Spring-2018 Phys101
**Assignment 8**
Check MateringPhysics for other problems
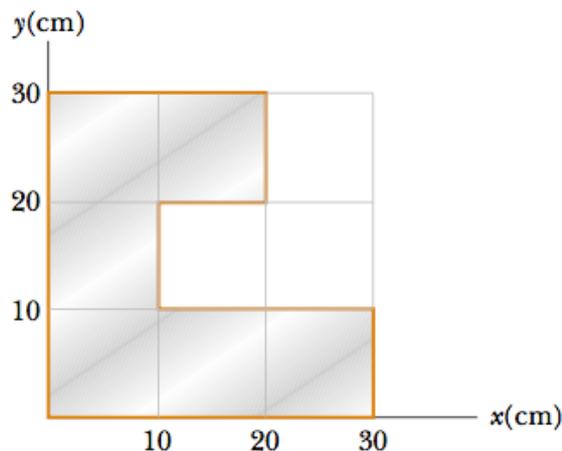Due date: 5 April 2018.

Discussion questions

1- A machine gun is fired at a steel plate. Is the average force on the plate from the bullet impact greater if the bullets bounce off or if they are squashed and stick to the plate? Explain.

2- A woman stands in the middle of a perfectly smooth, frictionless, frozen lake. She can set herself in motion by throwing things, but suppose she has nothing to throw. Can she propel herself to shore *without* throwing anything?

3- Explain how linear momentum is conserved when a ball bounces from a floor.

Problems

4- A 15.0-kg block is attached to a very light horizontal spring of force constant 500.0 N/m and is resting on a frictionless horizontal table. Suddenly it is struck by a 3.00-kg stone traveling horizontally at 8.00 m/s to the right, whereupon the stone rebounds at 2.00 m/s horizontally to the left. Find the maximum distance that the block will compress the spring after the collision.
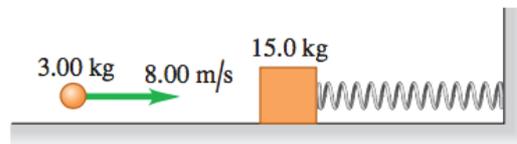
5-A uniform piece of sheet steel is shaped as shown below. Compute the x and y coordinates of the center of mass of the piece.

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6- The mass of the blue puck in the figure below is 20.0% greater than the mass of the green one. Before colliding, the pucks approach each other with equal and opposite momenta, and the green puck has an initial speed of 10.0 m/s. Find the speeds of the pucks after the collision if half the kinetic energy is lost during the collision.

30.0°

30.0°
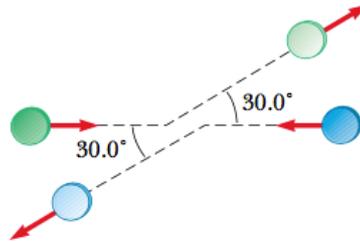
7- A large rocket with an exhaust speed of v_e =3000 m/s develops a thrust of 24.0 million Newtons.

(a) How much mass is being blasted out of the rocket exhaust per second?

(b) What is the maximum speed the rocket can attain if it starts from rest in a force-free environment with v_e =3.00 km/s and if 90.0% of its initial mass is fuel and oxidizer?