

# Monster Attack!

Grade: 4-8

Time: 1 hr

## Activity Overview :

In this activity you will build your own catapult to save us from all of the monsters. The objective is to knock over a bunch of dominos (monsters) by launching a container that opens on impact to release marbles. The goal is to knock down as many dominos as possible in one shot! Through this creation you will learn about the engineering cycle, potential energy, forces, and momentum. Here is some inspiration <https://bit.ly/3au7XXr>.

## Materials:

- scissors
- 8 thick popsicle sticks
- cardboard
- cardstock
- marbles
- pencil
- rubber bands
- dominos (or any other non breakable objects that are light and fall over easily, for example toy soldiers)
- 1 paper cup
- tape
- 1 plastic
- spoon

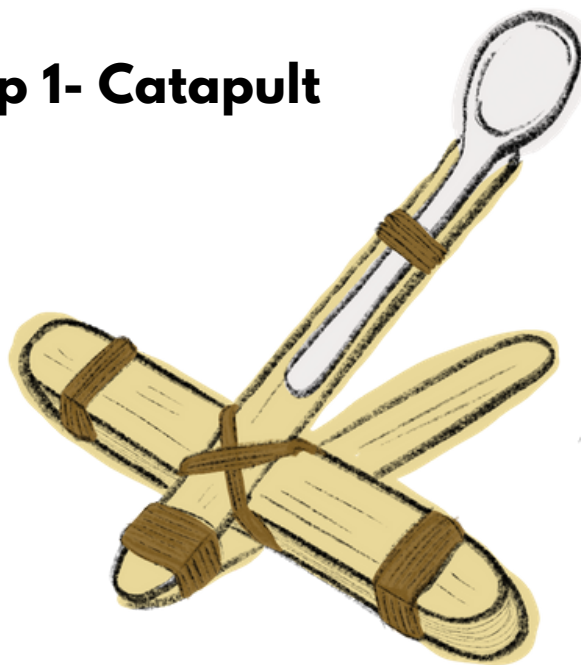


**Don't worry if you don't have all these supplies. Experiment with other everyday items and see what you can build!**

## Activity (Catapult):

- 1** There has been a monster outbreak! Your job is to create a catapult to take out the monsters. Your catapult must have a container that releases marbles on impact. The goal is to take down as many "monsters" (dominos) as possible in one shot. Steps to completing this activity include:
- 2** Brainstorm the project by answering the following questions: How can I use elastics to launch something? What makes a good catapult? What can I do to make more dominos fall? What problem am I solving? What makes a good engineer? What kind of thinking process do engineers use to solve problems?
- 3** Take 6 thick popsicle sticks and put them on top of one another. Attach the popsicle sticks using a rubber band on both ends.
- 4** Take the 6 popsicle stick stack and put it in between the 2 popsicle stick stack and push it in as far as possible. The 6 popsicle stick stack should be perpendicular to the 2 popsicle stick stack. One popsicle stick should now be elevated off the ground.
- 5** Attach a plastic spoon to the elevated popsicle stick using an elastic band, ensuring the spoon is facing up.

### Step 1- Catapult



## Activity (Container):

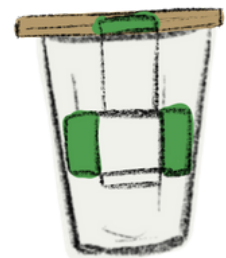
### Step 1 & 2



### Step 3



### Step 4- 8



### Step 4- 8

**1**

These are the steps to make the container which will release marbles upon impact. You can follow these steps or make your own! Take a paper cup and make sure the height of the cup is about 3cm. If it is too tall, cut off the excess.

**2**

Take a piece of cardboard and cut it to a square shape that can cover the top of the paper cup.

**3**

Tape down one side of the cardboard square to the cup. The cardboard square should now be able to open and close.

**4**

Now we will make the tab that will keep the container closed until it hits the ground. To do so, cut a 7cm length x 3cm width rectangle out of cardstock. Place it on the side of the paper cup, in front of where the cardboard flap opens. The position of the rectangle should be relatively close to the top of the cup.

**5**

Tape down the left and right sides of the 7cm length x 3cm rectangle to the paper cup, leaving an opening on the top and bottom of the rectangle.

**6**

Cut out another rectangle out of cardstock, ensuring that the width of it fits snugly inside the opening of the tab, and the length is long enough to stretch from the top of the cup to the inside the tab.

**7**

Tape the second rectangle to the top of lid, again making sure the other end of it reaches and fits inside the tab on the side of the cup.

**8**

Place 2 marbles inside the container and close the container with the tabs made.

## Test your catapult and container:

1

Put the container on top of the scoop of the spoon. Pull the spoon back and let go. Does it launch the container? Does the container open up when it hits the ground? If not, make necessary changes (less marbles for example).

2

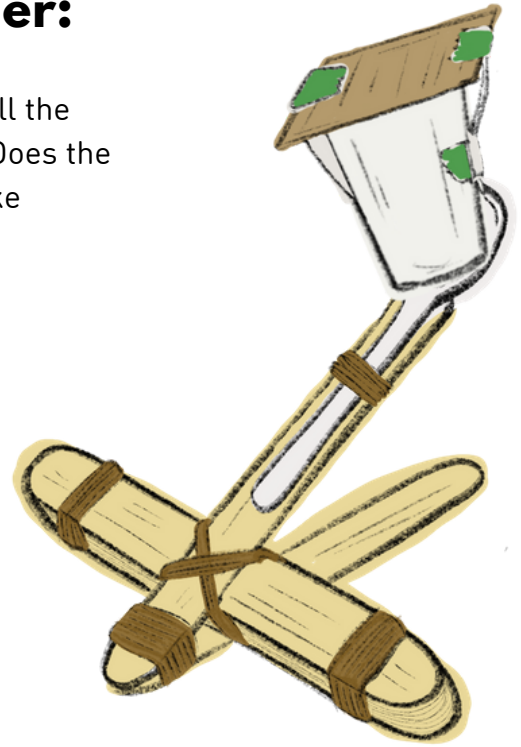
Let's get our monsters set up Place your dominos spread out so that one will not easily knock over the other. These are your monsters ready for battle. The distance from the catapult to the dominos should be based on how far the catapult shot in the testing stages.

3

Attack! (if there are more than one of you creating a catapult see who can knock down the most dominos, reset after each time) Shoot your catapult once at the monsters.

4

Did you get all the monsters in one shot? If not, try and build a new catapult/container or adapt the one you built. You could also put out less dominos If so, try one of our extensions.



## Engineering and Science Connections

Through this activity, you've had the chance to learn all about the [engineering cycle](#) as you understand the problem, design a solution, make it and test it. You then adapted the catapult as needed to answer the problem given. This follows the engineering cycle that engineers follow when constructing something to solve a problem. Engineers start by understanding the problem, designing a solution, building a model and testing. They then restart the process to improve their design.

While building the catapult you also learned how to use [potential energy](#) by using an elastic to propel your projectile. This movement stores elastic potential energy in the deformation of the rubber and is released when it is launched. The energy that was stored in the elastic is transferred to the projectile.

You also learned about momentum which is a quantity of a moving object defined by mass times velocity. As the projectile knocks over the dominos you will see that momentum is conserved. You will learn that momentum is conserved as the velocity of the projectile dictates the speed the dominos fly when they are hit. The larger the velocity of the projectile the larger the velocity of the dominos when they are hit.

### Extensions:

- Design and build your own catapult/container if you did not the first time
- Move the dominos farther away and see if you can still hit them
- Move the dominos to a raised height like a small table and try to hit it
- Design a different catapult with different supplies
- Design your catapult to always hit the same spot every time with minimal errors

**Share your creations!**



Don't forget to share your experiments and creations with us! We would love to see what you've made. You can Email us at: [esqinfo@uwaterloo.ca](mailto:esqinfo@uwaterloo.ca) or send us a message/tag us on our social media!

**Facebook:** @uwengoutreach

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**Thanks for exploring, discovering, and learning with us!**

# 3, 2, 1 Done!

**3 - Write or draw 3 things you learned from this activity**

**2 - Write or draw 2 things you found super interesting or cool and want to learn more about**

**1 - Do you have any questions about the activity? Did something make you wonder...what if? how? or why?**