

Counselor Edition - Cub Scout NOVA – Motion (This award may be repeated for different belt loops with Cub Scouts earning up to three NOVA Motion awards)

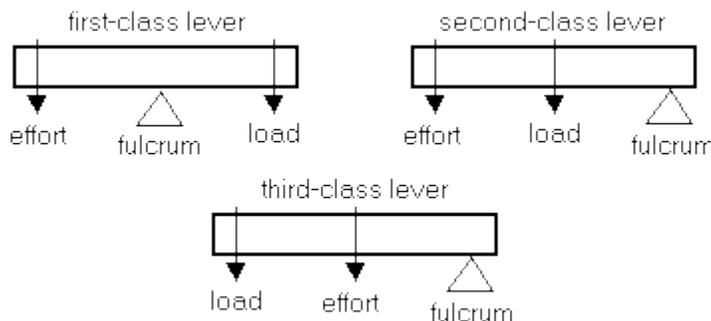
1. Watch or read, choose one:
 - a. Watch an episode or episodes (about an hour total) of NOVA or other media production* that involves motion or machines.
 - i. Make a list of at least two questions or ideas from each production
 - ii. Discuss the ideas and questions with your counselor
 - b. Read one long or two short magazine articles** that show(s) how motion or machines is/are measured, used, created or how machines work. (How does a gun work?)
 - i. Make a list of at least two questions or ideas from the article(s)
 - ii. Discuss the ideas and questions with your counselor
 - c. Do a combination of reading and watching
 - i. Make a list of at least two questions or ideas from the article or production
 - ii. Discuss the ideas and questions with your counselor
2. Complete a Belt loop or Pin from the following list

Badminton
Baseball
BB Gun Shooting
Fishing

Golf
Hockey
Softball
Table Tennis
Tennis

3. Levers
 - a. Make a list or drawing of the three types of levers

(a lever is one kind of simple machine; there are three classes of levers.)



http://www.google.com/imgres?imgurl=http://qldscienceteachers.tripod.com/junior/physics/simple01.gif&imgrefurl=http://qldscienceteachers.tripod.com/junior/physics/simple.html&usq=-_jIP9GuG-mOk1V7yvUxe0D92XCfY=&h=164&w=361&sz=2&hl=en&start=34&sig2=16PkIDeKGGBs6vEwYCsSg&zoom=1&tbnid=gS9c8Vt1SU7NfM:&tbnh=92&tbnw=202&ei=cA8ITeSWBYbGlQe5kZGkAQ&prev=images%3Fq%3Dthree%2Btypes%2Bof%2Blevers%26um%3D1%26hl%3Den%26sa%3DX%26rls%3Dcom.microsoft-us:IE-SearchBox%26rlz%3D117ADRA_en%26biw%3D1259%26bih%3D635%26bs%3Disch:1&um=1&itbs=1&iact=rc&dur=640&oei=Yg8ITeLmKIP_8Aa6_tXbDO&esq=4&page=3&ndsp=16&ved=1t:429,r:0,s:34&tx=92&ty=59

- b. Be able to tell your counselor
 - i. The class of each lever
 - ii. How it works.

A lever is a rigid bar that turns around a fulcrum (a fixed point). The force, a push or a pull, which is applied to the lever is called the effort. The farther the effort is from the fulcrum, the easier it is to use the lever. What the lever moves is called the load or the resistance. Levers can

change the direction of motion, make it easier to move something, or cause something to move a greater distance. There are three classes of levers.

Class 1 lever. The fulcrum is located between the effort and the load. The direction the load moves is opposite to the direction of the effort. Depending on where the fulcrum is placed, a first class lever can either make the load move more easily or move a greater distance. Examples of first class levers include seesaws, crowbars, scissors, and pliers.

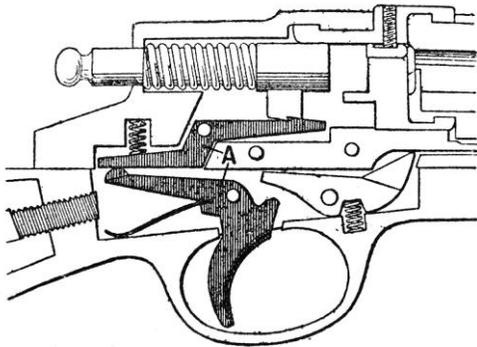
Class 2 lever. The fulcrum is at one end, the effort is at the other end, and the load is in the middle. The effort and the load move in the same direction. A Class 2 lever makes an object easier to move. Examples of second class levers include catapults, screwdrivers, nutcrackers, staplers, and wheelbarrows.

Class 3 lever. The fulcrum is at one end. The effort is applied between the fulcrum and the load. The effort and the load move in the same direction. A third class lever makes an object harder to move, but moves the object through a much greater distance than the effort force moves. Because the load end moves faster than the effort (it has to travel farther during the same time length) the load gains speed. Many sporting activities use Class 3 levers. Class 3 levers include bats, rackets, paddles, clubs, clubs, fishing poles, and brooms.

<http://www.fi.edu/pieces/knox/automaton/lever.htm>

- c. With your counselor, discuss
 - i. The type of lever involved with the motion in your chosen Pin

All the Cub Scout pins for this award use third class levers except BB Gun shooting. BB guns use a first class lever for the trigger.



The fulcrum (pivot point) is between the effort (applied by the trigger finger) and where the pressure (the load or resistance) is applied to the spring.

http://en.wikipedia.org/wiki/File:Trigger_mechanism_bf_1923.jpg

- ii. What you learned about levers and motion from doing your Pin
- 4. Visit –
 - a. A playground
 - i. Discuss with your counselor what playground or sports equipment uses levers
 - Seesaws – first class
 - Swings – second class levers

Sandbox shovels – third class

Bats, clubs, rackets, paddles, and fishing poles are third class levers.

Playgrounds have other simple machines, including incline planes (slides) and wheel and axles (merry-go-rounds).

5. Design

- a. Design, including a drawing or sketch, one of the following
 - i. A new playground fixture that uses a lever
 - ii. A new game or sport using a lever
- b. Discuss with your counselor
 - i. How the lever in your design will move something

*(Some media examples are the Discovery Channel, Science Channel, National Geographic, and the History Channel.)

** (Examples of magazine sources include Odyssey, Know : the Science Magazine for Curious Kids, Kids Discover, National Geographic Kids, Owl or **OWLkids Online**. You may wish to look at an article from Popular Mechanics or Popular Science with one of your parents.)