

JUDO-BOTS R-R-RUMBLE! CHALLENGE



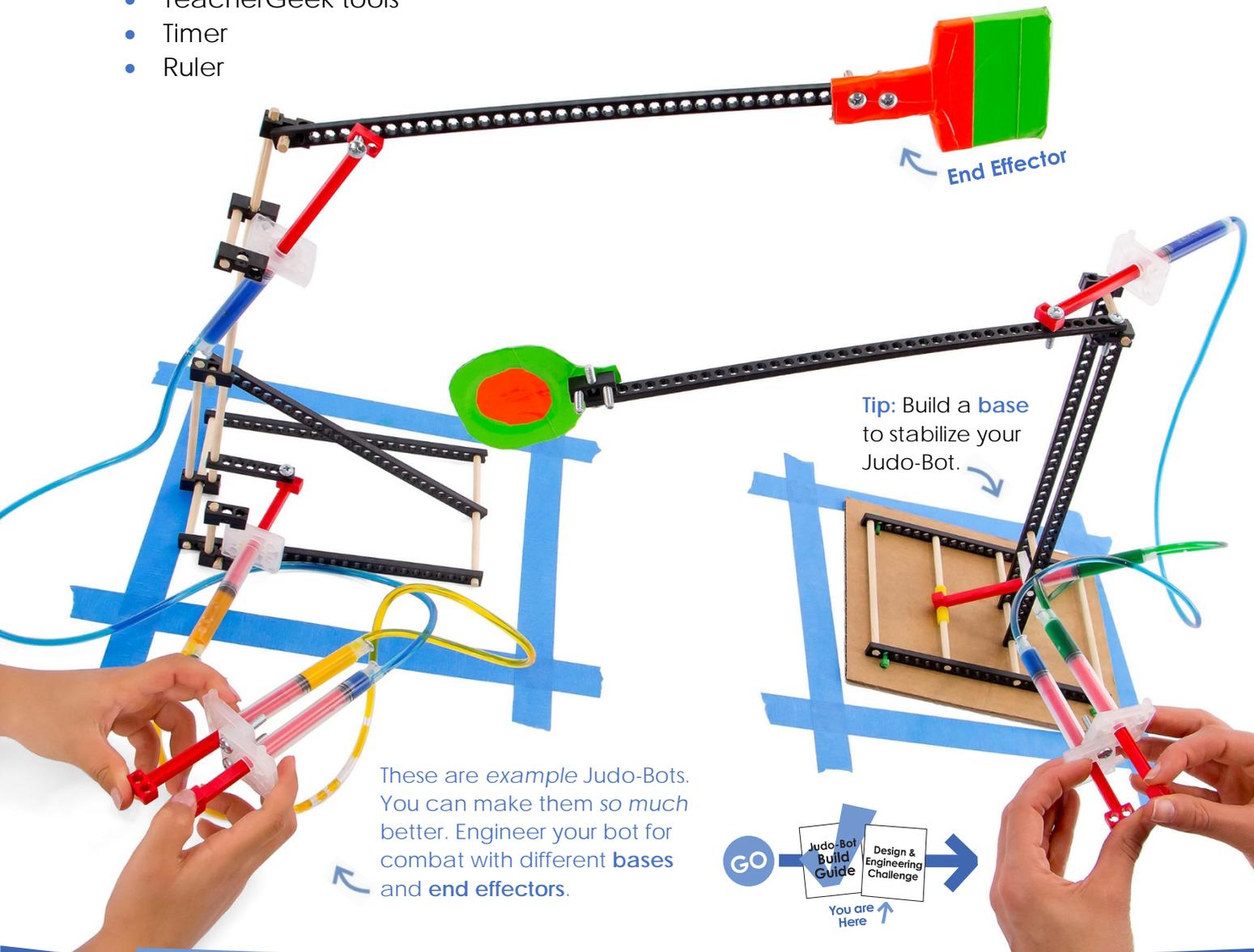
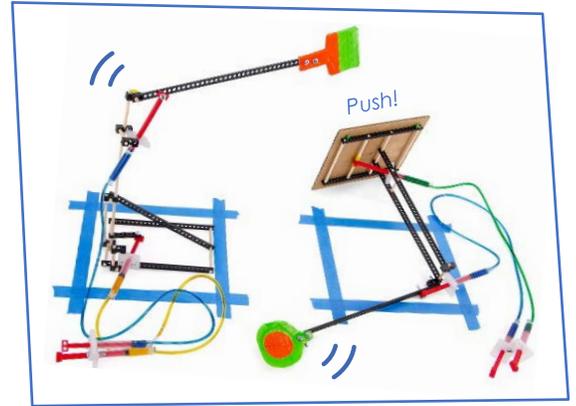
The Challenge: Engineer your Judo-Bot to knock over an opponent or push them out of the arena.

Time Limit: Two-minutes

Difficulty: Easy-Medium

Challenge Supplies

- Two (or more) assembled Judo-Bots
- Extra TeacherGeek components
- Arena materials (tape, chalk)
- Recycled or found materials
- TeacherGeek tools
- Timer
- Ruler

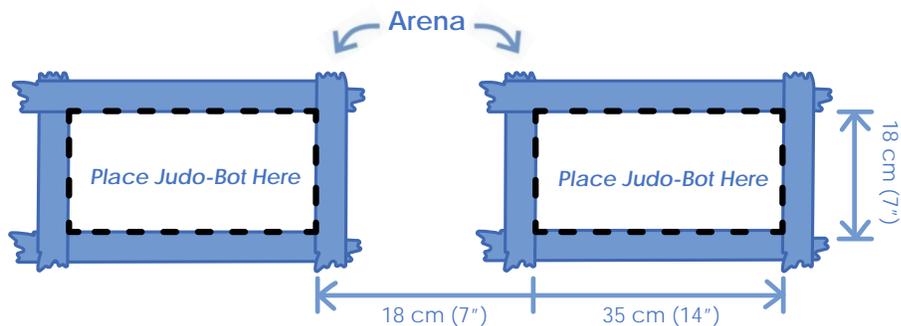


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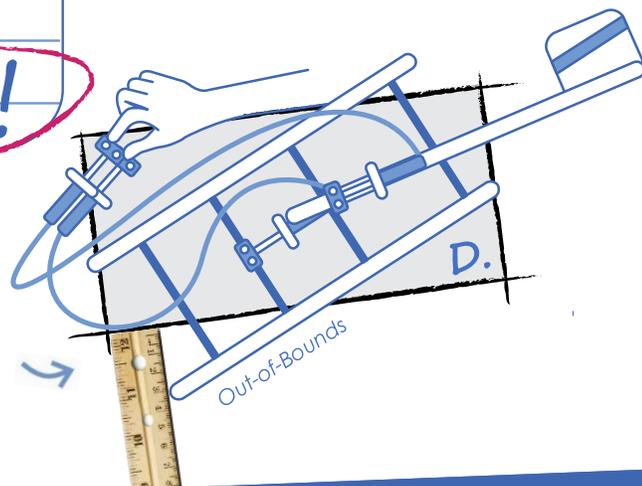
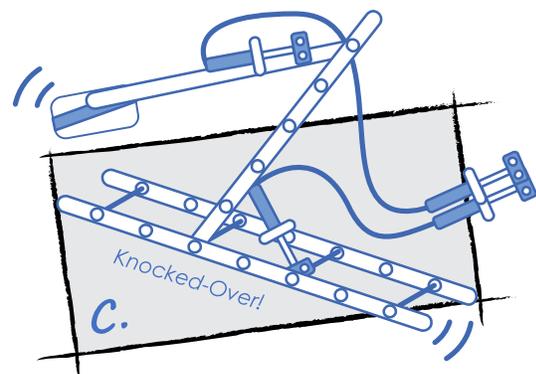
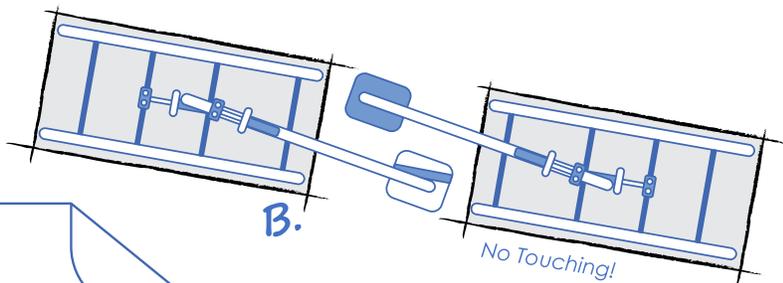
THE ARENA

Judo-Bots need an arena for combat. It consists of two rectangles marked on a flat surface. Use **tape** or **chalk** to outline, as shown.



THE CHALLENGE

Use **hydraulic power** to battle your **Judo-Bots**.



Ready? Get Set!

- | | |
|----|--|
| A. | Place your Judo-Bot inside the arena ,
(no portion of the base should be outside the rectangle). |
| B. | Start with the bot's lever arms <u>not</u> touching, nor extending over the opponent's arena edge. |
| | Go! ⌚ <i>Battle for Two Minutes!</i> ⌚ |
| C. | K.O! Knocking an opponent over is an <i>immediate win!</i> |
| D. | If the opponent's base is outside the arena by the end of two-minutes, they lose on default. |
| E. | Both bots in-bounds and upright by the end of two-minutes? It's a draw! |

?!

Note: If both bots are "out-of-bounds" after two-minutes, measure with a ruler to determine which is further from the arena's edge. **Shortest distance wins!**

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CONSTRAINTS

(rules and limits for your design)

Fail to follow these constraints?
Disqualification!

- Only **hydraulic power** may be used to move and control the Judo-Bot. 
 - Hydraulic lines may not be pushed or pulled to move the bot – just **pistons**.
- The **base** may not be anchored (taped, screwed, bolted) to the arena surface.
- The weight of the Judo-Bot and components may not exceed **250 grams**.
- Additional materials should be brought in for Judo-Bot designs, if they are:
 - TeacherGeek Components
 - Found & Recycling Bin Materials
 - Teacher Approved
 - Non-Hazardous (no sharp edges, harmful chemicals, etc.)
- You will have _____ to complete your design challenge.

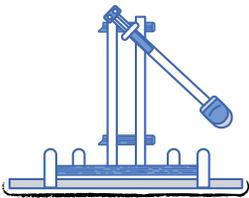
Fill in how much time you have

 The time from building and re-designing your Judo-Bot to the start of the competition.

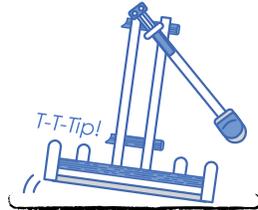
DESIGN YOUR JUDO-BOT

How Will You Stabilize Your Judo-Bot?

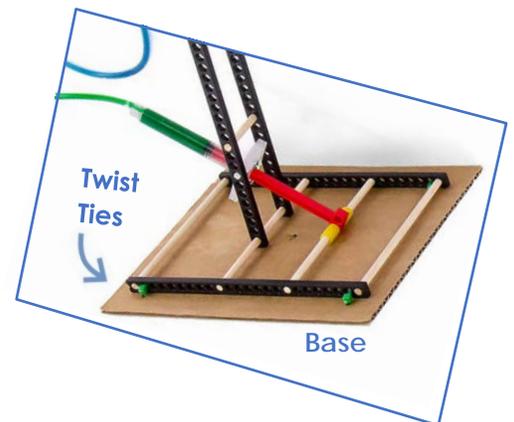
The example Judo-Bot **base** is light and easy to tip-over. Its footprint (dimensions) should not exceed 18 cm x 35 cm. You can design your base to be any size – but consider:



Big bases provide more support, yet are closer to the arena edge.



Small bases are less stable, but further from the arena edge.

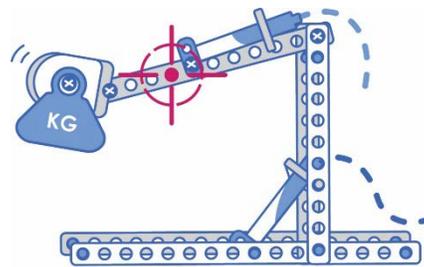


Center of Gravity

The center of gravity is the point where your bot is **equally balanced**.

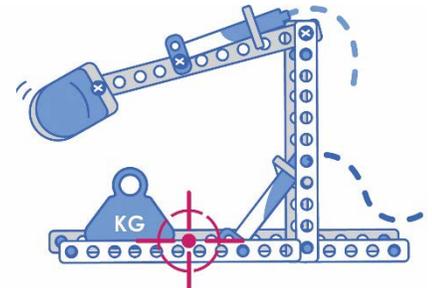
The **maximum weight** of your Judo-Bot should not exceed 250 grams (0.5 lbs).

*Where will you place your weight?
Will you use heavy or light materials for your base and end effector?*



High Center of Gravity

Raising the center of gravity with heavier end effectors makes the bot unstable. A top-heavy arm is great for whacking opponents!



Low Center of Gravity

Lowering the center of gravity by placing more weight on the base makes bots more stable.

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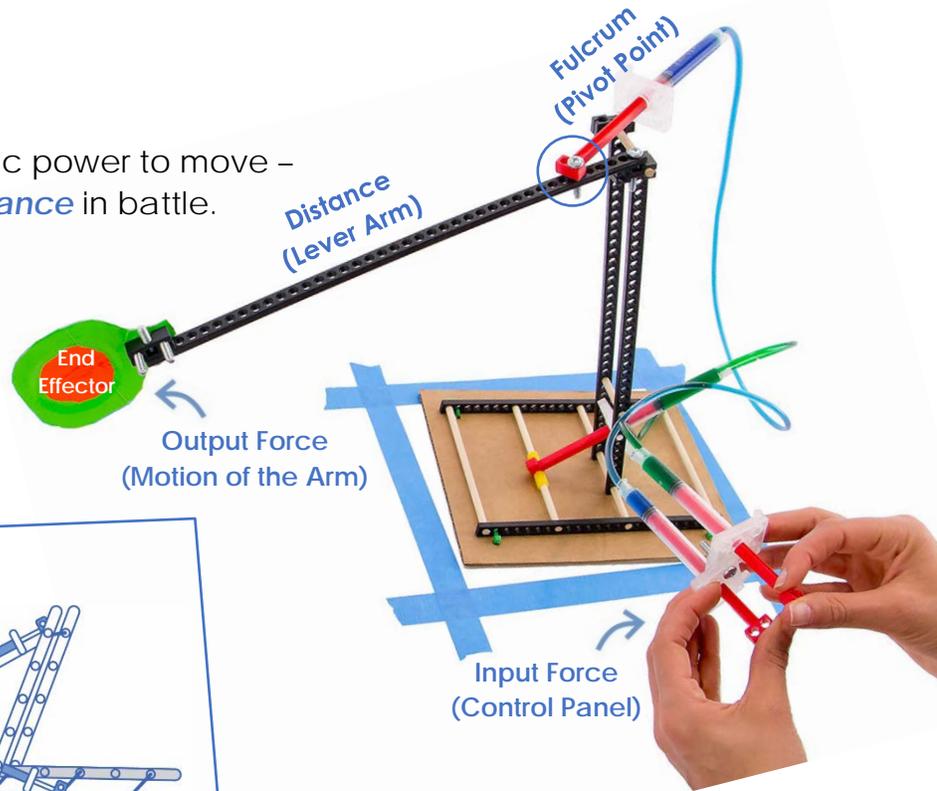


MECHANICAL ADVANTAGE

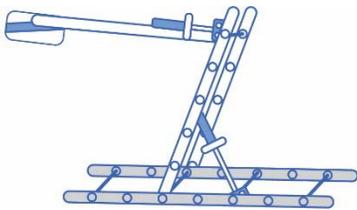
Trading Force for Distance

Your Judo-Bot uses more than hydraulic power to move – **levers** allow you to trade *force* for *distance* in battle.

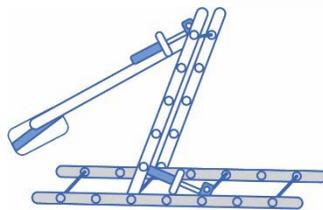
$$\text{Mechanical Advantage} = \frac{\text{Output Force}}{\text{Input Force}}$$



Try It Out!

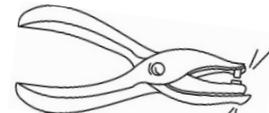


Reposition the base's cylinder as **high** on the upright as possible. Is the effort it takes to move the upright **easy** or **difficult**?



Reposition the base's cylinder as **low** on the upright as possible. Is the effort it takes to move the upright **easy** or **difficult**?

Teachers *initial* here when students are finished:



Use blocks, screws, tape and hole punches to attach your end effectors.

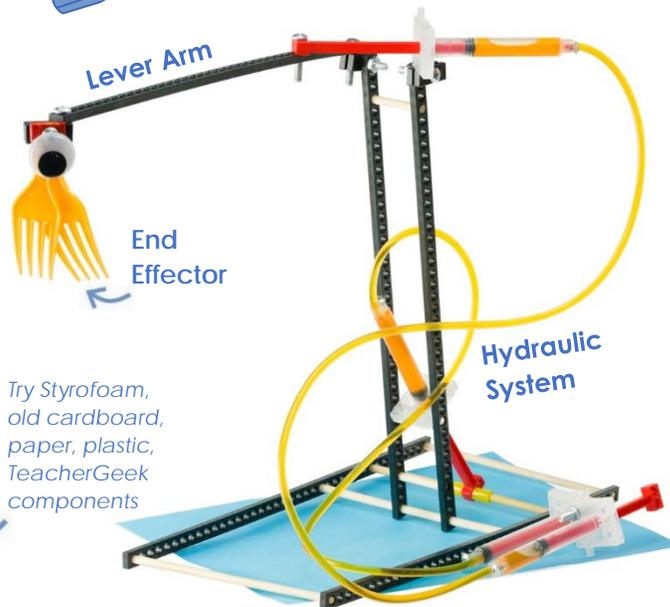


END EFFECTORS

An **end effector** is the device or tool at the end of your lever arm. Its design changes how your Judo-Bot can battle – slapping, pushing, gripping, and swinging. Use found or recycling bin materials.



Try Styrofoam, old cardboard, paper, plastic, TeacherGeek components



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CLASS DATA

Tally your design's wins + losses in the chart below. Record notes for the engineering process.

Judo-Bot Tally Sheet: Points Scored			
Group Names	Win!	Lose!	What happened? [e.g. How did you win or lose? What parts of your design changed? How would you redesign your Judo-Bot for future competition?]



The Engineering Design Process:

You will be using the **Engineering Design Process**. What does that mean? Your design is never finished! It can always be improved. Fill out a new *Engineering Notebook* page each time you design/redesign your **Judo-Bot**.



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Use an elimination tournament bracket for class competition. This bracket can fit sixteen Judo-Bot teams or designs.

TeacherGeek
Intercontinental
Championship Belt.

