

**Review:**

*What is a gear?*

*What is a fulcrum point?*

*How are gears used?*

**Lesson: Pantograph/Scissor Mechanism**

**Pass out this weeks worksheets - Go over with the class.**

**Example:** Show students your examples and how they work.

Show them how to construct the 2 projects before you hand out the boxes.

**Ultimate Challenge:**

Setup a test area. Put down a straight piece of tape and 2 feet away put another piece of tape down. Put the minifigure on one side and then the students will start on the opposite side and see if they can grab the minifigure and bring it back with out crossing the line.

Engineering with Legos : Crazy Contraptions



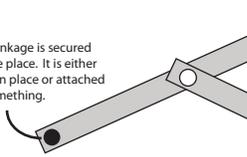
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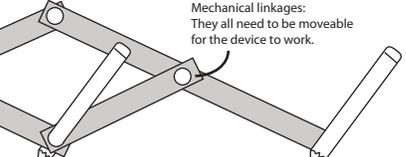
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**What is it?** The pantograph was invented in 1603 and it was a device used to copy images or enlarge drawings. The device is based on mechanical linkages that form parallelograms\*.

This linkage is secured in one place. It is either held in place or attached to something.



Mechanical linkages: They all need to be moveable for the device to work.

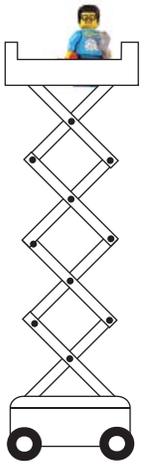


\*Parallelogram- a 4 sided shape where the opposite sides are equal in length.

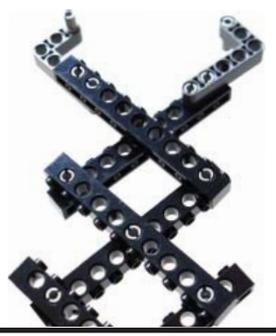


**Scissor Mechanism:**  
This is also known as a pantograph due to its unique design which opens and closes like an accordion. It is made with many linkages and it forms a criss-cross "X" shaped pattern. They are a great contraption as they can become very small and compact and can also extend out very far.

Scissor lifts are used everyday and it helps people reach high places. It is especially helpful when a ladder is not tall enough to reach an area.



Can you engineer a pan tograph like the one above and can you engineer a scissor lift or "scissor claw"!



**Challenge 1 - Individual build or team of 2**

-Write your name on the back of the worksheet. Then using the pantograph, replicate your name and make sure it comes out larger!

**Challenge 2 - Individual build or team of 2**

- Engineer a scissor lift that can raise a LEGO minifigure or a scissor claw that can grab a minifigure

**Ultimate Challenge- Individual build or team of 2**

- Build a scissor claw that can grab something 2 feet away.(approximately the length of 2 pieces of paper)