



Illinois 4-H | Spark Ideas. Ignite Possibilities.

Learn about engineering and robotics while building machines and robots using common household supplies. No computer is needed! Use the engineering design process to brainstorm, build, test, and improve your fun creations.



Exploring 4-H Junk Drawer Robotics

Spark Activity: Build a Marshmallow Catapult

For this activity you'll need: 9 craft sticks, 5 rubber bands, 1 plastic spoon, and 1 mini marshmallow.

Activity Directions:

1. Stack 7 craft sticks on top of each other and fasten them together tightly with two rubber bands (one on each end).
2. Use 2 more craft sticks and fasten those together with a rubber band at one end, creating a "V-like" shape.
3. Place the craft stick stack from step 1 in between the craft stick "V" from step 2, creating a cross. Adjust the 2 "V" sticks that wrap around the stick stack to be on top of each other.
4. Secure the 2 parts together with a rubber band in the middle where the sticks meet. To do this you'll wrap around one side of the stick stack and the center sticks, then cross over and do the same for the other side of the stack. Keep alternating sides and wrapping until tight.
5. Use a rubber band to attach the plastic spoon to the top stick in the "V". The end of the spoon should just come under the center rubber bands from the previous step and the bowl of the spoon should be just off the surface of the stick, open side facing up.
6. Place a mini-marshmallow into the spoon's bowl. Use one hand to hold the bottom of the catapult down while using one finger from your other hand to gently pull back on the spoon. Release the finger on the spoon to launch the marshmallow in the air.



Download detailed [activity directions with images](#) (pdf) or [watch the instructional video](#) (YouTube).

4-H Project Levels and Goals

Beginner

- Explore the design and function of robotic arms, hands, and grippers
- Build a robotic arm that moves
- Design a marshmallow catapult
- Learn about form, function, pneumatics, 3-dimensional space, and the engineering design process
- Improve scientific skills including observation, data collection, construction, and communication

Intermediate

- Explore robotic movement, power transfer, and locomotion
- Build machines that roll, slide, draw, or move underwater
- Learn about friction, electronic circuits, simple machines, mobile robots, and buoyancy
- Improve scientific skills including prediction, troubleshooting, testing, and reporting

Advanced

- Explore connections between the mechanical and electronic elements of robots
- Build basic circuits
- Learn about sensors and analog and digital systems
- Learn basic programming elements and instructions for robotic computer control
- Design and build your own robot
- Learn designing and sequencing

Put Your Project Into Action

Show Your Skills

- Build a marshmallow catapult or robotic arm
- Engineer an underwater ROV
- Make a “clipmobile” or rover with a gear train
- Draw with a can-can robot
- Design a robot that is controlled by a sensor
- Demonstrate how logic operators work

Service and Leadership

- Make take-home junk drawer activity kits (with directions) and distribute to kids in need
- Lead a robotics or engineering activity at a 4-H club meeting, county workshop, or local library
- Start a community makerspace or regular maker night for local youth
- Apply the engineering design process to improve or streamline an existing service project
- Join a 4-H STEM Ambassador team

Entrepreneurship

- Be a “maker”: use your skills to build, hack, craft, and tinker in order to create fun gadgets, tools, and toys related to your interests, then sell them
- Create a machine that can complete or simplify a common task that kids hate doing
- Sell art made by your machines and robots

Technology Connection

- Combine your prototypes with augmented reality software to simulate real world conditions
- Use free online software to digitally design machines and parts, then 3-D print them
- Visit your local makerspace to learn how to use tools and tech to advance your skills

Connecting with a Mentor

- Connect with makers at your local makerspace
- Find engineers at local firms and research labs, or via engineering societies and associations
- Connect with college engineering clubs
- Find 4-H alums with related experience or careers

Events

- 4-H Bridge Bust Engineering Challenge
- 4-H Engineering Design Challenge (Minnesota)
- National 4-H Youth STEM Summit



Careers Related to Junk Drawer Robotics

Civil Engineer

Electrician

Mechanical Engineer

Computer Scientist

Architect

Systems Analyst

Start a Conversation

What kind of machine that can roll (like a toy car) can you make using items in your recycle bin?

If you could build a machine or robot to perform one task to make your life easier, what would it be and how would the machine work?

What’s the coolest thing you’ve ever built? With your current knowledge, how could you go back and improve on your original design?

Want to learn more?

go.illinois.edu/4Hjunkdrawerrobotics

Explore more at Illinois 4-H!

4-h.extension.illinois.edu



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University of Illinois | U.S. Department of Agriculture | Local Extension Councils Cooperating.
University of Illinois Extension provides equal opportunities in programs and employment.

Credits: National 4-H Junk Drawer Robotics Curriculum & Resources: <https://4-h.org/parents/curriculum/robotics> | Teach Engineering: <https://www.teachengineering.org> | Science Buddies: <https://www.sciencebuddies.org/science-engineering-careers#engineering> | University of Illinois Extension staff that contributed to this resource include Amy Henschen. 4-H Spark Sheets are a collaborative effort of 4-H staff, volunteers, alumni and teens from across Illinois. A big thanks to the many contributors and reviewers!