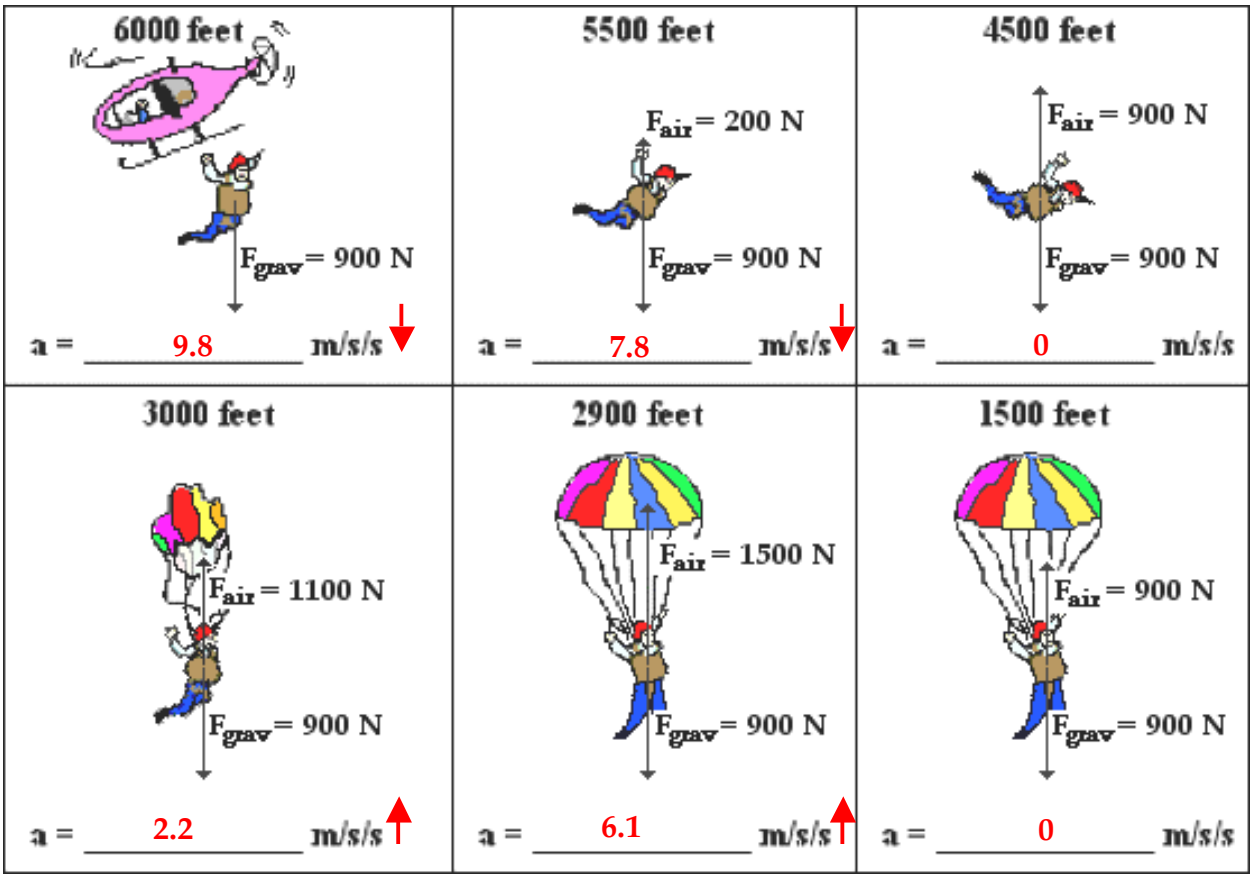
Skydiving

Read from **Lesson 3** of the **Newton's Laws** chapter at **The Physics Classroom**:
http://www.physicsclassroom.com/Class/newtlaws/u2l3e.cfm

MOP Connection: Newton's Laws: sublevel 11

A 90-kg (approx.) skydiver jumps out of a helicopter at 6000 feet above the ground. As he descends, the force of air resistance acting upon him continually changes. The free-body diagrams below represent the strength and direction of the two forces acting upon the skydiver at six positions during his fall. For each diagram, apply Newton's second law ($F_{net} = m \bullet a$) to determine the acceleration value.



1. At which two altitudes has the skydiver reached terminal velocity? **4500 feet and 1500 feet**
2. At which altitude(s) is the skydiver in the state of speeding up? **6000 feet and 5500 feet**
3. At which altitude(s) is the skydiver in the state of slowing down? **3000 feet and 2900 feet**
4. At 2900 feet, the skydiver is **B and D**. Choose two.
   a. moving upward **b. moving downward** c. speeding up **d. slowing down**
5. Explain why air resistance increases from 6000 feet to 4500 feet.
   The skydiver is speeding up during this stage of the fall. The air resistance force depends upon speed. As the skydiver increases speed, the amount of air resistance increases.
6. Explain why air resistance decreases from 3000 feet to 1500 feet.
   The air resistance force also depends upon the cross-sectional area of the falling object. With the parachute open, there is more cross-sectional area. The increased upward force exceeds the downward gravity force and slows the skydiver down.

