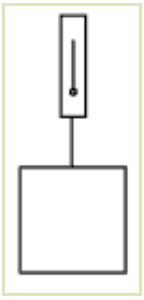
Force Lab

Name:
Period:
Mr. Z.'s Physics Class
11/10/05

We learned that whenever an object that was standing still starts moving, this happened because some force is pushing or pulling it. For example, all objects are pulled downward by the Earth's gravity; this force is called "weight." Often, although there are forces acting on an object, it sits there and doesn't move. This is because the forces acting on it are *balanced*. So, for example, an object sitting on a table has gravity pulling it down, but the table pushes up with a **normal** force that is big enough to cancel that out.

Force is measured with a "spring scale." You might have noticed that the more you stretch out a spring, the harder it tries to pull back. This means that if we measure how far a spring is stretched by, this tells us how hard the spring is pulling on its ends. This type of force is called a tension force.

1. Hang your block from your spring scale. The scale shows with what force of tension the block is being pulled up.

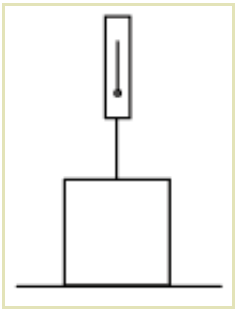


   a) What is the force that the scale is pulling with (read the N side of the scale)?

   b) The block is not moving, so there must be another force acting on it to balance out tension. What is that force called? How big is it?

   c) Draw in the diagram on the left the two forces acting on the block, showing their direction and labeling them with their names and their size.

2. Place your block on a table, and hook the spring scale to its string. Gradually pull harder on the spring scale until the block rises off the table.



   a) There are three forces acting on the block as you lift: gravity, the normal force from the table, and the tension force from the scale. Draw and label arrows representing these forces on the diagram to the right.

   a) What happens to the reading on the scale as you start to lift?

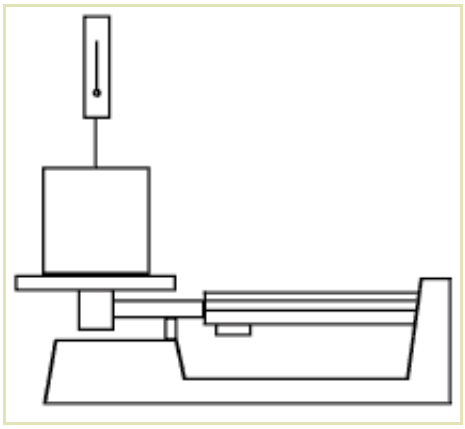
   b) What is the scale reading when the block rises off the table?

   c) Since nothing is moving as you lift, the normal force and the tension force must add up to be equal to the weigt of the block. What is the normal force when the scale reads 3 N?

   d) What is the normal force when the block lifts off the table?

The remaining questions may be completed in any order. A three-beam balance is needed for one question; if there aren't any free when you get to that question, you can go on to another question and do that one later.

3. Now, put your block on the pan of the 3-beam balance. Set the balance to 300g, so that it will balance when it is pushing up with a normal force of 3 N. Now, lift up on the block with the scale until the balance balances.

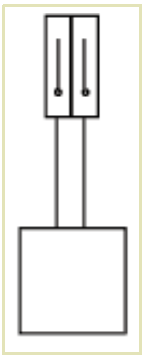


   a) What is the spring scale reading?

   b) Draw and label the forces acting on the block in the picture to the right.

   c) Add up the forces in each direction to show that they are balanced.

4. For this problem, use two spring scales. Connect both to the top of your block, so that both are pulling up on it.



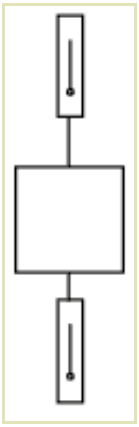
   a) With what forces are the two scales pulling?

      Scale 1:

      Scale 2:

   b) Add up the forces in each direction. Do the two scales balance out the gravity force?

5. For this problem, use two spring scales. Connect one to the top of your block, one to the bottom, and pull down on the bottom one.



   a) With what forces are the two scales pulling?

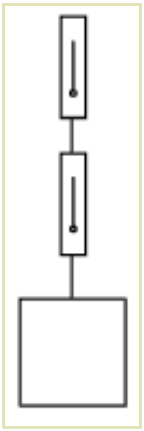
      Top scale:

      Bottom scale:

   b) In the diagram to the right, draw and label all the forces acting on the block.

   c) Add up the forces acting in each direction to show that they balance out.

6. For this problem, use two spring scales. Connect one to the top of your block, and connect the other to the top of that scale.



   a) With what forces are the two scales pulling?

      Top scale:

      Bottom scale:

   b) Why are they each pulling the full weight of the block, rather than half its weight?