

HW 2

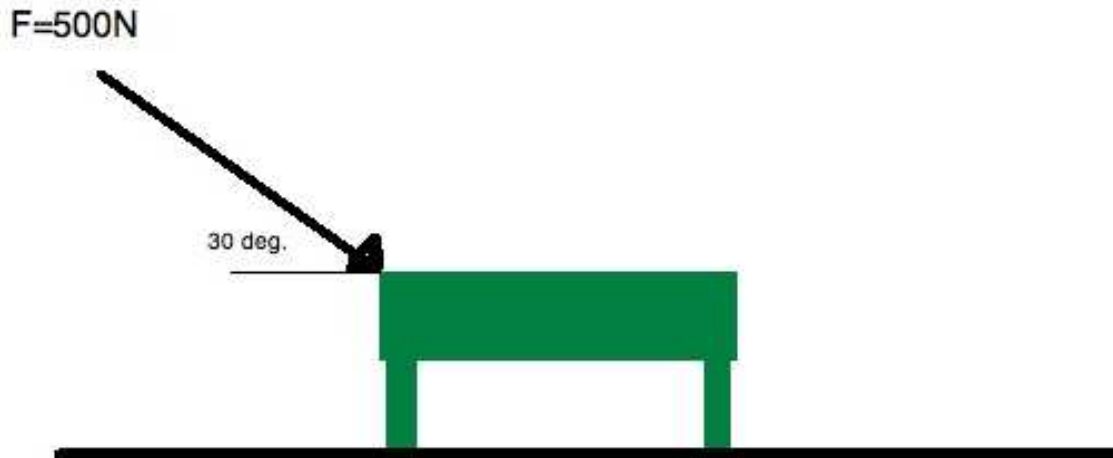
Due May 6, 2009 in recitation

Please answer all questions clearly and concisely. While you need not transcribe the question completely, it should be clear from your answer alone what you are talking about.

You are strongly encouraged to discuss the homework with your classmates, but you must complete the written homework by yourself, and of course, the material you submit must be your own.

Remember, show all of your work!

1. In my spare time, I move furniture. Just yesterday I was pushing a 100kg piano (It's a little one, like the kind that Schroeder played in "Peanuts"). I pushed on it with a force of 500N at an angle of 30 degrees to the horizontal, as shown.



The coefficient of kinetic friction between the piano and floor is 0.2.

- (a) What is the normal force that the floor exerts on the piano?
- (b) Draw a free-body diagram of the piano as I push it along. Make sure you calculate all of the forces on the piano (in Newtons).
- (c) I push the piano 2m before I give up and quit for the day. How much work did I do?
- (d) How much work did friction do over the same distance?
- (e) Assuming the piano started at rest, how fast was it going when I eventually stopped pushing it?

(over)

2. You throw a 0.2 kg ball horizontally with a speed of 15 m/s off a cliff 10m above the ground.
- (a) What is the kinetic energy of the ball immediately after it leaves your hand?
  - (b) What is the gravitational potential energy of the ball (relative to the ground) immediately after you throw it?
  - (c) What is the kinetic energy of the ball when it's about to strike the ground?
  - (d) What is the speed of the ball the instant before it's about to strike the ground?
  - (e) Use the projectile motion equations to show that your result from part d) is correct.