

# Newton's Attic Field Trip Answer Key

## Engineering Process

1. There are 7 steps in the engineering process. How many can you name?

1. need.

5. fabrication.

2. specification.

6. testing.

3. feasibility.

7. use.

4. creative design synthesis.

## G Force

1. Acceleration is a change in speed.

2. A simple machine is used to amplify force and pull the cart back.

3. Two types of energy are potential and kinetic.

## The Ballista

1. Great force is required to pull back the bow strap.

2. The coiled ropes store potential energy.

3. When the pumpkin or melon is flying through the air, it has kinetic energy.

4. The projectile follows a parabolic pathway.

## Rockets

1. Pressure is defined as force over area.

2. When the rocket blasts from the end of the barrel, what kind of energy does it have?  
kinetic.

3. What type of energy is this converted into? potential.

4. What purpose do the fins on the rockets serve? stabilization.

5. The nose cone makes the rocket more aerodynamic.

## SPINtron

1. Why was the multi-axis trainer invented in the first place?

It was invented by NASA to train astronauts to recover from a tumble in a spacecraft.

2. What is center of gravity? The point of an object at which the weight is evenly dispersed and all sides are in balance. Or, the point at which the entire weight of a body

may be considered as concentrated so that if supported at this point, the body would remain in equilibrium in any position.

3. What is a degree of freedom, and how many does SPINtron have?

The degree of freedom is a direction in which independent motion can occur. SPINtron has 3 degrees of freedom.

4. What is an axis? A point in space around which something rotates.

5. How many axes does SPINtron have? 3.

## Science at Newton's Attic

### Things you will learn about today:

1. Simple Machines
2. Stored Energy
3. Mechanical Advantage

### Three different simple machines used today at Newton's Attic:

1.       Lever                            found on       G-Force
2.       Windlass                            found on       G-Force
3.       Wheel and Axle                            found on       Ballista

### Three examples of stored energy:

1.       Elastic Potential                            found on       G-Force
2.       Compressed Gas                            found on       Rocket Launcher
3.       Spring (Tension)                            found on       Ballista

### Three ways we used simple machines to get mechanical advantage:

1.       Windlass                            used to       pull back cart on G-Force
2.       Lever                            used to       crank winch on Ballista
3.       Lever                            used to       trigger on G-Force