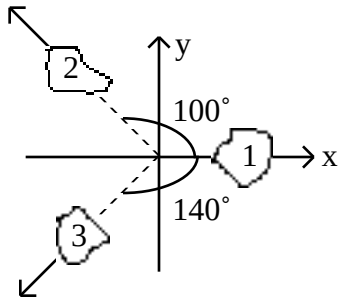
Name:_____

Solve the following problems in the space provided. Use the back of the page if needed. Each problem is worth 20 points. You must show your work in a logical fashion starting with the correctly applied physical principles which are on the last page. Your score will be maximized if your work is easy to follow because partial credit will be awarded.

1. A 0.350kg block slides along a frictionless surface at 2.00m/s when it makes a head-on elastic collision with a 1.15kg block. Find the velocity of each block after the collision. *Note: The algebra is very messy so you may want to just set this problem up to get most of the credit and complete the algebra later if you have time.*

2. A pumpkin collides with the ground and breaks into three pieces of equal mass. Considering only the horizontal motion, the first piece heads off with a speed of 20.0m/s. The second moves away at a 100˚ angle with respect to the first and the third heads off at 140˚ as shown in the sketch. Find the speed of the second and third pieces, resepctively.



3. A 12.0cm long pencil is balanced temporarily on its point. The mass of the pencil is 20.0g. The pencil tips and the point of contact stays fixed as it fall. Find the speed of the center of mass just as it lands on the horizontal tabletop.

4. Between ice ages the polar ice caps melt substantially and the resulting liquid water is distributed throughout the world's oceans. Since the ice caps are near the poles and the oceans are uniformly distributed over the entire globe (more-or-less) the length of the day changes. Explain why and state whether the days get longer or shorter.

5. A baseball bat leans against a smooth wall making a 60˚ angle with the ground. The center of mass is two-thirds of the way down the bat. Find the minimum coefficient of static friction needed to keep the bat in place.