

## Practice - Free-Fall Explained

1. Find your parent/guardian and ask them the same questions you were asked in class today regarding free-fall acceleration. You might start by grabbing a piece of paper and something much heavier (preferably an object that is okay to drop and won't damage the floor) and asking them which would hit the ground first if dropped from the same height in the presence of air? Then drop the objects and let them observe if they were right or not. Then you might ask them how this would change if there were no air in the room. Many people will respond with the right answer (both hit at the same time), but few can explain why and most will usually say something like, "Gravity pulls on everything the same!" At this point, have them hold the paper and heavier object, one in each hand, and ask if they would like to reconsider their statement (the heavier object is clearly being tugged by Earth with a greater force). Here you might want to really drive home the essential question, how is it that something that is pulled harder hits the ground at the same time as something that is pulled not nearly as hard? You can even demonstrate this to them even in the presence of air by finding two objects that are about the same size and shape and pretty heavy (though one clearly heavier than the other) and dropping them... they should hit the ground at nearly the same time, or at least it will be obvious that the object that was twice as heavy didn't get to the ground twice as fast. At that point, explain to them why the heavier of two objects dropped in the presence of air hits the ground first and why in the absence of air, all objects hit the ground at the same time. Summarize your experience below:
  
2. The ratio of circumference/diameter for all circles is  $\pi$  (3.14). What is the average ratio of force/mass for all freely-falling bodies falling near the surface of the Earth?
  
3. In a vacuum, a coin and a feather fall side by side. Would it be correct to say that in a vacuum equal forces of gravity act on both the coin and the feather? Explain.