

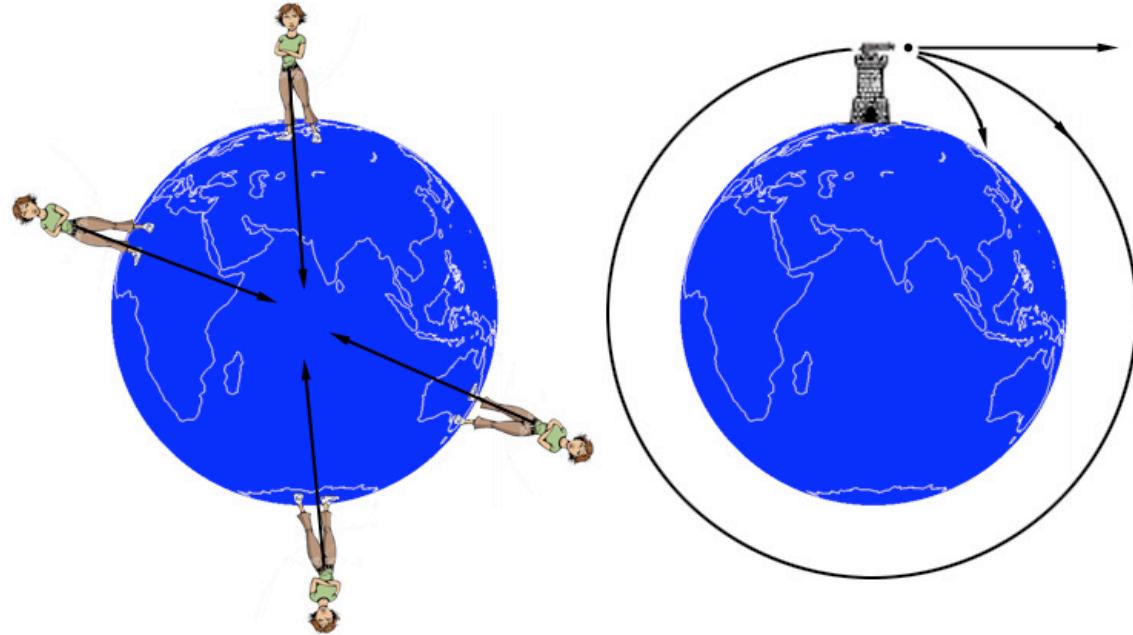
## **LIFT vs GRAVITY**

Sir Isaac Newton, an English scientist, observed the force of gravity when he was sitting under a tree and an apple fell on his head! It is a strong force that pulls everything down toward the earth. The more mass, the more gravity pulls. The lighter the object the less lift required to make it buoyant (able to float on air).

Jump up into the air – and stay there! What happens? Do you know of any place that does not have gravity or much less gravity? Drop a pencil, rock and a ball. What happens? What does this mean for bigger and heavier airplanes?

When you lift things up you have to pull against gravity. If you drop a pencil, gravity pulls it to Earth. If you rest its mid-point on your finger, gravity will pull down equally on both sides of the pencil and it will balance in the air.

The attractive force of gravity acts between at the center of two objects. In the case of people standing on the earth's surface, the effect of gravity is to attract us towards the center of the earth. As a result, no matter where you stand on the earth, you don't fall off. Gravity is also the reason why the moon (and satellites) orbit the earth and why we orbit the sun.

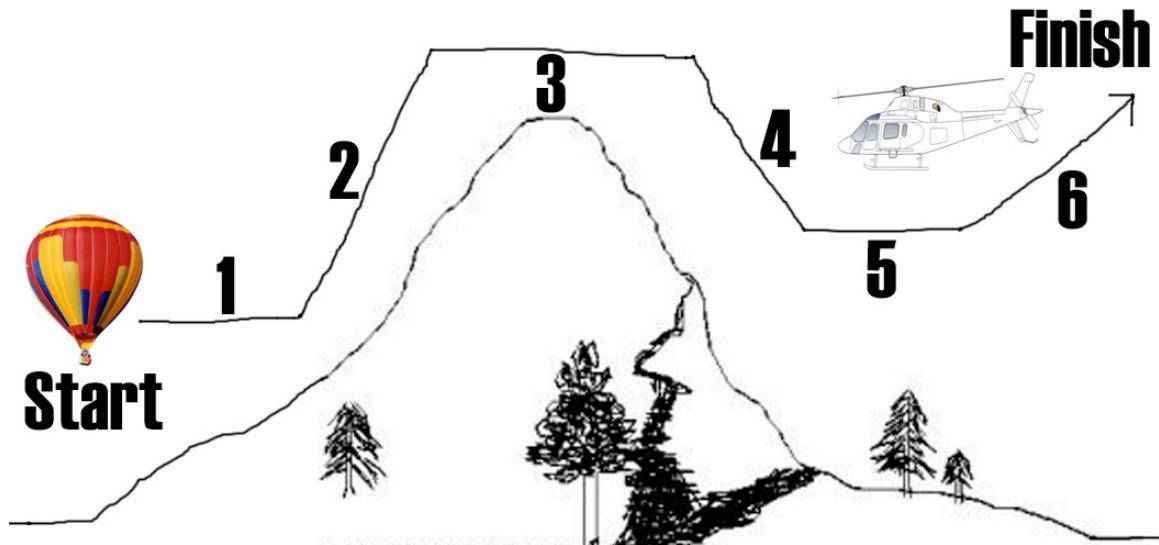


Lift is the upward force used to overcome gravity and to achieve flight. Lift occurs if the force on the bottom of an object is greater than the force of gravity from above. To sustain a particular height, lift must equal gravity).

## Lift vs. Gravity Questions:

Answer the following questions on looseleaf.

1. All objects within the Earth's atmosphere are pulled downward by \_\_\_\_\_.
2. The upward force that enables an object to fly is called \_\_\_\_\_.
3. In order to fly, objects must overcome \_\_\_\_\_ and attain \_\_\_\_\_.
4. The greater the mass of the object, the \_\_\_\_\_ the attraction of gravity.
5. The greater the mass of the object, the \_\_\_\_\_ the force of lift required.
6. Identify the relationship between gravity and lift at each interval indicated in the diagram below.



7. Since lift is required to make an object fly, why is it important that Engineers make flying devices as light as possible?