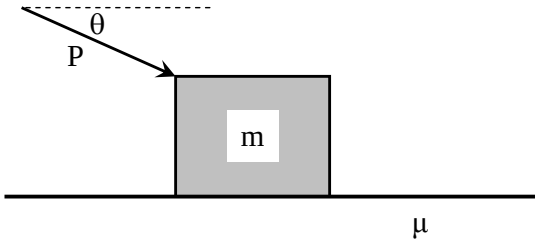
**AP Physics – Assignment #5**
**Forces on an inclined plane**

**Instructions:** Complete these problems on separate paper. On ALL questions (yes, even multiple choice), you must:

1. *Draw a picture or diagram* to visualize the problem
2. *Show each step of your calculations clearly*
3. *Write a few sentences* explaining important steps and discussing the reasonableness of your result.

It is ok to collaborate with your peers, but the work must be your own.

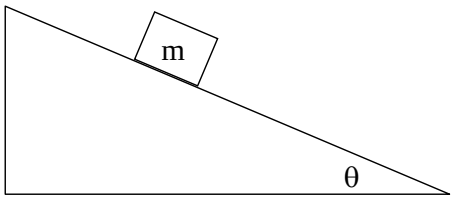
*You must take assignments seriously to learn physics*



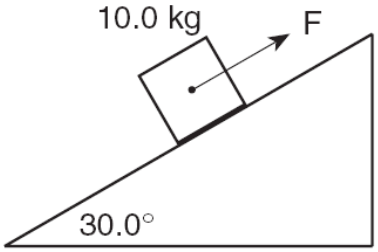

1. A worker is pushing a box with mass *m* along a rough warehouse floor at a constant speed. The push force is applied at an angle of $\theta$ below the horizontal and has a magnitude *P*.
   a) Draw and clearly label all of the forces acting on the box.
   b) Solve for the normal force in terms of given variables (*P, m*, $\theta$) and known constants (*g*).
   c) Solve for the frictional force in terms of given variables and known constants. (The coefficient of friction $\mu$ is <u>not</u> a given variable.)
   d) Solve for coefficient of friction $\mu$ in terms of given variables and known constants.

2. A box with mass *m* is at rest on a ramp with a rough surface.
   a) Draw and clearly label all of the forces acting on the box.
   b) What is the magnitude of the frictional force acting on the box?
   c) What is the magnitude of the normal force acting on the box?

   Express your answers in terms of *m*, $\theta$, and *g*.




3. Multiple Choice: The diagram below shows a 10.0-kilogram mass held at rest on a frictionless 30.0° incline by force *F*.




What is the approximate magnitude of the force *F*?

   A. 9.81 N
   B. 49.1 N
   C. 85.0 N
   D. 98.1 N

**Answers to #1:**
These answers are provided so that you receive immediate feedback. Use them to check your work and to assess your own understanding. If you don't 100% understand how to reach these answers, come in for extra help.

**Part 1b:** $F_N=mg+P\sin\theta$
**Part 1c:** $F_f=P\cos\theta$
**Part 1d:** $\mu=(P\cos\theta)/(mg+P\sin\theta)$

*"You don't have to be a fantastic hero to do certain things. You can be just an ordinary chap, sufficiently motivated to reach challenging goals."*
- Sir Edmund Hillary