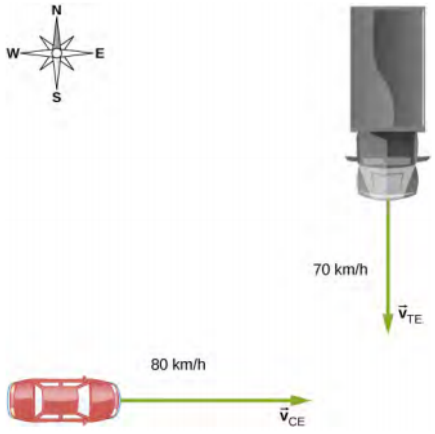
AP Physics C Relative velocity 1D and 2 D practice + Momentum

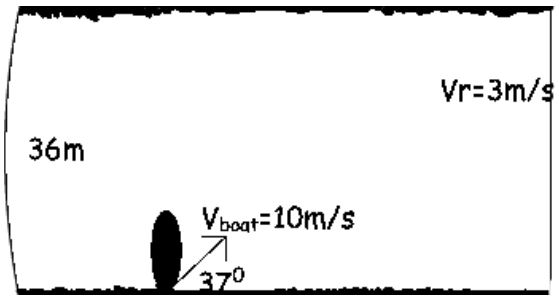
1) A truck is traveling south at a speed of 70 km/h toward an intersection. A car is traveling east toward the intersection at a speed of 80 km/h (Figure 4.27). What is the velocity of the car relative to the truck. (106 Km/hr , E41.2N)



2) A pilot must fly his plane due north to reach his destination. The plane can fly at 300 km/h in still air. A wind is blowing out of the northeast at 90 km/h. (a) What is the speed of the plane relative to the ground? (b) In what direction must the pilot head her plane to fly due north? (Ans: 230 Km/hr, N12E)

3) Boat has velocity 5m/s with respect to the river. It aims to reach point A, however, because of the river speed it reaches another point B. If the speed of current is 2m/s to the east calculate the time of trip and the distance between A and B. (Ans: 16m)

4) Velocity of the boat with respect to river is 10 m/s. It passes the river and reaches opposite shore at point C. If the velocity of the river is 3m/s, find the time of the trip and distance between B and C. (Ans: 66m)



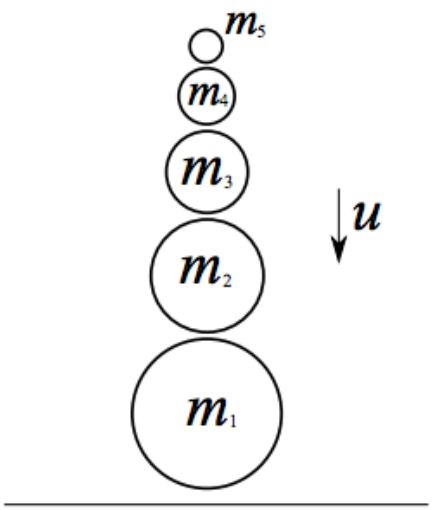


Figure 20: A falling stack of balls.

Exercise 47. *Imagine a stack of five balls, with masses* $m_1 \gg m_2 \gg m_3 \gg m_4 \gg m_5$, *which are all dropped from a height so the stack hits the ground with downward velocity* u, *as shown in fig. 20. By imagining the balls as very slightly separated, consider the sequence of collisions after the bottom one hits the ground, and thus calculate the speed the smallest ball bounces up with. If the balls were dropped from a height of* 1m, *show the smallest ball will bounce back by* 3969m.