

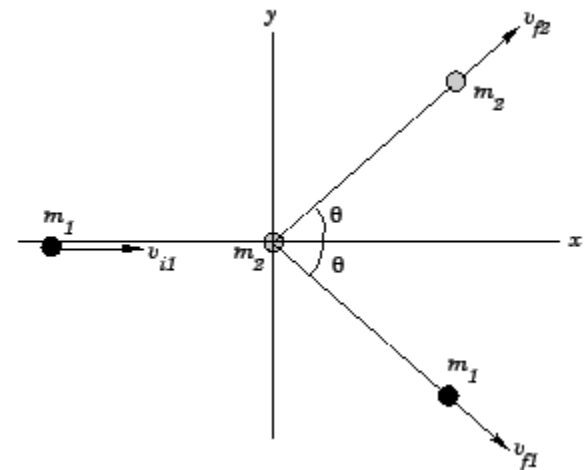
## Year End Review: Energy and Momentum

1) A 1250kg wooden roller coaster was moved up an 8.0m tall and 15.0m long incline at constant speed of 2.0 m/s.

- What was the work done by machinery to move the wooden roller coaster to the top of the incline? Assume no friction in the rails and no air resistance.
- The machinery operates on 60.0kW of power. What is the efficiency of the machinery?
- While moving at 2.0 m/s at the top of the incline, the roller coaster came down the other side of the incline and reached the bottom. What was its speed at the bottom? Assume no friction in the rails and air resistance is negligible.
- If the roller coaster only reached a speed of 10.0 m/s at the bottom, how much energy was lost due to heat?

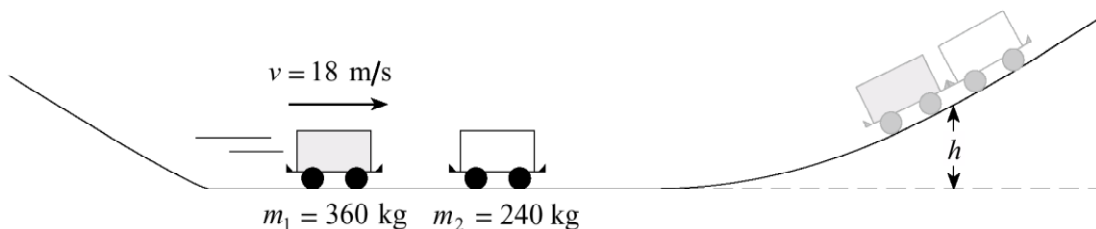
2) Two objects slide over a frictionless horizontal surface. The first object,  $m_1 = 5.0$  kg, is propelled with speed  $v_{i1} = 4.5$  m/s toward the second object,  $m_2 = 2.5$  kg, which is initially at rest. After the collision, both objects have velocities which are directed  $\theta = 30.0^\circ$  on either side of the original line of motion of the first object.

- What are the final speeds of the two objects?
- Is the collision elastic or inelastic?



3) Challenge! A 360 kg roller coaster car traveling at 18 m/s collides (completely) inelastically with a stationary 240 kg car on a section of horizontal track as shown in the diagram below.

- How much kinetic energy does the front white car have after the collision?
- Calculate how much heat energy was lost in the entire trip if the 2 roller coaster cars reached a height of 4.7m. How much lost in the collision? How much was lost going up the incline?



Name: \_\_\_\_\_

Answer Key

1)

- a. 98000J
- b. 22%
- c. 13 m/s
- d. 38000J

2)

- a.  $v_{f1} = 2.6$  m/s  
 $v_{f2} = 5.2$  m/s
- b. Elastic

3)

- a. 14000 J
- b. 31000J, 23 000J, 7400J