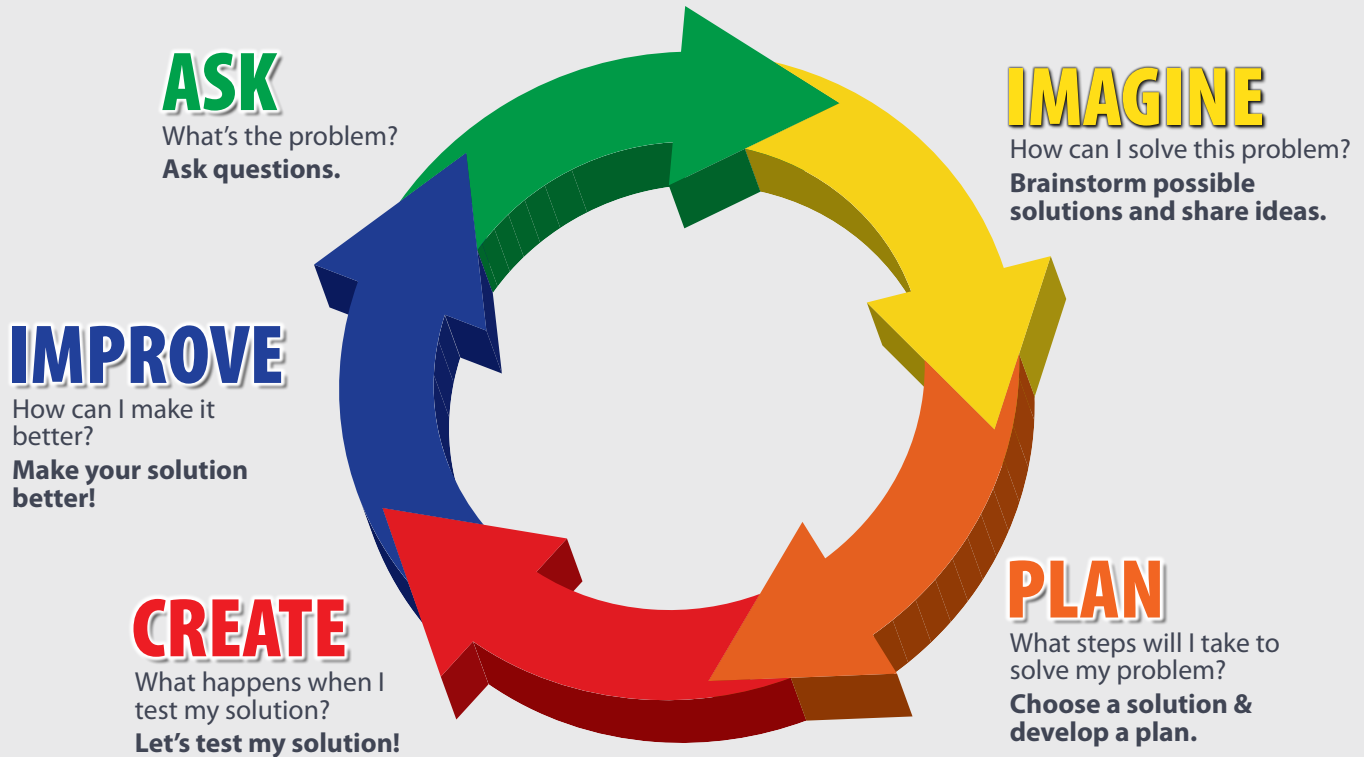


ALL ABOUT INVENTIONS

OK, maybe not *all*, but enough to get us started.

When engineers consider improvements to an existing product (an innovation), they use the engineering design process. It looks like this:



The process goes through several steps that enable engineers to go from an idea to a completed design. Sometimes engineers go around the loop several times as they modify their prototype and test it to see how it works.

You should go through a similar process as you innovate your prototype.



ACTIVITY 1

A MASSIVE EXPERIMENT



What do you get when you combine the technologies of catapults and slings? A trebuchet! Because catapults and slings have their own advantages and disadvantages, some people got together and designed a machine that could hurl larger objects over a greater distance. The rest, some say, is history!

DID YOU KNOW?

One kind of trebuchet uses the strength of people pulling the lever arm instead of a counterweight. This is called a traction trebuchet.

Credit: ScienceDaily.com/terms/trebuchet.htm

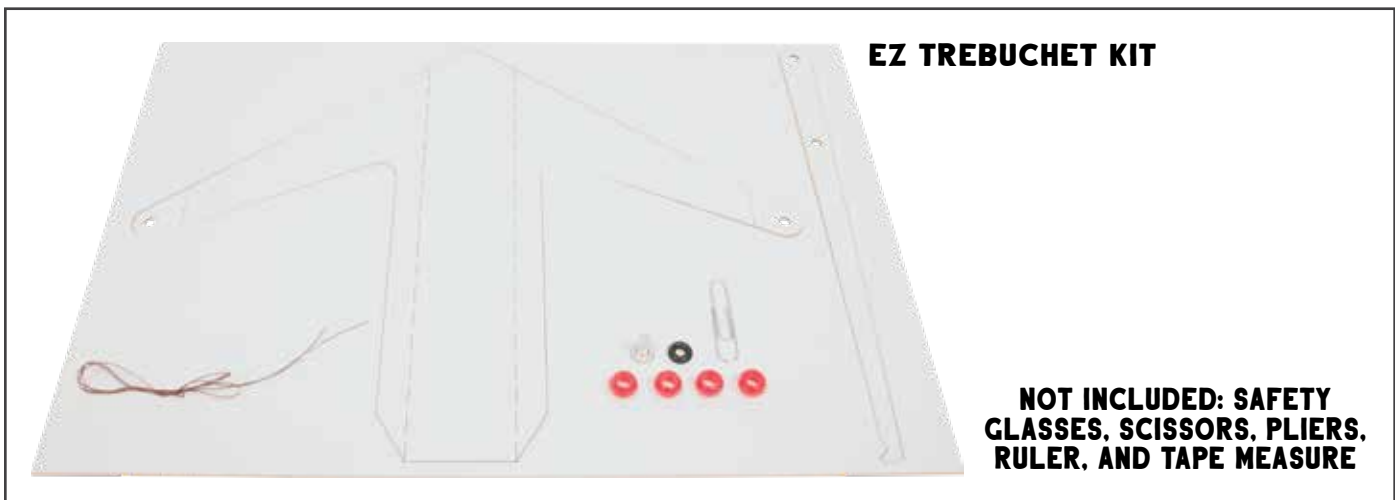
NOTE: A projectile is an object that is moving, usually through the air, by an applied force. In these activities, your bead will be a flying projectile as a result of being launched from the trebuchet.

LET'S MAKE



GATHER YOUR SUPPLIES

So we can, you know, do this thing!



STEP 1

Follow the instructions in the *EZ Trebuchet User Guide* to construct your trebuchet. Prepare only one bead with a 5" string at this time (you will use the others in another activity). When the trebuchet and stringed bead is ready, you are ready to begin this activity.



STEP 2

Practice launching the bead with five washers a few times until you get consistent distances. To fire the trebuchet, hook the loop in the string onto the end of the trebuchet arm and pull the arm down. When you're ready to launch, release the projectile and watch it fly!

NOTE: Make sure everyone in the launching area is wearing eye protection when you're launching projectiles!

STEP 3

When you have the projectile landing close to the same location, measure and record the distance it traveled in the following table.

Number of Washers	Distance Traveled (ft or m)
5	
10	
15	

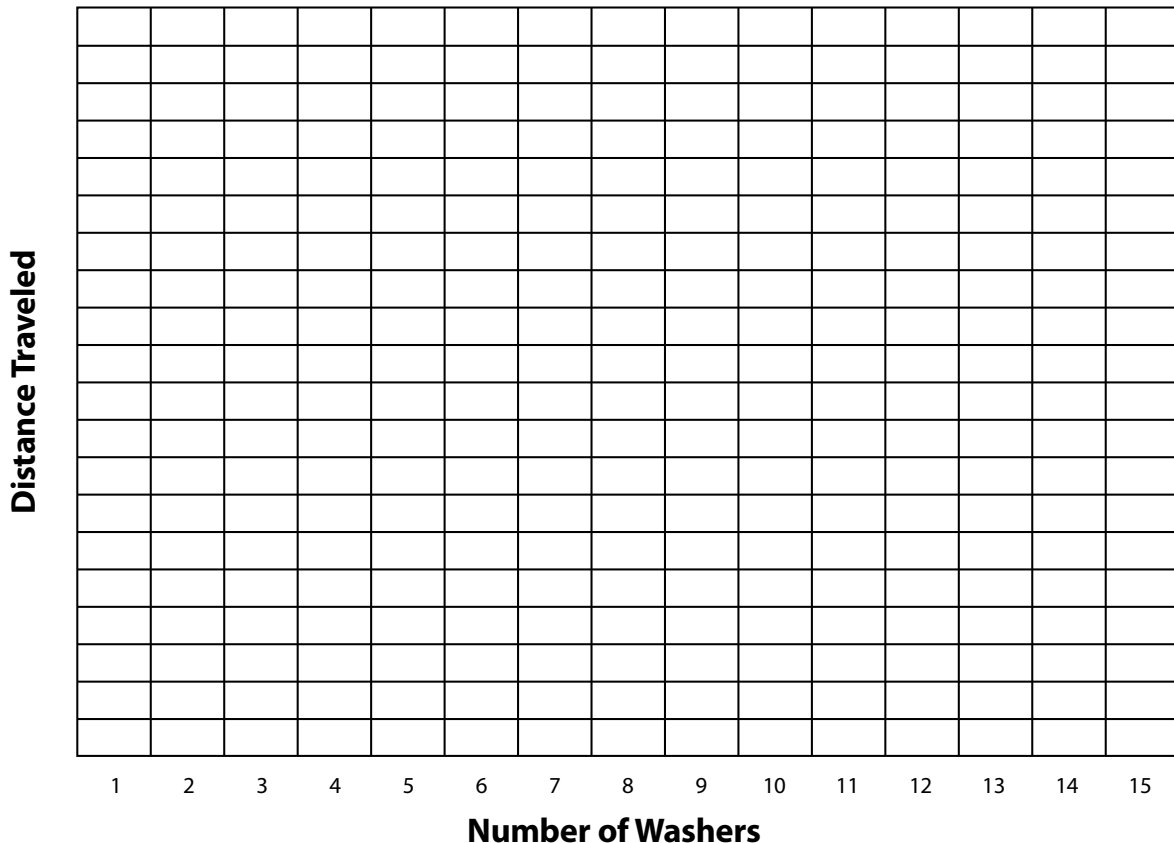


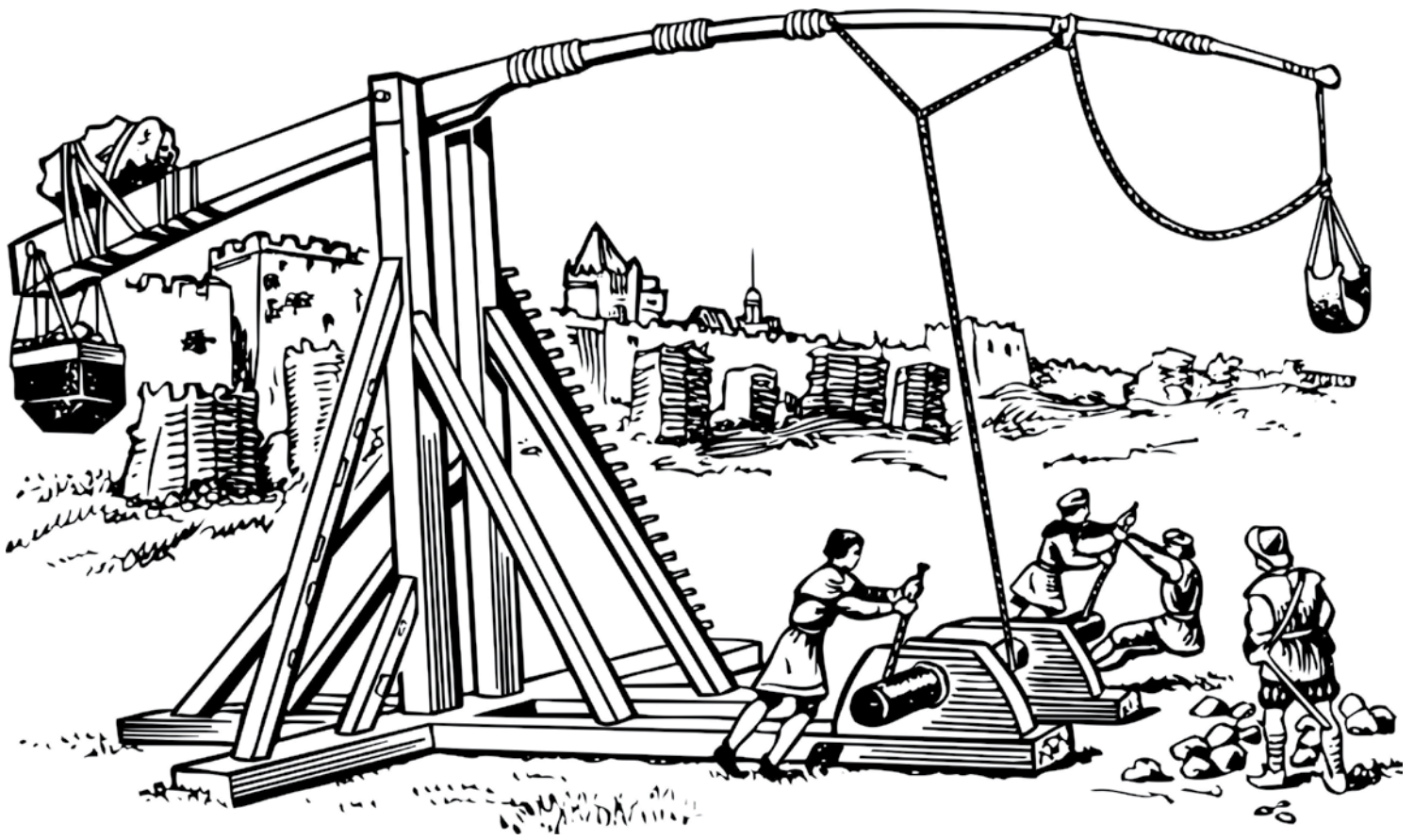
STEP 4

Repeat the previous steps using 10 and 15 washers.

STEP 5

Graph your data here. Connect the points starting from the origin through 15 washers. Make sure to choose a scale for your y-axis and identify the units of length!





STEP 6

Use your graph to predict the distance the projectile would travel with three, eight, and 12 washers.

STEP 7

Launch the projectile with three, eight, and 12 washers. Compare the actual distances traveled to each of your predictions.

THINK ABOUT IT

ASK THE QUESTION

Because understanding the why is important.

How close were your predictions to the actual distance the projectile traveled?

How helpful was your graph in making your predictions?

Most innovations are created for improvement. What improvement could be made to the trebuchet to make it more consistent?