Badger Overview

Learn about simple machines and how they work together as you build your own heavy-lifting crane. When you’ve earned this badge, you’ll know how to build and test a crane and understand simple and compound machines.

**Badge Components**

1. **Explore simple and compound machines**
   Watch these 2 videos to learn a little bit more about simple and compound machines.

2. **Design and build a crane**
   Design your crane—engineers create a plan before starting to build anything.
   - Use this Crane Design Plan to pull your ideas together into a plan for your crane. The four basic parts you need to include in your crane are:
     - The Pulley: This is a wheel with a groove in it that holds a rope or cable.
     - The Drum: The rope or cable is attached to the drum so when it is turned the object is pulled up.
     - The Boom: This is the long solid arm that is used to support the pulley and move objects.
     - The Counterweights: The crane’s counterweights are near the cab’s exterior—they prevent the crane from becoming unbalanced when lifting heavy loads.
   
   Make your model crane—there are lots of ways you can do this, just choose one and see how to do it by following the links below:
   - **Cereal Box Crane**
     Materials: Popsicle sticks, Glue, 2 thread spools, Cereal box, Scissors, Pencil, Toothpicks, Thread, Paper clips or Button magnet
   - **Cardboard Crane**
     Materials: Scissors, Cardboard, Paper clips, 2 Rulers, Pencil, String, Tape, and Thread spools
   - **Crane of your design**
     Here are some of the materials you can use: Cardboard box, Paper clips, Paper cup, Pencils (1 sharpened for poking holes in cardboard), Scissors, String, Corrugated cardboard (corrugated cardboard has grooves in the middle, like a cardboard shipping box), Tape, Weights (marbles, pennies, or washers), and a Wooden spool.
   - **Lego Crane**
     Materials: Lego and String

3. **Test your crane**
   Add a bucket or a magnet to the end of the string on your crane and do an experiment to see how many paper clips your crane can pick up.

4. **Analyze and share your results**
   Repeat your experiment at least 2 more times to make sure your results are accurate.
   - Did you have to do any repairs or improvements to your crane?
   - Do you see any areas of weakness?
   - Show someone how your crane works; maybe even let them try it too!

5. **Brainstorm ways to improve your design**
   - What improvements can you make to your crane so it can pick up more paper clips?
   - How can you make it more stable?