Practice Problem Set 4

Not for credit – Practice only!

Question 1 (1 point)

What is the difference between an elastic collision, an inelastic collision, and a completely inelastic collision?

Question 2 (3 points)

Rocky McBlock is the star receiver for the Kennesaw Kilowatts in the Metro Metric Football League. Big Bobby Clobber plays for the rival Marietta Megatons. Rocky McBlock has a mass of 75 kg and Big Bobby Clobber has a mass of 150 kg. Rocky catches the ball and runs eastward at 2.5 m/s until he collides with Big Bobby Clobber. Big Bobby Clobber's velocity is 2 m/s in a direction 30 degrees south of west until he collides with Rocky McBlock. If Rocky and Big Bobby collide COMPLETELY INELASTICALLY what are their final velocities?

Question 3 (3 points)

Two steel balls are rolling in a track which points north/south – the balls can only move along the track. The first ball has a mass of 0.24 kg and is moving northward at 1.5 m/s. The second ball has a mass of 0.36 kg and is moving southward at 1.8 m/s. If the balls collide COMPLETELY ELASTICALLY what are their final velocities?

Question 4 (3 points) A wheel is rolling down a ramp. The ramp is 35 m long and inclined at an angle of 12 degrees from the horizontal. In all cases the wheel starts at rest from the top of the ramp and rolls down the ramp without slipping.

(a) If the wheel has a total mass of 1.5 kg, which is distributed in the shape of a thin hoop of radius 24 cm, what is its velocity when it reaches the bottom of the ramp?

(b) If the wheel has a total mass of 1.5 kg, which is distributed in the shape of a solid disk of radius 24 cm, what is its velocity when it reaches the bottom of the ramp?

(c) If the wheel has a total mass of 1.5 kg, which is distributed in the shape of an inner disk of radius 12 cm and a mass of 0.85 kg, surrounded by a hollow cylinder, also with a mass of 0.65 kg, which has an inner radius of 12 cm and an outer radius of 24 cm, what is its velocity when it reaches the bottom of the ramp? Which of the three wheels do you think would be most appropriate for a car?