


4-H Robotics: Engineering for Today and Tomorrow

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4-H Robotics Curriculum


Designed by a team of 4-H professionals, engineers and educators from across the US, 4-H Robotics represents a new perspective toward curriculum.

4-H Robotics introduces youth to:


- basic physical science concepts related to robotic systems,
- the scientific inquiry process,
- the engineering design process,
- technology tools for learning and communications,
- and exploration of SET careers.




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4-H Robotics Curriculum



➤ *Virtual Robotics:* Youth utilize an interactive computer game environment to learn about the science and engineering of robots.




➤ *Junk Drawer Robotics:* Youth make use of everyday objects to design, build and learn about robots.

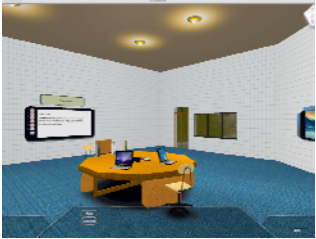


➤ *Robotics Platforms:* Youth employ robotics kits to understand robotics and programming and develop their own robot designs.


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 **Track 1: *Virtual Robotics***


Virtual Robotics is an on-line space for individual learners to experiment with building and programming robots in a virtual environment. The learning experience includes videos, simulations, and animations – all in an interactive virtual environment.




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 **Track 2: *Junk Drawer Robotics***


Junk Drawer Robotics is a youth-led program that guides learners through the design, construction and testing of robots using everyday objects. Learners are able to design and build working robots that really lift, move or float. This track includes a printed leader's guide and student *Robotics Notebook*, along with an optional kit that includes some of the basic components used to construct robots.



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 **Track 3: *Robotics Platforms***

Robotics Platforms is an on-line curriculum which challenges youth to apply the engineering processes of designing, building and programming robots and develop new skills and knowledge. Using a commercial robotic kit such as LEGO MINDSTORMS, VEX, TETRIX or CEENBoT learners will build their skills and knowledge as they learn about robotics and then apply what they have learned in a challenge activity.



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 **Junk Drawer Robotics**



Trunk of Junk




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 **To Learn, To Do, To Make**

**Module 1:
Get Things Rolling**


Overview of Activities in this Module

- To Learn**
 - Activity A – Slip N Slide
 - Activity B – Rolling Along
- To Do**
 - Activity C – Copterlike Design Team
- To Make**
 - Activity D – Copterlike Build Team



Note to Leader
When two people don't seem to get along, we say there is friction between them. What is friction? In up a hill? Sometimes we need to both reduce and increase friction.
Uses of friction in everyday life can be seen when we walk on ice or a car. Have you slipped on spilled water, or on ice? Have you seen a car spin around

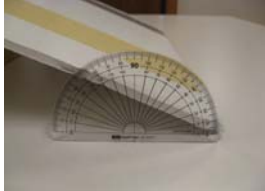
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 **To Learn** **Activity A – Slip N Slide**

Engineering for Today and Tomorrow
Activity Student

To Learn
Activity A – Slip N Slide
This activity has you use a protractor to draw a curved ramp of paper and see how far a ball can roll down it. You'll learn about the angle of the ramp and how it affects the ball's speed. You'll also learn about the force of gravity and how it affects the ball's speed.

Activity	Time	Materials
Preparation	15	100 sheets of paper
Protractor	15	1 protractor
Ball	15	1 ball
Surface 1	15	1 surface
Surface 2	15	1 surface
Surface 3	15	1 surface
Surface 4	15	1 surface
Surface 5	15	1 surface
Surface 6	15	1 surface
Surface 7	15	1 surface
Surface 8	15	1 surface
Surface 9	15	1 surface
Surface 10	15	1 surface




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 **Robots on the Move**
Module 1: Get Things Rolling

Clipmobile Design Objectives

Design a vehicle that will roll easily and meet the customer requirements and constraints.


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 **Robots on the Move**
Module 1: Get Things Rolling

Customer Requirements for Clipmobile

- Design a vehicle that will overcome friction and roll freely down a ramp, and travel a long distance (performance).
- It must be able to hold (carry) a box of paper clips (capacity).
- It must contain at least five different types of parts (complexity).
- But it must use the least total number of all parts (efficiency).
- Cost target is to be no more than \$40.00 of play money, including start-up supplies in inventory bag (budget).

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 **Robots on the Move**
Module 1: Get Things Rolling



Manufacturing Selection Criteria
Criteria to select the team that will be chosen to mass produce the Clipmobile.

Meeting Design Criteria (constraints)

Capacity – carry a box of paper clips: (Yes) 10 points; (No) 0 points _____

Performance – roll down ramp and coast: +1 point per inch – maximum 24 points _____

Complexity – various types of parts used: +2 points for each type of part _____

Efficiency – least overall number of parts: -1 point for each part used _____

Budget/cost – cost of production: +1 point for each dollar under \$35.00 _____
 -2 points for each dollar over \$35.00 _____

Team Business Strength

Capital – dollars left from \$45.00: +1 point for each dollar still in cash _____

Inventory value – value of supplies in inventory: +1 point for each dollar of value _____

Overall Team Score _____

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