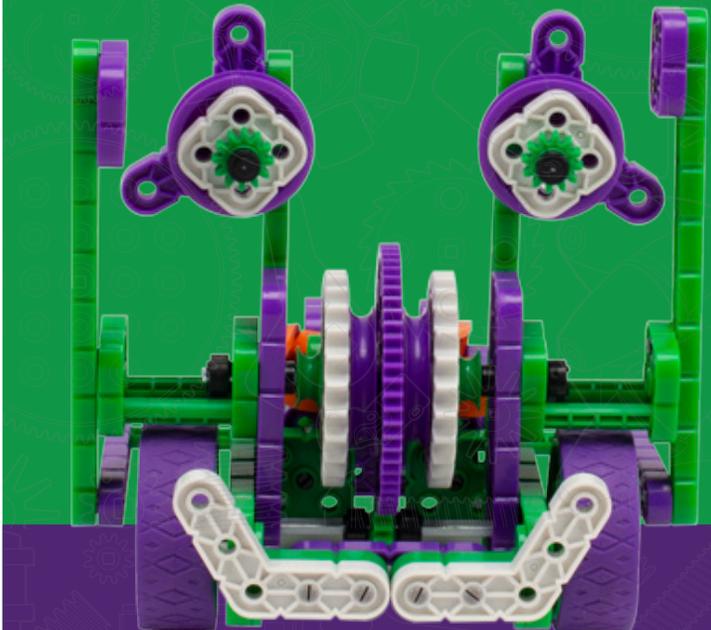


VEX IQ MIA KIT
BUILDING
EXCITEMENT
EXPLORE • LEARN • DEVELOP



DAISY
ROBOTICS BADGE CURRICULUM

$E=mc^2$



Girl
Powered.



EXPLORE • LEARN • DEVELOP

Explore the world of robotics, science, technology, engineering and math with the Robotics Education & Competition Foundation, and put your knowledge to work with these hands-on engaging activities to earn robotics Girl Scouts badges!

Together, through these real-world concepts and activities, the REC Foundation and Girl Scouts want to empower you to reach for your dreams and redefine the face of STEM.



Daisy Robotics Curriculum



Robotics Badge 1: What Robots Do

06 | Learn about robots

07 | Find out what robots can do

08 | Team up to design your own robot



Robotics Badge 2: How Robots Move

10 | Learn about the parts of a robot

12 | Find out how robots move

13 | Make a robot move



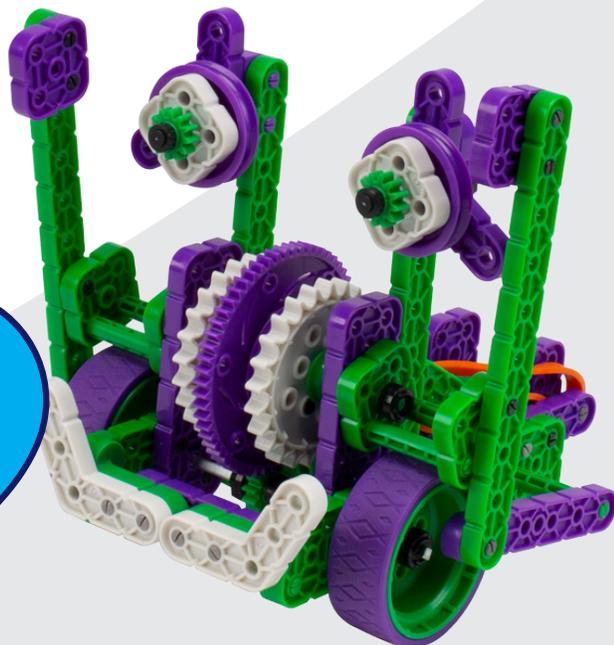
Robotics Badge 3: Design a Robot

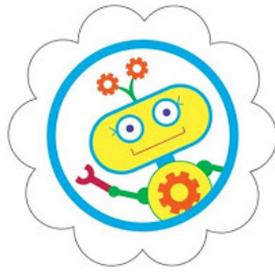
15 | Plan your robot

16 | Create a prototype

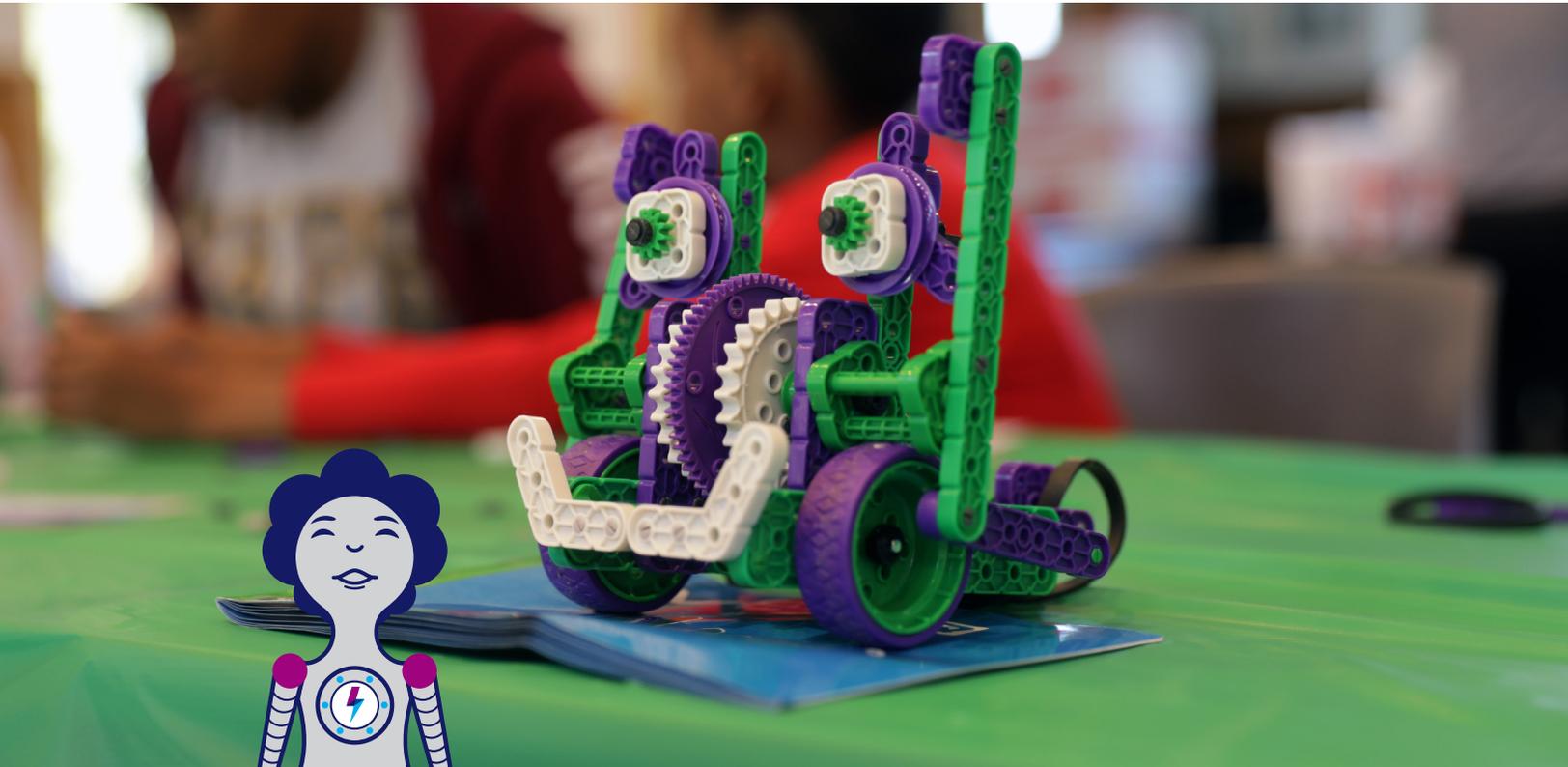
16 | Get feedback on your robot

Conclusion



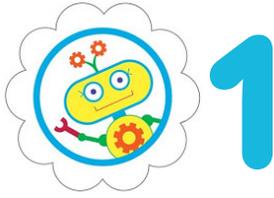


Badge 1 What Robots Do



What is a robot?

A robot is a machine that can move and do things that we, as humans, can't or don't like to do. Robots can be super small and go into small spaces, or they can even go to far away planets and send information back to scientists! With this guide, your girls will learn about what robots do. They will work in teams, like engineers, to design a robot that solves an everyday problem.



Vocabulary

Prototype

When you invent something new, like a robot, you want to try it out or show it to people. To do that, you can create a model of your idea first; this model is called a prototype. A prototype can be a drawing. You can also make a model of your robot idea using cardboard, paper, string, rubber bands or other simple materials. You can show it to people and ask them what they think about your design.

Algorithm

This is a set of step-by-step instructions for how to do something. For example, a recipe is an algorithm. It tells you the steps you need to take to bake a cake or cook some food. When your friend gives you directions to her house, that's an algorithm, too. She's telling you what you need to do to get to where she lives. Robots use algorithms to know what to do.

Parts of a Robot

Brain

The controller is the robot's brain. It's the part of the robot that takes directions from a program.

Body

A robot's body is made of mechanical parts like wheels, gears, motors and grippers. These parts let the robot move or pick up objects.

Coding

Transforming algorithms into a language that computers understand

Program

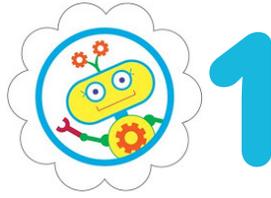
An algorithm that has been coded into a machine or robot to make it run.

Debugging

Sometimes a programmer writes a program for a robot, but the robot doesn't do what it's supposed to do. That means there's something wrong with the program. Programmers say that there's a "bug." When they find and fix the problem, they call it "debugging."

Sensors

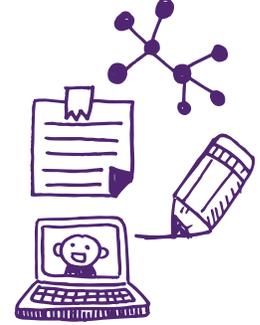
Sensors are devices that help robots take in information from the world around them. Just like we use our eyes, ears or hands to sense things around us, sensors help robots sense things like light, sound, heat and water.



Badge 1 • Step 1: Learn About Robots

ITEMS NEEDED

- Robot or Not Card Game Document (print one copy per pair of girls)
- Paper
- Pencils, Colored Pencils, Markers
- Computer or tablet with Internet connection to watch a video



ASK

What is a robot?

A robot is any machine that can follow instructions to do a job. Some jobs are too boring, dangerous, or impossible for people to do. Robots can help. Robots can do anything from vacuuming the floor to performing delicate eye surgery!

1. What are some robots you know?
2. Do you know any robots from the movies or TV?
3. Where have you seen robots before?

ACTIVITY

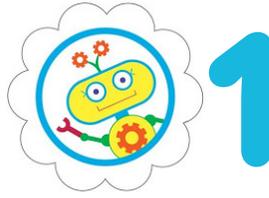
Robot or Not Card Game:

1. Cut out the photos of robots and non-robots (Found on pages 18-19)
2. Have students identify which one is a robot. The student with the highest score wins!

DISCUSS

A robot is a machine that runs automatically and is created by engineers and programmers.

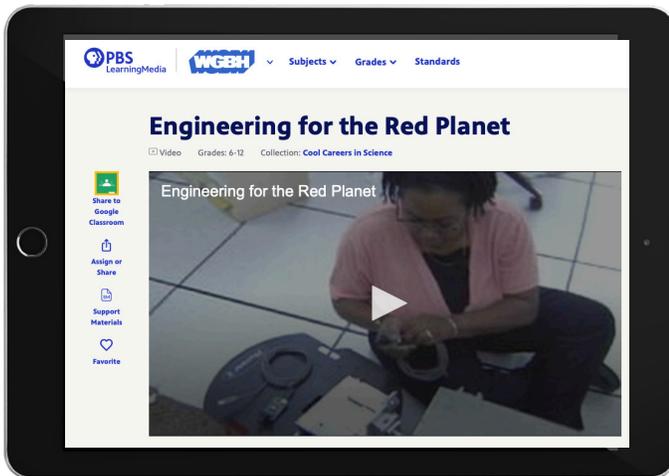
- Which pictures in the games did you think were robots, but were actually not?
- What made them not robots?



Badge 1 • Step 2: Find Out What Robots Can Do

ASK

- What are some things robots can do?
- What do robots look like? What are the main parts of a robot that help it do different things? (Answer: Brain, Body, Sensors)
- If you create a robot, what would you make it do?



ACTIVITY

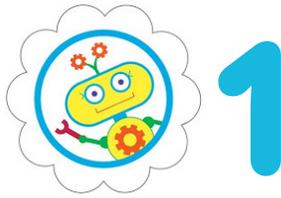
Watch this fun video of a robotics engineer from NASA as she designs robots that go to Mars.

<https://mass.pbslearningmedia.org/resource/eng06.sci.engin.design.ayanna/engineering-for-the-red-planet/#.W09fgzpKhhE>

Sketch a picture of your dream robot and compare it to some robots created by other engineers in your troop! Identify the parts and functions of a robot (such as the head, body, and sensors) and write it beside your sketch.

DISCUSS

Robots can look wildly different. They can be made of plastic, metal, wood, or even paper. They can look like a human or an animal and they can be big or small. However, there are three main parts of a robot, what are they? (Brain, Body, and Sensors.) What did you design your robot to do?



Badge 1 • Step 3: Team Up To Design Your Own Robots

ASK

- What is the first step engineers do when they design a new robot?
(Brainstorm solutions to problems)
- What parts do all robots have to help them complete tasks? (Brain, Body, Sensors)
- What would you want a robot to do?

ACTIVITY

With your troop, brainstorm problems that you see day to day that need to be solved. Once you have identified the problem, brainstorm a robot design to solve this problem. Draw your robot design.

DISCUSS

What are common and complicated problems a robot can solve?

When drawing your robot, what did you add to it to help you solve the problem you chose to solve?





Badge 2

How Do Robots Move



Overview

Robots are simple machines that are programmed to run automatically. Programmers are the engineers that create step-by-step instructions, or algorithms, that tell robots how to move, understand, and act. Think you might be a good robot? See if you can follow your programmer's algorithm. After, become a programmer, and create algorithms for robots and friends.

Vocabulary

Algorithm

A set of step-by-step instructions for how to do something.

Program

An algorithm that has been coded into something that can be run by a machine.

Debugging

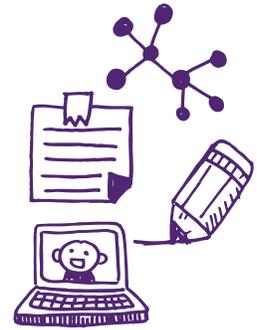
Finding and fixing issues in an algorithm.



Badge 2 • Step 1: Learn About the Parts of a Robot

ITEMS NEEDED

- Computer or tablet with Internet connection to watch a video and play online game (at least one per two girls)
- Colored Pencils, Markers, or Crayons
- Paper
- VEX IQ Mia Kit



ASK

- What are robots? (Robots are simple machines that do what engineers tell them to do with programming)
- How do robots work? (Robots know what to do by the step-by-step instructions, known as algorithms, that engineers give them)
- What are robots made of? (Brain, Body, Sensors and more)
- Who makes a robot? (Engineers, Programmers, and Girl Scouts!)

ACTIVITY

Parts of the Robot

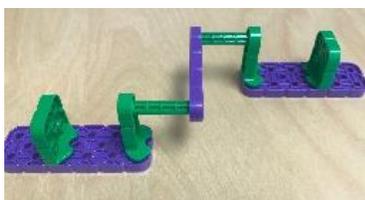
- Explain that Robots are simple machines that do what engineers tell them to do. They are made up of many different parts, each with its own important job to help the robot to work. Some of these parts create the body, like its wheels, wire and sensors. They help robots to understand their worlds.
- Use your VEX IT MIA KIT to explore the different body parts of a robot. See how the pieces could be like parts of our bodies.
- Talk about how robots have wheels that help them move around, just like we have feet. Pulleys and arms help robots to lift and grab things, just like we have hands. Nuts, bolts and screws help to keep different pieces together, just like we have joints.



Activity, Parts of the Robot (continued)

- Some of these parts create the robot's body. Like its wheels, and other parts, like wires help to give the robots directions.
- These parts all work together and trigger one another to make the robot move and act. Robots are very similar to other machines we find in our everyday life. Engineers put together different parts to form the body of the robot.
- Use the VEX IQ MIA KIT parts to build the five machines shown below.

PEDALS



SEESAW



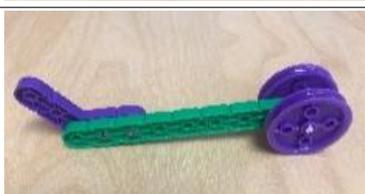
SCISSORS



**SIMPLE
AUTOMOBILE**



**WHEEL-
BARROW**



DISCUSS

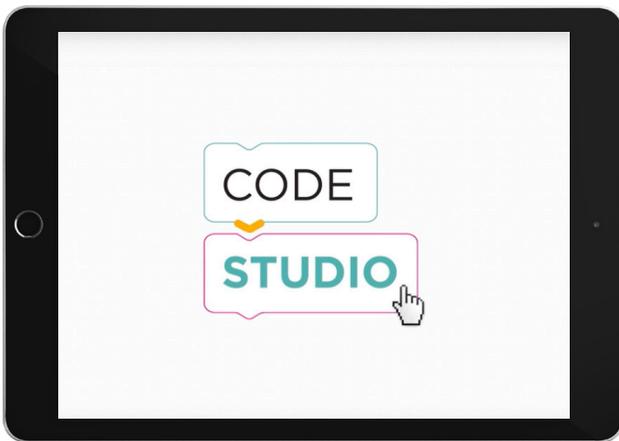
How could the machines that you just built be used in building a robot? (Pedals can be legs, the automobile can be wheels, the seesaw can help the robot bend over, the wheelbarrow can pick things up and carry them, etc.)



Badge 2 • Step 2: Find Out How Robots Move

ASK

- How do robots move? (Robots know how to move by the programs given to them by engineers)
- What is an algorithm? (A set of step-by-step instructions for how to do something)
- What is a bug? (A problem or error in the algorithm)
- What is debugging? (Finding and fixing the problems in an algorithm)



ACTIVITY

In order to make a robot move, programmers must create a list of steps known as an algorithm. Sometimes these algorithms do not work, so programmers have to debug their program before it is finished.

Watch this fun video about debugging!

<https://studio.code.org/s/course2/stage/10/puzzle/1>

Next, have girls pair up. One girl will be the “robot” and her partner will be the “programmer”. The programmer will tell the robot what to do and how to move with an algorithm. Move your robot with verbal instructions based on steps (like: move right, move down, move left, move up, etc.)

The robot cannot do anything unless the programmer gives the instruction. Have girls take turns being the robot and programmer.

DISCUSS

1. Did your robot have problems with your algorithm that you gave it? What are these problems called? (Bugs)
2. How did you fix the problems your robot had? (Debugging)
3. How was it hard to create specific instructions for your robot? (Robots can only do what engineers specifically instruct them to do; robots cannot think for themselves)



Badge 2 • Step 3: Make A Robot Move

ASK

- Can you move like a robot?
- Do you think you can program a robot and make it move?

ACTIVITY 1

Watch this video on Introduction to coding with Angry Birds.

<https://studio.code.org/s/express-2019/stage/2/puzzle/1>



ACTIVITY 2

Try some simple coding with Scrat from Ice Age.

<https://studio.code.org/s/coursea-2019/stage/4/puzzle/1>

DISCUSS

1. Was it easy to get Scrat to the acorn?
2. What trouble did you have?
3. How is this game like programming a robot?



Badge 3

Design A Robot



Overview

Now that you know what robots can do and how they do it, it's time to design your own! Plan and build a prototype of your robot that solves an everyday problem. Don't forget to make a program for your robot, as it will need it for your prototype to "run." After, test and share with your fellow Daisies for ideas on how to make it even better.

Vocabulary

Prototype

A quick way to show an idea to others or to try it out. It can be as simple as a drawing or it can be created with common materials such as cardboard, paper, string, rubber bands, etc.

Algorithm

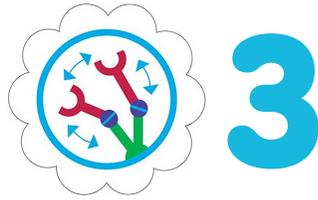
A set of step-by-step instructions for how to do something.

Program

An algorithm that has been coded into something that can be run by a machine.

Debugging

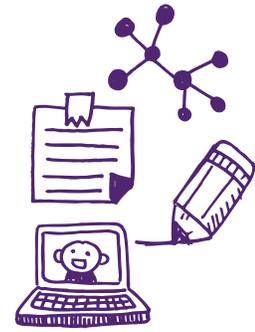
Finding and fixing issues in an algorithm or code.



Badge 3 • Step 1: Plan Your Robot

ITEMS NEEDED

- VEX IQ Mia kit (in-tact from where you left off from Badge 2)
- Paper, Pencils and Markers



ASK

- What problems do you see every day that need to be solved?
- How would you design a robot to solve these problems? If the robot could solve this problem, what would it do? What would the robot look like?
- How would you use the VEX IQ Mia kit pieces to design a robot that solved a problem?

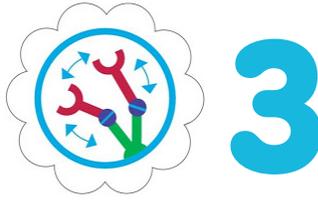
ACTIVITY

Brainstorm and sketch some robots that you could design to fix problems in your life, keeping in mind the shapes and pieces you have in the VEX IQ Mia kit. Pick your favorite design to use for the rest of the badge!

DISCUSS

What robot parts did you incorporate in your design and why? How will this robot function properly? How will it help others in the future?





Badge 3 • Step 2: Create A Prototype

ASK

- What is a prototype? (*a model of your first idea*)
- What is an algorithm? (*a set of step-by-step instructions for how to do something*)
- Can you give an example of an algorithm? (*a recipe, directions to your best friend's house, etc.*)

DISCUSS

Did the materials in the VEX IQ Mia kit function properly to build the prototype that you designed?
Did your robot achieve its purpose? Are the instructions you created easy to understand and follow?

Badge 3 • Step 3: Get Feedback On Your Robot

ASK

- How will you test your prototype?
- Will you be able to adapt and make changes if necessary?

ACTIVITY

Find a partner and test your prototype. Receive feedback on your robot and debug
Change something in your prototype or program - to improve your design.

DISCUSS

Did your prototype work exactly the way you hoped it would the first time? Was your partner's feedback helpful? How did you improve your design using your partner's feedback?



Badge Completion Conclusion

- Did you enjoy the activities?
- How did this project effect your vision for the future?
- Would you be interested in some type of engineer or designing job?



Badge 1 • Step 1: Learn About Robots, Robot or Not: Answer Key: Vacuum–not, Roomba vacuum–robot, Coke machine–robot, Bicycle–not, Toy machine–robot, Refrigerator–not, Stove/oven–not, Mars Rover–robot, Robotic Arm–robot. Ladder–not, Kitchen mixer–not, Telephone–not

ROBOT OR NOT?



ROBOT OR NOT?



