



FOR YOUTH DEVELOPMENT[®]
FOR HEALTHY LIVING
FOR SOCIAL RESPONSIBILITY

STORM THE CASTLE

GRADE LEVEL: K-6

OBJECTIVES:

- To increase understanding of simple machines
- To increase ability to generate creative solutions to problems
- To increase ability to make sound judgments and conclusions
- To familiarize youth with the design process

TIME: 60 minutes

MATERIALS:

- Craft/Popsicle Sticks – 10 per youth
- Strong Rubber Bands – 4 per youth
- Plastic Spoon – 1 per youth
- Soda/water bottle lid – 1 per youth
- String – 6 inches per youth
- Brown paper lunch bags – 1 per youth
- Tape
- Glue
- 1 6-ft long piece of 2x4 (lever arms)
- 1 4-inch long piece of 2x4 (lever fulcrum)
- 5 8½ x 11 targets (attached)

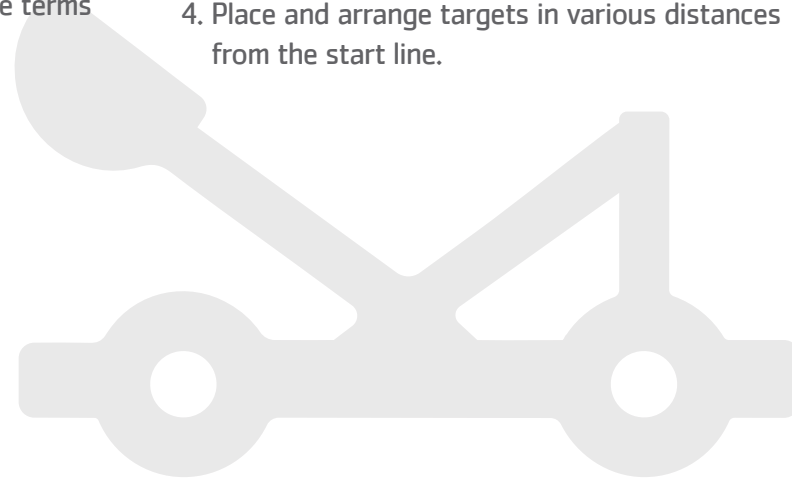
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IMPLEMENTATION NOTES:

- This activity is designed to enhance youth's ability to design and redesign, and to solve problems and face challenges. Youth will have to alter their designs in order to solve different problems.
- At the end of this activity, youth should have a foundational understanding of the lever simple machine and how it works. Youth will become familiar with the terms lever, fulcrum, load and effort.

PREPARATION (before the session):

1. Separate materials into pre-packaged bundles for each youth. This allows easy distribution and sorting of materials.
2. Place a paper bag at each youth at their workstation or under their chair.
3. Tape a starting line long enough for every youth to have a space somewhere in the room.
4. Place and arrange targets in various distances from the start line.



At the Y, we believe in a holistic approach to youth development so that all children reach their full potential and become competent and healthy adults. **Find more activities at yexchange.org/STEM**

PROCEDURE:



1. ENGAGE AND CONNECT

 2 MINUTES

Ask:

- Who has ever used a see-saw or teeter-totter? Who can describe what happens when you're on that toy on the playground? Allow youth to answer questions, and draw a diagram of a teeter-totter on a large piece of paper or white board that is visible to all.
- Today we will be talking about **levers**. A common type of lever is a see-saw! After we talk about levers, I'm sure you'll be able to identify many more levers we see every day!



2. INTRODUCTION AND SET UP

 8 MINUTES

Communicate the following:

- Simple machines are used every day to help us get work done faster and easier. From looking at the teeter-totter, can anyone already think of some other levers we see in our day-to-day life? (ex: wheelbarrows, pliers, crowbars, fishing rods, baseball bats, and our arms!)

Demonstrate the following concepts related to levers:

- Place the piece of 4-inch 2x4 and 6-ft 2x4 on the ground in the form of a lever (6-ft piece will be on top of the 4-inch piece, with the extra length of the 6-ft piece creating the arms of the lever). Invite three youth to the front – two in a pair, one separate.



- Tell youth that we will be witnessing what a lever can do. Point out the parts of the lever – the small 4 inch piece in the middle is the fulcrum, the part of the lever in which the arms rest and pivot (move around). The 6 foot piece of 2x4 makes up the lever's arms. The arms of the lever will hold the load, or the object or person we want to move, and the force we use to lift the load is called our effort.
- Have the pair of youth stand on one arm of the lever. Have the single youth stand on the opposite arm. Adjust the fulcrum until the single youth is able to lift the pair of youth just by standing on the arm (the fulcrum will have to move closer to the pair of youth). Have youth return to their seats.

Introduce activity and materials:

- **Youth will create a historic lever – a catapult. A catapult is a lever that is used to project, or throw, materials toward a target. The youth will have a common starting point, and have to create and change their catapult in order to hit as many targets as possible.**
Youth may use some or all of their materials in order to create their catapult. Youth should aim to hit as many targets as possible, but must start from the same spot on the starting line each time.



3. QUESTIONING/REASONING

 30 MINUTES

Have youth begin to create their lever catapults. Inform youth that they can test and design as they go, but an official testing will occur in 15 minutes. Aid in learning by asking the following questions:

- What was the idea behind your design?
- Where on your catapult is your fulcrum?
- Which part of your catapult holds the load?
- How do we apply effort to your catapult?
- How are you going to adjust your catapult to hit different targets?
- What is challenging you?

15 minutes in:

Tell youth to put finishing touches on their design and meet on the starting line. Allow youth time to do an official test of their catapults to see how many targets they can hit with minor adjustments to their catapult. After testing, have youth think of some ways they can redesign their catapult asking the following questions:

- How can you change your catapult to hit more targets?
- What gave you trouble during the test? What can you do to fix it?
- What can you do to increase the success of your catapult?
- What success did you have with your catapult?

Give youth 10 additional minutes to make any changes to their catapult before performing another test.



4. REFLECTION

 10 MINUTES

Solidify learning by discussing the following:

- What were some common design features among all of the catapults?
- What really creative design did you see?
- What do you think engineers years ago needed to think about when making large catapults?
- What additional materials would you have liked to use to create your catapult?
- How many different targets were you able to hit?
- What changes did you make to your design in order to hit the different targets?
- Where in your life might you use this information?