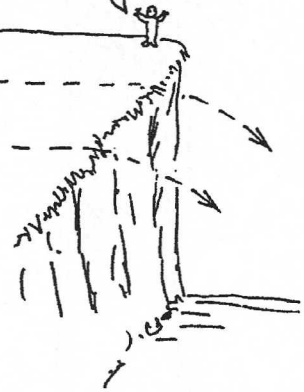
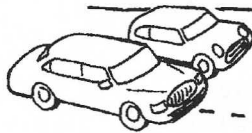


**Chapter 7 Energy**  
**Energy and Momentum**

A MiniCooper and a Lincoln Town Car are initially at rest on a horizontal parking lot at the edge of a steep cliff. For simplicity, we assume that the Town Car has twice as much mass as the MiniCooper. Equal constant forces are applied to each car and they accelerate across equal distances (we ignore the effects of friction). When they reach the far end of the lot, the force is suddenly removed, whereupon they sail through the air and crash to the ground below. (The cars are wrecks to begin with, and this is a scientific experiment!)

Let equations guide your thinking!



1. Which vehicle has the greater acceleration? (Think  $a = F/m$ .)  
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2. Which vehicle spends more time along the surface of the lot? (The faster or slower one?)  
\_\_\_\_\_
3. Which vehicle has the larger impulse imparted to it by the applied force? (Think Impulse =  $Ft$ .) Defend your answer.  
\_\_\_\_\_
4. Which vehicle has the greater momentum at the cliff's edge? (Think  $Ft = \Delta mv$ .) Defend your answer.  
\_\_\_\_\_
5. Which vehicle has the greater work done on it by the applied force? (Think  $W = Fd$ .) Defend your answer in terms of the distance traveled.  
\_\_\_\_\_

Impulse =  $\Delta$  momentum  
 $Ft = \Delta mv$   
Work =  $Fd = \Delta KE = \Delta \frac{1}{2}mv^2$



6. Which vehicle has the greater kinetic energy at the edge of the cliff? (Think  $W = \Delta KE$ .)  
Does your answer follow from your explanation of Question 5?  
Does it contradict your answer to Question 3? Why or why not?  
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\_\_\_\_\_  
\_\_\_\_\_

Making the distinction between momentum and kinetic energy is high-level physics.



7. Which vehicle spends more time in the air, from the edge of the cliff to the ground below?  
\_\_\_\_\_
8. Which vehicle lands farther horizontally from the edge of the cliff onto the ground below?  
\_\_\_\_\_

**Challenge:** Suppose the slower vehicle crashes a horizontal distance of 10 m from the ledge. Then at what horizontal distance does the faster car hit? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Hewitt  
Draw it!