Engineering Design

An Interactive and FUN Way to Learn Science

- Engineering is a hands on interactive way for students to learn about science
- Especially pertinent to elementary school aged kids due to their short attention span
- An opportunity to get out of boring lectures
- Engineering is playing!

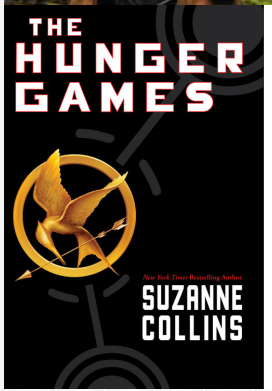
Legos: Conservation of Matter

- Kids love to play with Legos!
- Legos are toys that are rooted in engineering
- They allow you to build aka “engineer”
- Also teaches the conservation of matter
- When a structure is built is built by Legos, it can be broken down to those original Legos
- The Legos have not changed and are analogous to atoms

Legos: Static Friction

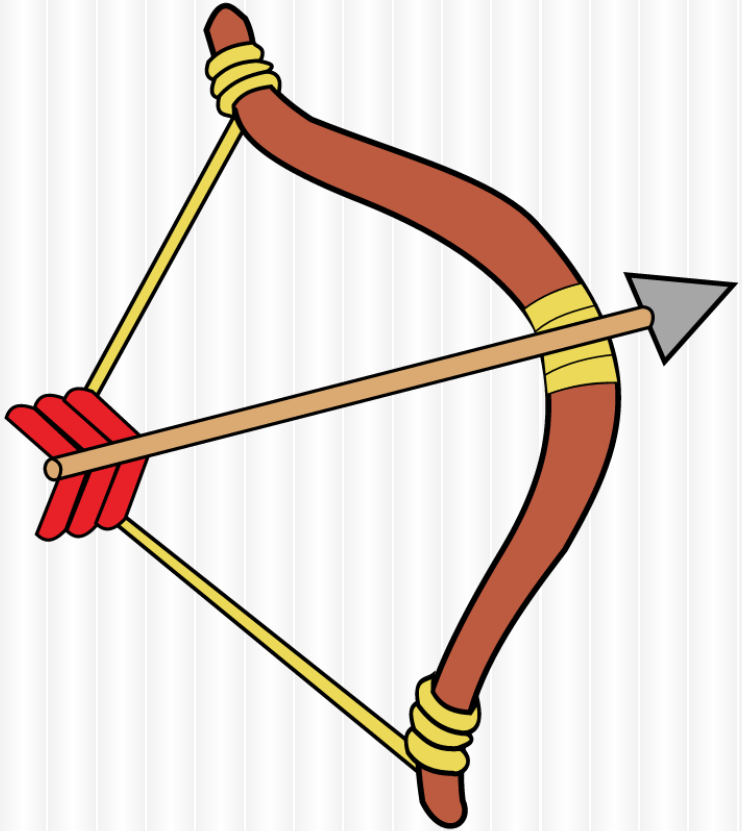
- Legos are AWESOME
- Legos stay together because of static friction
- That is to say, Legos can be built with because of the natural tendency to resist motion when two objects are in physical contact
- Without the principles of friction, the fun of Legos would not be possible

Science in *The Hunger Games*



- Science is everywhere, even in places where you would not expect, for example your favorite movie
- The hunting bow Katniss uses is an engineering marvel, a design so elegant, efficient it was invented independently in several separate civilizations

Engineering of the Bow and Arrow



- Potential Energy: the stored and untapped energy to do work
  - Is stored in the limbs of the bow
  - Similar to a diving board
- When the string is pulled back and eventually released, the potential energy is converted to kinetic energy: actively used energy in motion

The Arrow as an Object

- Before the motion of the arrow is taken into account, the arrow by itself is an object
- An object is simply the fancy scientific way to say “thing”
- Object: A physical body with a spatial location

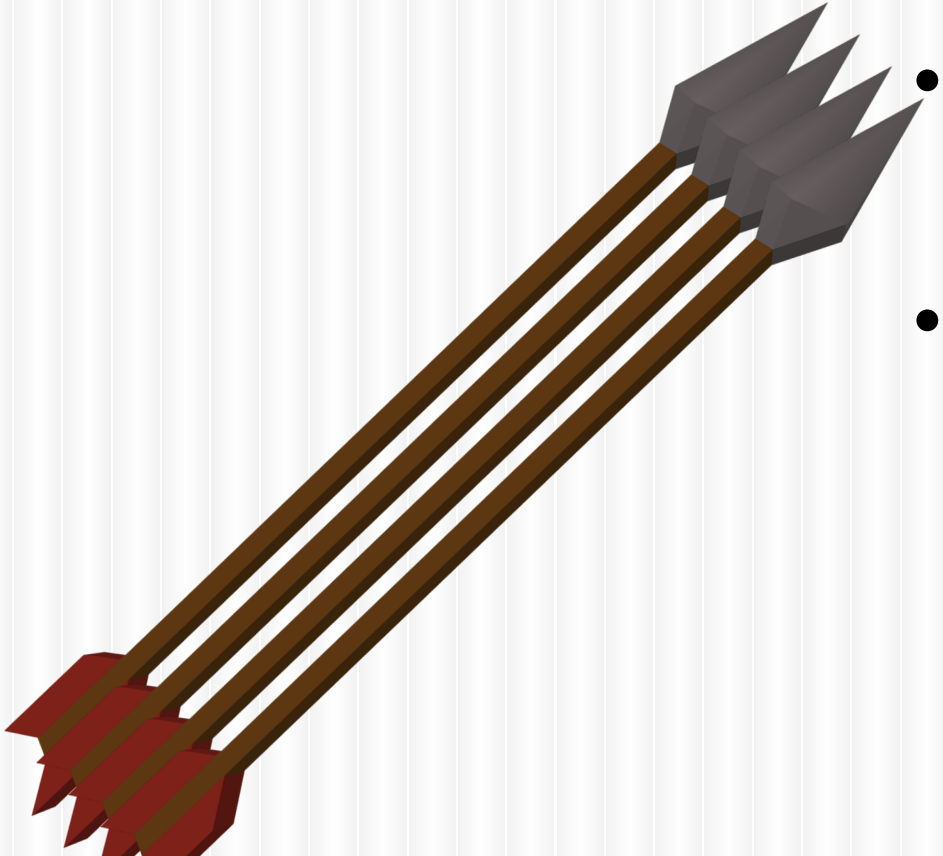
Velocity and Vectors

- As the arrow moves through the air after being shot out of a bow, it is said to be in motion: the movement or change in position
- This movement occurs at a specific rate measured as speed
- This speed coupled with the direction it is traveling in is known as velocity: the combination of speed and direction
- Velocity can be measured as a vector

Force

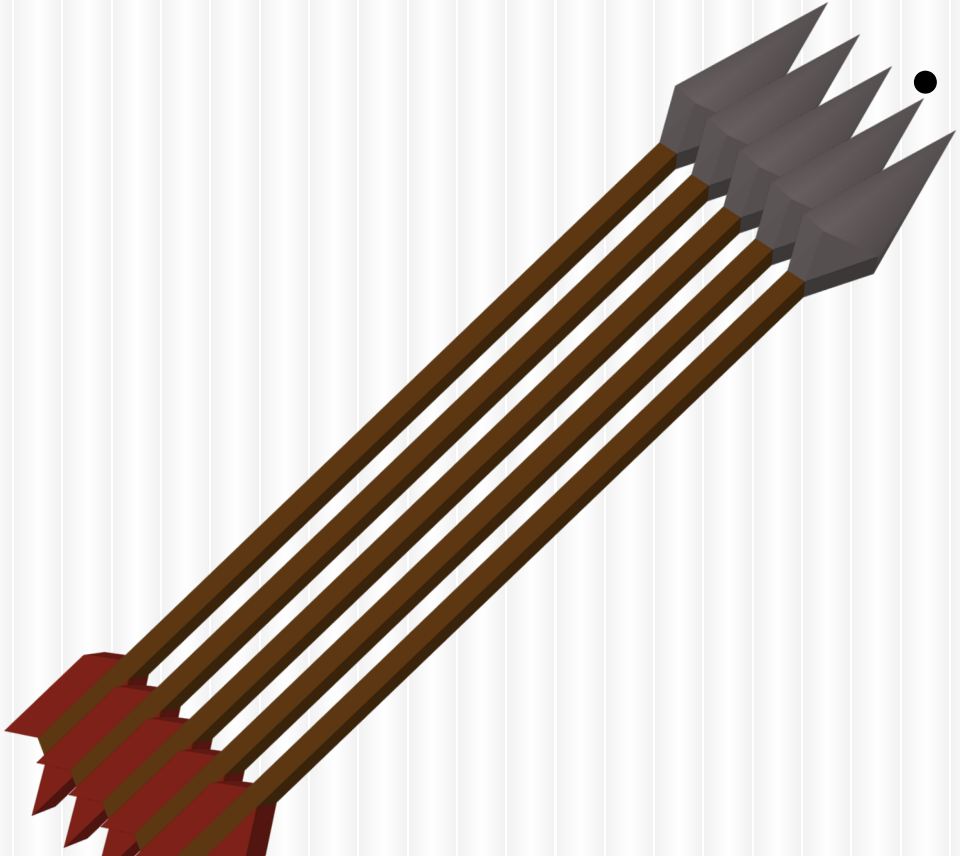
- After traveling through the air, the arrow arrives at the target with a certain amount of force: an external effort that causes an object to change its location, movement, or form
- In this case, the arrow is likely to change the form of the target, rending a hole in the target be it an animal for food or another tribute

Work



- When this force is applied to the target the result is called work: what results when force is applied to an object
- The work done on the object differs between the objects
  - A metal plate might get scratched
  - A deer would be more affected
    - the fundamental properties of these objects dictates the exact nature of the work

Resistance



- There are various environmental factors that also affect the flight of the arrow
  - The drag of the wind slows the arrow over time
  - Chafing and friction between the bow arm and the arrow destabilizes the bow
  - The eventual collision with the target is also an example of resistance