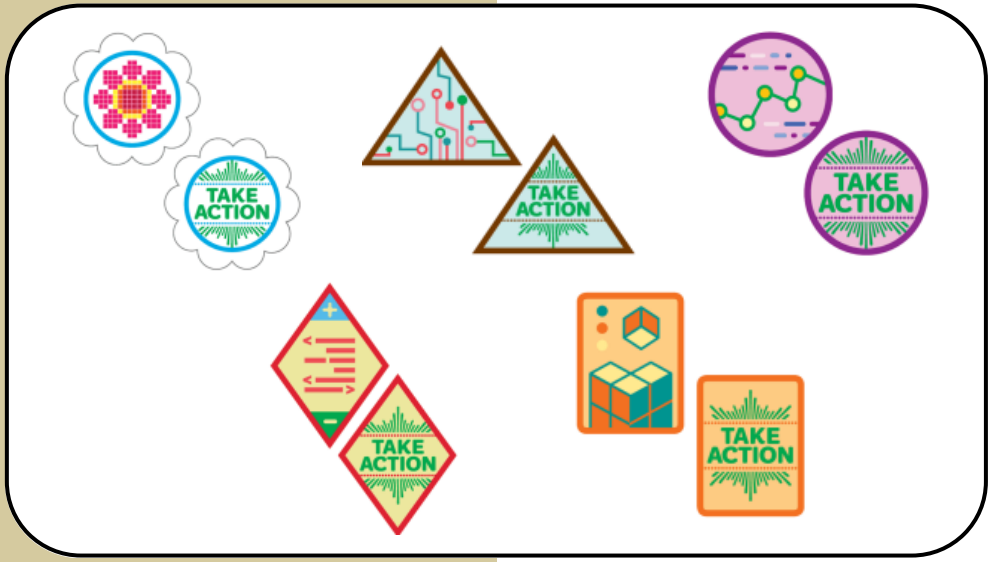
girl scouts of wisconsin badgerland



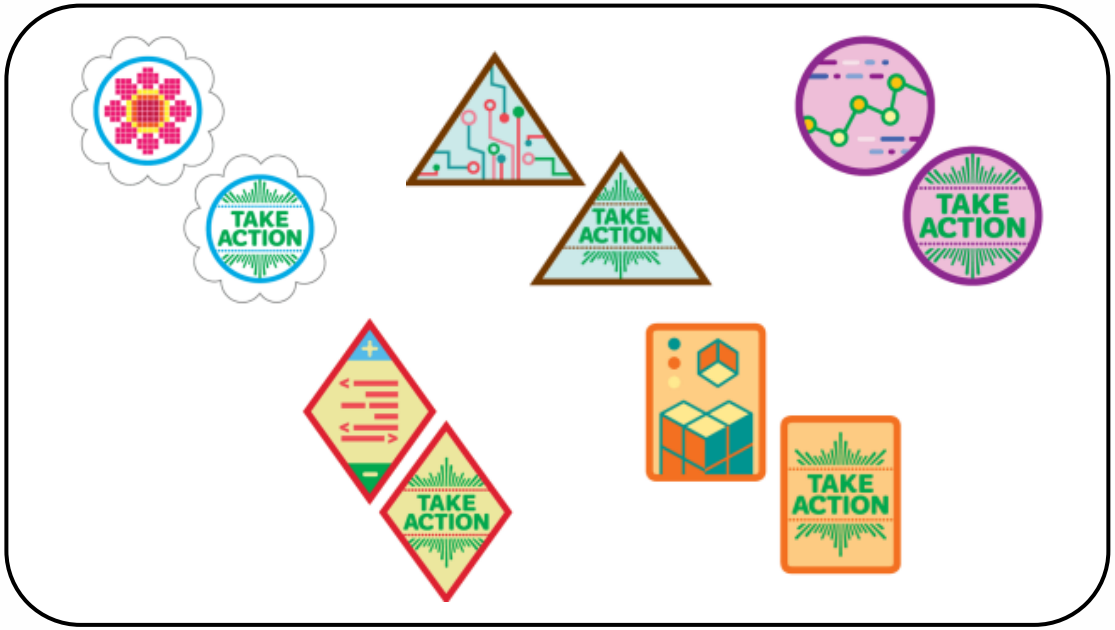
Think Like a Programmer Multi-Level Kit

Full Color For Digital Use:
Pages 51-99

Printable:
Pages 2-50

girl scouts of wisconsin badgerland

Badge In a Box



Think Like a Programmer Multi-Level Kit

How To Use This Kit

Using this Badge in a Box Kit, Girl Scouts will learn about the different parts of computer programming and then complete a take action project using their own skills and talents.

On the following pages you will find the different types of activities and how many of each type of activity your Girl Scouts will need to complete based on their age and level. If you have a mixed group, you can decide if everyone does the higher number of activities or if the younger Girls Scouts will need more time on an activity and the older kids can move on to a different activity.

Each activity comes with a materials list and Girl Scout focused directions. The troop leader or a Girl Scout will read the "Read" and "Think" sections aloud. Give time for everyone to think about the question before sharing as a group. Then, follow the instructions listed under the "Do" section. If you want more detailed instructions for an activity, you can also view the Troop Leader Guide.

A Note About Journeys From GSUSA

Girl Scout Journeys are multi-session experiences in which girls dig deeper into their interests and use the skills they gain along the way to make a difference in their community. While badges show the world you've learned a new skill, Journey awards say, "I found a way to make a difference."

During a Journey, Girl Scouts do hands-on activities, connect with experts, and take the lead on a Take Action project with their community. And once a Junior, Cadette, Senior, or Ambassador completes their Journey, they're ready to drive lasting change in their communities by going for their Bronze, Silver, or Gold Award.

Badge Requirements for Each Level

5+ Activities Total

Required:
- Rapid Prototyping
- Contribute to a Take Action Project

Choose:
- 2 Algorithm Activities
- at least one other activity

6+ Activities Total

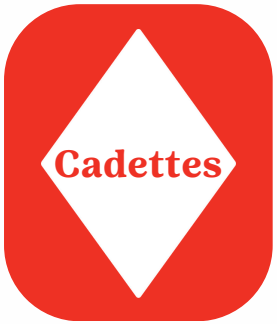
Required:
- Rapid Prototyping
- If-Then Logic
- Contribute to a Take Action Project

Choose:
- 2 Algorithm Activities
- 1 Data Representation Activity
- 1 Function Activity

8+ Activities Total

Required:
- Rapid Prototyping
- If-Then Logic
- Variables
- What is a Computer
- Contribute to a Take Action Project

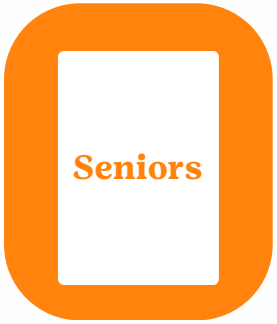
Choose:
- 1 Algorithm Activities
- 1 Data Representation Activity
- 1 Function Activity



9+ Activities Total

Required:
- Rapid Prototyping
- What is a Computer
- User Centered Design
- Sorting
- Contribute to a Take Action Project

Choose:
- 1 Algorithm Activity
- 1 Data Representation Activity
- 1 Function Activity
- 1 other activity, If-Then Logic is Recommended



9+ Activities Total

Required:
- Rapid Prototyping
- Sorting
- Contribute to a Take Action Project

Choose:
- 1 Algorithm Activity
- 1 Data Representation Activity
- 1 Function Activity
- At least 3 other activities

Types of Activities in this Kit

Rapid Prototyping
- Rapid Prototyping

Algorithms
- Troop Handshake
- Let's go code
- Back2Back Drawings
- Walk the Line
- Tangrams

Representing Data
- Morse Code Bracelets
- Morse Code Treasure Hunt
- Learn about Binary Numbers
- Binary Birthday Bracelets
- Animal Alphabet

If-Then Logic
- If-Then-Else Game

Functions
- Functional Pattern Challenge
- Add a Function to the Troop Handshake or other Algorithm activities
- Function Simon Says

Contribute to a Take Action Project
- Daisies
- Brownies and Juniors
- Cadettes and older

Debugging
- Found in all Algorithm activities
- Puzzles

Variables
- Mad Glibs

What is a Computer
- What is a computer

User Interface
- User Centered Design

Sorting
- Card Sorting

Items you will need to supply if you do all the activities:

Basic Office/Craft Supplies:

Scotch Tape
Painters tape or masking tape
post it notes or paper with tape
Scissors
Paper
Pencils
Markers

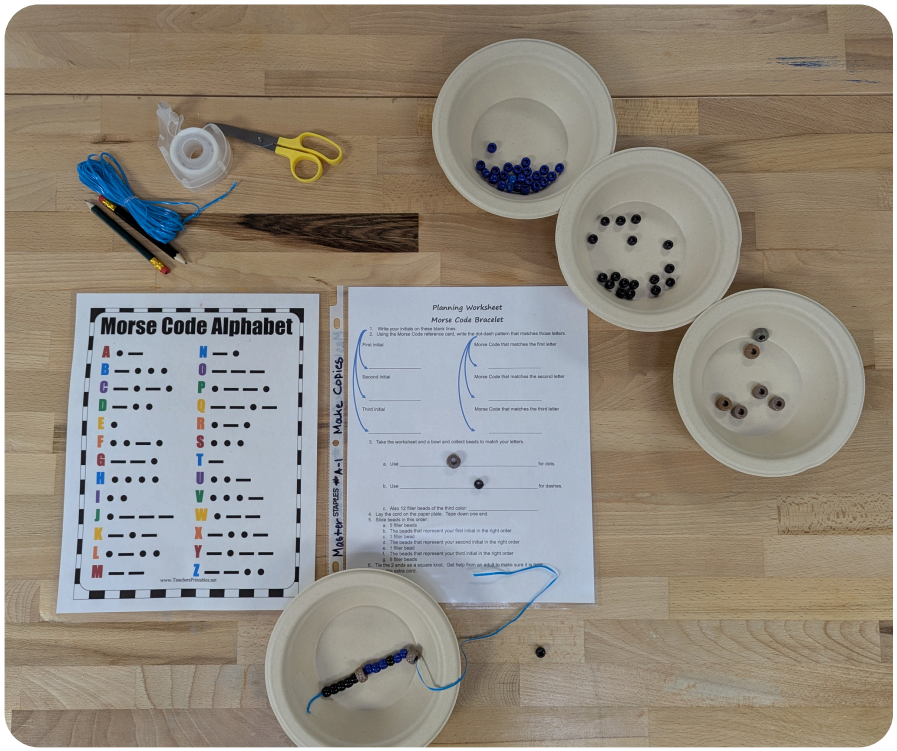
Supplies you might need to purchase:

- String/elastic (1mm elastic works well)
- At least 3 colors of beads and at least 2 shapes
  - Useful shapes for the activities would be barrel beads and hearts in addition to regular pony bead
  - You will need a special bead or charm for each girl for one of the activities
  - You may want 1 lobster clip or jump ring per girl
- Bowls or containers for beads or other materials
- A treasure for the treasure hunt
- Small paper plates or trays for girls to work on
- Copies of planning sheets if you would like
- Clipboard/writing surface such as a book or cardboard
- Poster boards
- Blindfolds
- Mini marshmallows and toothpicks (200-300+ per girl)
- Timers (could use a cell phone timer)

Take it online:

After your Girl Scouts have learned some of the basics, they may want to try out their skills. Here are a few resources you can look at to decide what works best for your troop:

- scratch.mit.edu Free online coding platform for basic coding and creating games
- makecode.adafruit.com Free online coding platform that can be used on its own or with circuit playground expressed
- arcade.makecode.com Free online coding platform for making basic programs and games
- code.org Free online coding games, self paced curriculum, teacher led curriculum, and offline lessons



Morse Code Bracelets

Learn about Morse Code and create a bracelet of your initials using the code.

From the kit:

Activity A-1 and the Morse Code Alphabet Cards

What you need to supply:

- 1 foot of elastic cord per girl (1mm cord is recommended)
- 3 colors of beads: this activity works best if one of the colors is a barrel bead (long and narrow) and the others are regular pony beads
- Copies of the planning worksheets if you would like one per girl
- Containers to hold the beads
- A small plate or tray for a workplace for each girl
- Pencils
- Tape
- Scissors

One “Representing Data” activity is required for:

Brownies | Juniors | Cadettes | Seniors

A-1: Morse Code Bracelets

READ

Morse code was used to send messages over long distances before we had phones or the internet. Each letter can have dots, dashes, or both to represent it. For example, the letter A has a dot followed by a dash. Dots are short and Dashes are long. So we could send 1 short sound and 1 long sound over a radio for the letter A.

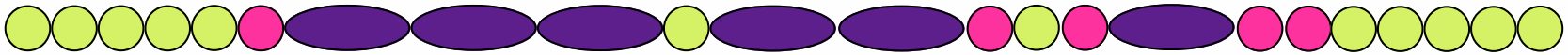
THINK

We can also use a flashlight to send morse code messages. How do you think we would send dots and dashes using a flashlight?

DO

Instead of using sound or light for our codes today, you will create a code using different colored or shaped beads. You will make a bracelet with the initials of your name.

For example, Juliette Gordon Low would be JGL. Her bracelet would look like:



Morse Code (Treasure) Hunt

Learn about Morse Code and use it to decode clues to a scavenger hunt.

From the kit:

Activity A-2 and the Morse Code Alphabet Cards

What you need to supply:

- Pencils
- Copies of the Binary Code fill in the blank worksheet if you would like

Set Up:

- Choose which color of scavenger hunt to do (Green is for early readers, Blue is intermediate, and Purple is advance)
- Place the tents around the room in any order.

One “Representing Data” activity is required for:

Brownies | Juniors | Cadettes | Seniors

A-2: Morse Code (Treasure) Hunt

READ

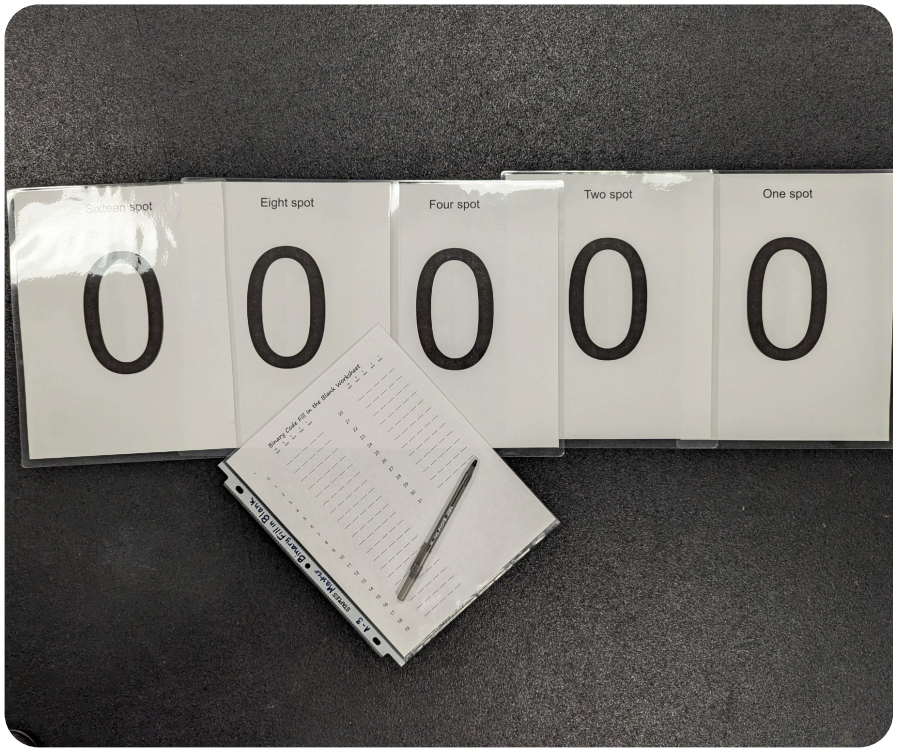
Morse code was used to send messages over long distances before we had phones or the internet. Each letter can have dots, dashes, or both to represent it. For example, the letter A has a dot followed by a dash. Dots are short and Dashes are long. So we could send 1 short sound and 1 long sound over a radio for the letter A.

THINK

We can also use a flashlight to send morse code messages. How do you think we would send dots and dashes using a flashlight?

DO

Your team will follow clues that are written in morse code. You will need to solve each clue to figure out where to go next. Your team will start by picking a color of clues to follow. Go to the Starting Clue (Dog, Horse, or Giraffe). Solve the code, put the clue back in the pocket and go to your next clue. Follow your color of clues until you reach the end!



Learn about binary numbers

Learn about binary numbers.

From the kit:

Activity A-3

What you need to supply:

- Pencils
- Paper
- Clipboard or something to write on
- Optional Treasure such as stickers, trinkets, a treat, etc

Set Up:

- Lay out the laminated cards with zeros facing up. 16 spot should be on your left, followed by 8, 4, 2, and 1.

One “Representing Data” activity is required for:

Brownies | Juniors | Cadettes | Seniors

A-3: Learn about Binary Numbers

READ

Binary Numbers are a code that computers use. The Binary Number system only has zeros and ones--it doesn't have 2, 3, 4, 5, 6, 7, 8, or 9!

In our regular counting system, which is based on ten numbers, we have a ones spot, 10s spot, 100s spots, etc. We add up each of the spots to get our total number.

THINK

In our regular counting system, if we have 9 hundreds, 8 tens and 7 ones, what would the number be? How would we write it ?

Hundreds Spot		Tens Spot		Ones Spot		
	+		+		=	
_____		_____		_____		_____

DO

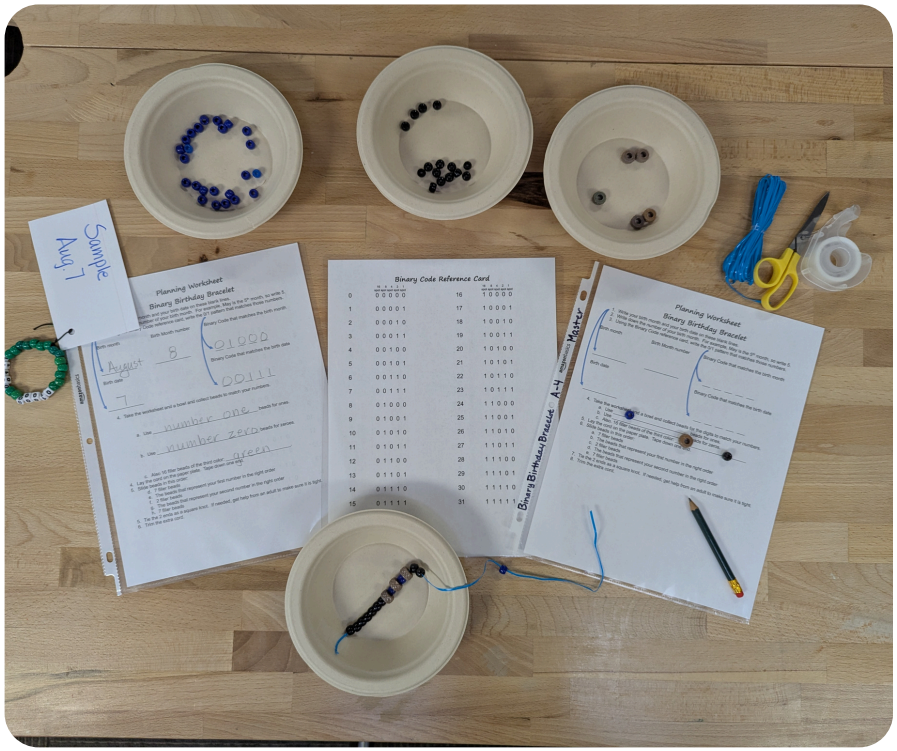
The 16 spot is biggest number card, so it should be on the left. The ones spot is the smallest number, so it should be on the right. Start by turning all the cards to 0. How many ones are in the ones spot? How many in the twos spot? 4spot? 8spot? 16spot? Add up your total to figure out what number your code represents.

For example,

16 spot	8 spot	4 spot	2 spot	1 spot
1	0	1	0	1

16 + 0 + 4 + 0 + 1 = 21

See if you can figure out the code for all the numbers between 0 and 31!



Binary Birthday Bracelets

Learn about Binary code and use it to make a bracelet with your birthday on it

From the kit:

Activity A-4

What you need to supply:

- 1 foot of elastic cord per girl (1mm cord is recommended)
- 3 colors of beads
- Copies of the planning worksheets if you would like one per girl
- Containers to hold the beads
- A small plate or tray for a workplace for each girl
- Pencils
- Tape
- Scissors

One “Representing Data” activity is required for:

Brownies | Juniors | Cadettes | Seniors

A-4: Binary Birthday Bracelets

READ

Binary Numbers are a code that computers use. The Binary Number system only has zeros and ones--it doesn't have 2, 3, 4, 5, 6, 7, 8, or 9! So to represent the numbers 0 to 31, each Binary number is made up of 5 spots that are filled with a 1 or 0.

Each Binary Number has a different pattern of 0s and 1s. If you want to learn more about how Binary Numbers work, you can complete the "Learn about Binary Numbers" activity in this kit.

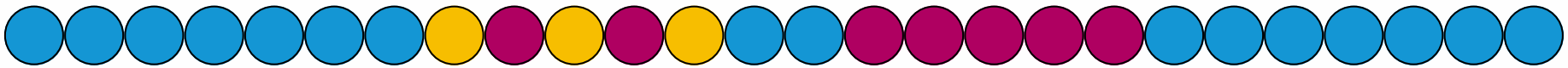
THINK

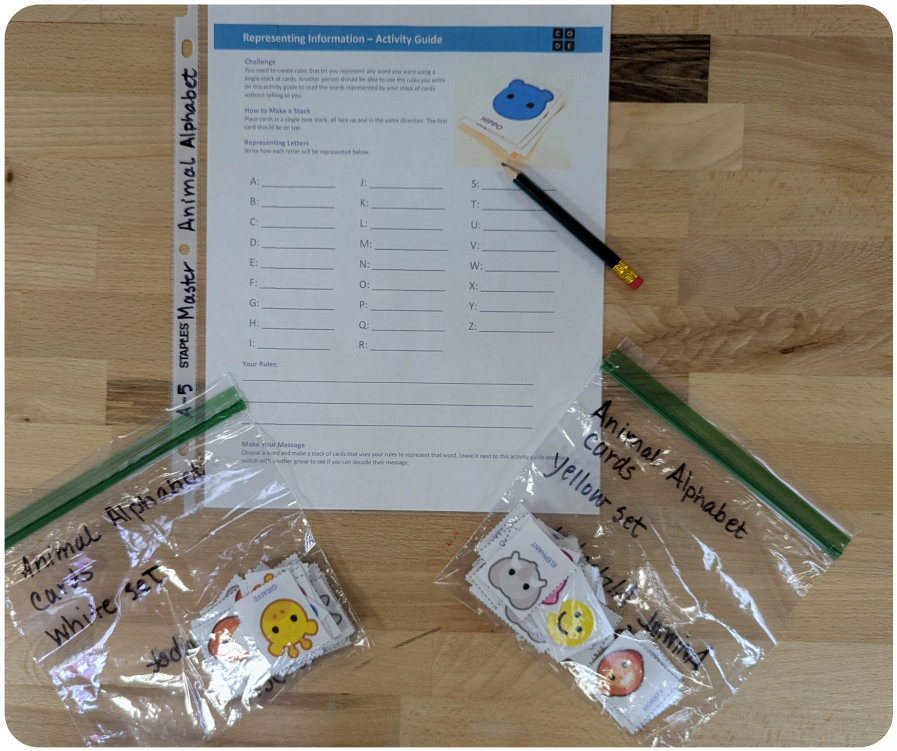
The word "binary" means that it involves two things. Why do you think this number system is call "Binary Numbers"? What do you think a binary planetary system is?

DO

You will put your birth date on a bracelet in binary using different colored beads. You will need to use one color for the zeros, a different color for the ones, and a third color for filler beads in between the numbers.

For example, Juliette Gordon Low's birthday is October 31. Her bracelet would look like:





Animal Alphabet

Create your own code using animals and then swap to see if you can decode each others messages.

From the kit:

Activity A-5
*see the troop leader guide page 14-17 for more information and tips/tricks if your troop gets stuck

What you need to supply:

- Pencils
- Copy of worksheet if you want one for each Girl Scout

One “Representing Data” activity is required for:

Brownies | Juniors | Cadettes | Seniors

A-5: Animal Alphabet

READ

Data Representation is how we use a code, such as binary numbers, to represent something in the computer. For example, computers can't understand pictures or sound if it hasn't been converted into a language the computer knows. We can use number systems such as binary or something called hexadecimal to represent the data that we want to put into the computer and get out of the computer.

THINK

Can you think of something in Girl Scouts that is used to represent something else? What do your badges represent? How do different badges represent different things?

DO

Your team will be creating your own "code" to represent letters in our alphabet. Your code will be made up a stack of animal pictures. Decide how each letter will be represented and then write out the rules of your language. All of your words have to be stacked into a single stack of pictures. The pictures all have to be face up and in the same direction

After your language is ready, write a message to a the other team and give them the rules and code to figure out your message without your help. Were they able to do it? If not, try making some changes to your code or rules and see if they can figure out the message. Keep debugging your code and solving your problems until the other team can read your code.

How did you "debug" or find the problems and fix your code?

Troop Handshake

Create a Troop Handshake or dance and add in functions or debugging if you'd like.

From the kit:

None

What you need to supply:

- Optional: markers and posterboard or paper

One "Algorithms" activity is required for all ages, a second is required for Daisies and Brownies

Daisies Brownies Juniors Cadettes Seniors

B-1: Troop Handshake, also works for Functions and Debugging

READ

Computer scientists use algorithms all the time. An algorithm is a fancy word for directions or a set of steps. When a computer scientist writes an algorithm, they pay attention to the order of their steps and how much detail they should put into their directions.

After a programmer has written an algorithm, they test it. If they find problems, or "bugs", they go back and re-write the algorithm. This is called debugging.

Sometimes programmers have part of their code that they need to repeat. They can write a repeat step called a loop. Other times, programmers need to do the same steps lots of different times in their program. They would write these steps separately as a mini-program called a function and give it a name. Then, they can just write the name of the function and the program will do all of those steps.

THINK

Why do you think fixing an algorithm is called debugging?

DO

With your group, come up with an algorithm for a handshake or dance that you can all do together. It might help to write your algorithm down. After you have the steps in the order you want them, practice your algorithm and see if you like your handshake or dance.

Do you need to debug anything? Could you add in a loop or a function?

Let's Go Code

Learn about algorithms by creating a set of directions to get through a foam square coarse.

From the kit:

Smaller tub: Activity B-2

What you need to supply:

- None

One "Algorithms" activity is required for all ages, a second is required for Daisies and Brownies

Daisies | Brownies | Juniors | Cadettes | Seniors

B-2: Let's Go Code, also works for Functions and Debugging

READ

An algorithm is a set of steps. In other words, it is a list of instructions or directions. The algorithm is written by a computer programmer, or coder. If an algorithm doesn't work, the coder will need to fix the "bugs" or problems by debugging it. This means that they change the algorithm to try and fix the problems.

THINK

Where have you see algorithms before in your every day life?

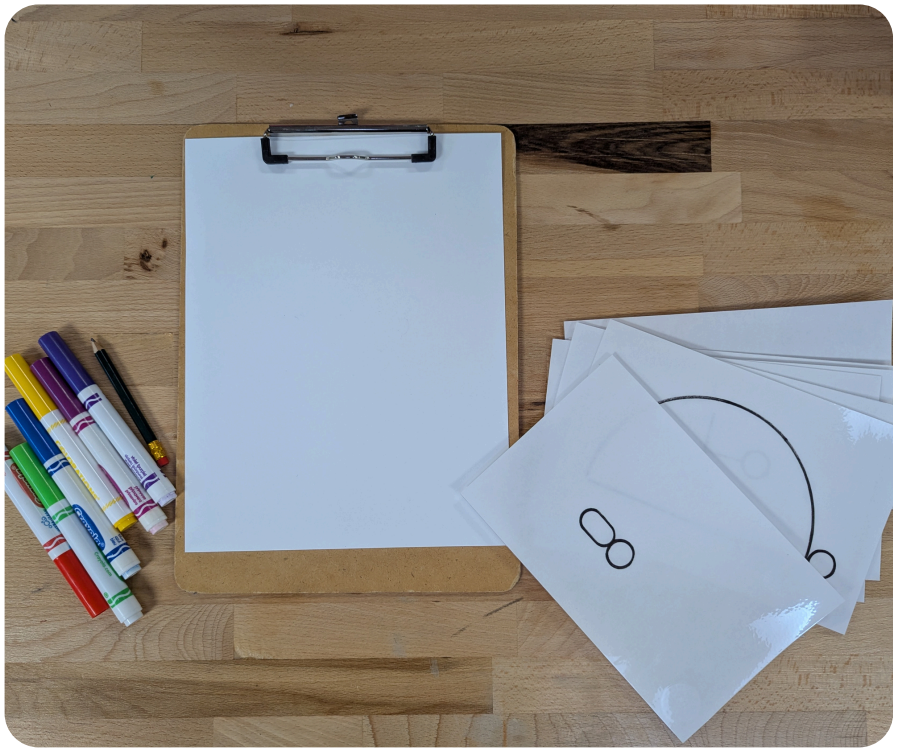
DO

You will work in teams of 2-3. One person will be the Explorer who acts like the computer or robot: you can only do what the algorithm says, even if it is wrong. The other person or people will be the coder that sets up the algorithm and the caller that says the algorithm out loud.

Set up 8 foam square for each group. The arrow goes on the start foam square and the robot is the finish.

After the coder is done with the algorithm, the caller will read it out loud and the explorer will follow it. Did the explorer make it to the end robot? If not, you might need to debug! Take turns being the coder, caller, and explorer.

Challenge cards: X cards mean "don't step here". Broken spring and gears need to be picked up and taken to the robot. The algorithm jetpack card means jump over the Xs, the claw is used to pick up a spring or gear, and the question mark means the Explorer chooses something to do like a song, yoga pose, or dance move!



Back2Back Drawings

Create an algorithm to tell your partner how to copy your drawing without looking at it.

From the kit:

Activity B-3

What you need to supply:

- paper
- markers, pencils, or crayons
- clipboards or something to write on

One “Algorithms” activity is required for all ages, a second is required for Daisies and Brownies

Daisies | Brownies | Juniors | Cadettes | Seniors

B-3: Back2Back Drawings, also works for Debugging

READ

An algorithm is a set of steps. In other words, it is a list of instructions or directions. The algorithm is written by a computer programmer, or coder. If an algorithm doesn't work, the coder will need to fix the "bugs" or problems by debugging it. This means that they change the algorithm to try and fix the problems.

THINK

What do you think a computer does if the algorithm is wrong or is entered into the computer incorrectly?

DO

You will sit back to back with your partner. One of you will take a card and describe to your partner step by step how to draw the picture. You can only give simple directions such as lines, curves, circles, triangles, squares, above, below, etc.

How close does the artist comes to the original picture? How could you debug the algorithm and make the instructions clearer?

Take turns being the coder and the artist!

Walk the line

Create an algorithm to tell your partner how to copy your drawing without looking at it.

From the kit:

Activity B-4: Walk the line laminated cared

What you need to supply:

- Blindfolds
- Painters tape or masking tape

Set Up:

- Put the tape in different shaped paths on the floor. Ideally this is done so the Girl Scouts don't see it before the activity.

One "Algorithms" activity is required for all ages, a second is required for Daisies and Brownies

Daisies | Brownies | Juniors | Cadettes | Seniors

B-4: Walk the Line, also works for Debugging

READ

An algorithm is a set of steps. In other words, it is a list of instructions or directions. The algorithm is written by a computer programmer, or coder. If an algorithm doesn't work, the coder will need to fix the "bugs" or problems by debugging it. This means that they change the algorithm to try and fix the problems.

THINK

What do you think a computer or robot does if the algorithm is wrong? What happens if the programmer makes a typo?

DO

You will take turns being the "robot" by being blindfolded and having to follow the coders directions to follow the line on the floor. No peeking! You may want to keep your hands up in case your coder has problems and needs to debug the algorithm to get you to the end of the line.

Take turns! If there are more than one path you can try a different path, otherwise you can try to debug your algorithm and see if you can "code" it so that your Robot doesn't go off the line.

Tangram Algorithms

Write directions (an algorithm) to describe how to create a specific picture using tangrams. Try out each others algorithms.

From the kit:

Activity B-5

What you need to supply:

- Pencil and paper or other writing supplies

One “Algorithms” activity is required for all ages, a second is required for Daisies and Brownies

Daisies Brownies Juniors Cadettes Seniors

B-5: Tangram Algorithms, also works for Debugging

READ

An algorithm is a sequence of steps, or in other words, a set of directions. If there is a problem or “bug”, we have to fix or “debug” it.

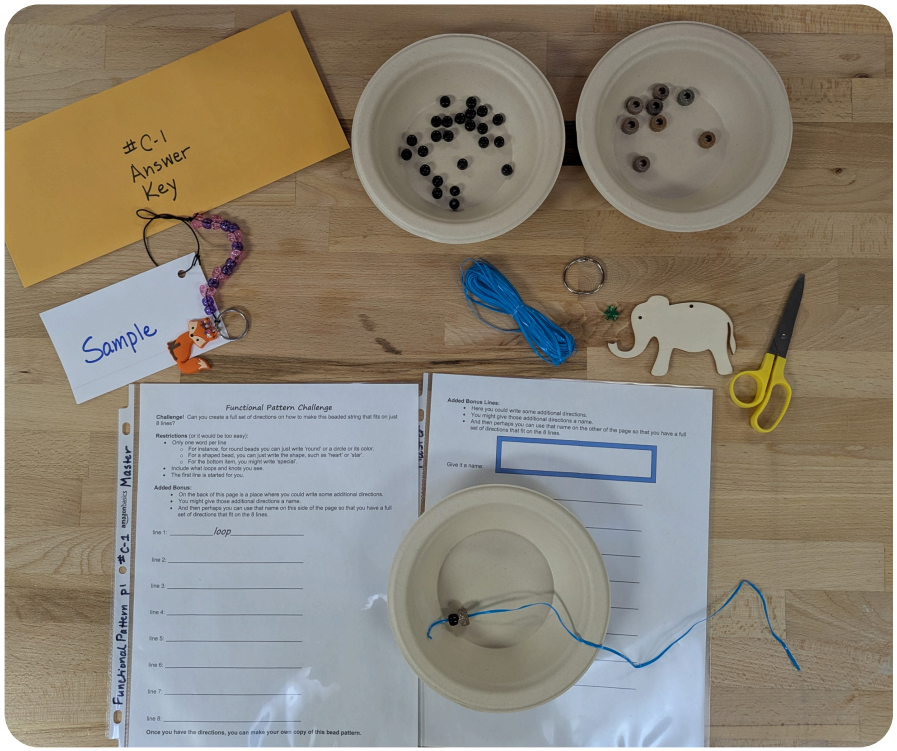
THINK

What would happen if you gave a computer the wrong directions? Why is it important to double check our work when we write an algorithm?

DO

Create a picture with your set of tangrams. Write out directions for someone to put together the same picture without looking at it. Be as detailed as you can.

Then someone else will read your directions and you won’t be able to give any hints! The rest of the group can try to make the picture based on your algorithm. How close did they get? Take turns trying each others algorithms.



Functional Pattern Challenge

Learn about Functions and Loops while creating a keychain.

From the kit:

Activity C-1

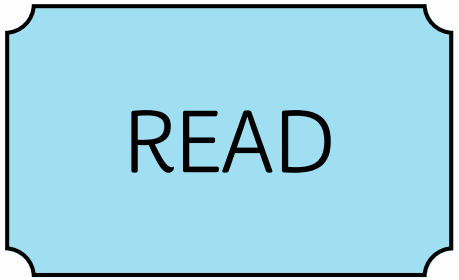
What you need to supply:

- elastic cord or string cut into 18" sections
- Beads: two different shapes
- a fun bead, charm, or keychain for the last step; you may need a jump ring or lobster clip to connect the charm
- scissors
- tape
- tray or container to work on
- containers to hold the beads
- copies of the Functional Challenge Worksheet
- pencils

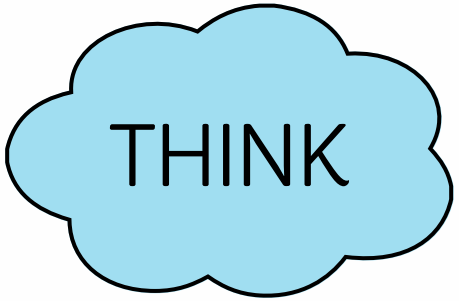
One “Functions” Activity is required for:

Brownies Juniors Cadettes Seniors

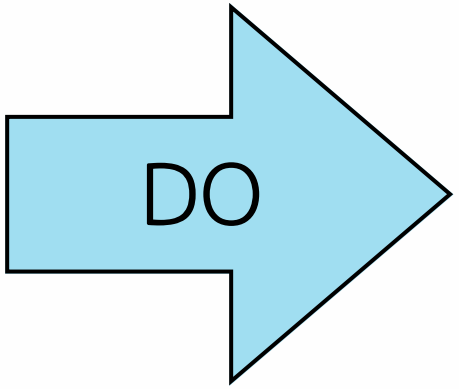
C-1: Functional Pattern Challenge



In Computer Science, a function is a reusable section of code that does a specific job. After you have written a function, you give it a name so that you can "call" it by that name when you need to put it in your code. Sometimes functions are similar to a loop, but a loop repeats the directions right away. In a function, you can call it whenever you want and have lots of code in between the times you use a function.

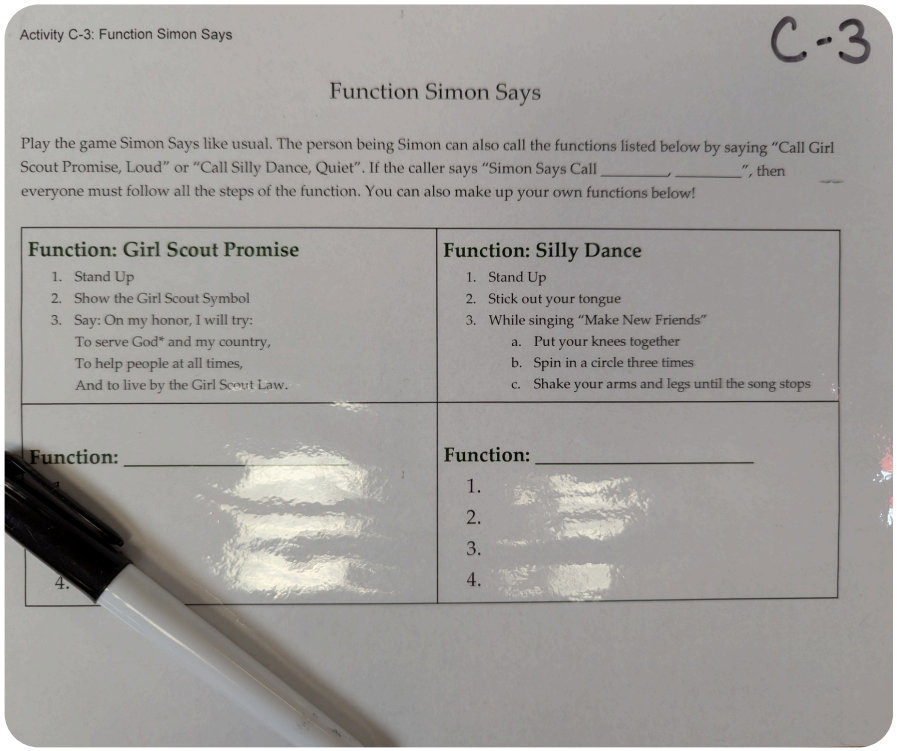


Why would it be helpful to use functions in your code? When would you use a function versus a loop?



Look at the Sample. The starting place will be the knotted loop at the top followed by a pink heart bead. The last step of your algorithm will be adding the special bead/charm. You are going to write an algorithm for how to create this keychain pattern. Your algorithm will start with the making a loop on the string. We will call this step "Loop". You will need to figure out the rest of the algorithm, but it can't have more than 8 steps. Pay close attention to the pattern, you might need to stretch the elastic to look for any hidden knots!

You can choose to write a function or a loop to help make the pattern fit in the 8 lines.



Activity C-3: Function Simon Says

C-3

Function Simon Says

Play the game Simon Says like usual. The person being Simon can also call the functions listed below by saying "Call Girl Scout Promise, Loud" or "Call Silly Dance, Quiet". If the caller says "Simon Says Call _____, _____", then everyone must follow all the steps of the function. You can also make up your own functions below!

Function: Girl Scout Promise	Function: Silly Dance
1. Stand Up 2. Show the Girl Scout Symbol 3. Say: On my honor, I will try: To serve God* and my country, To help people at all times, And to live by the Girl Scout Law.	1. Stand Up 2. Stick out your tongue 3. While singing "Make New Friends" a. Put your knees together b. Spin in a circle three times c. Shake your arms and legs until the song stops
Function: _____ 4.	Function: _____ 1. 2. 3. 4.

Function Simon Says

Practice using a function by playing Simon Says. Simon can call the Function: Girl Scout Promise or Silly Dance or you can create your own.

From the kit:

Activity C-3

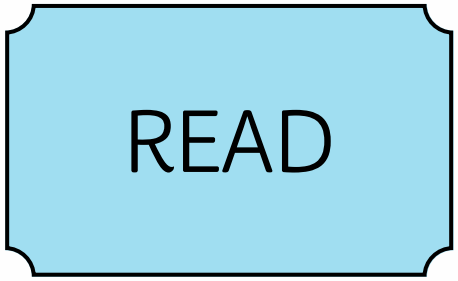
What you need to supply:

- Nothing

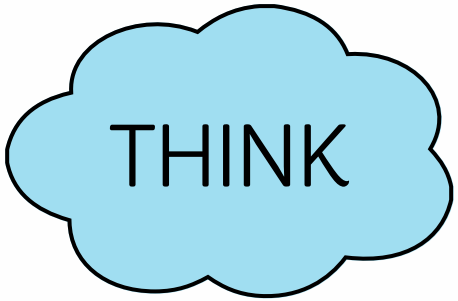
One "Functions" Activity is required for:

Brownies | Juniors | Cadettes | Seniors

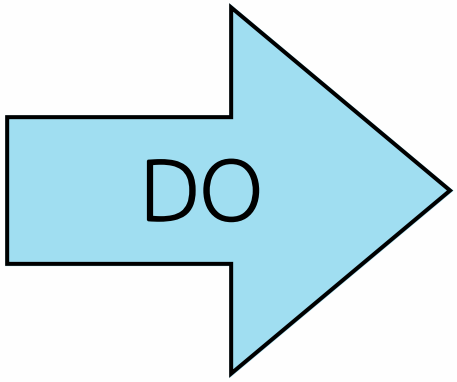
C-3: Function Simon Says



Functions are a way to organize our code when we need to repeat an action in different parts of the code. The function lists all the steps you need to do the action. We give the function a name. Then we can "call" the function name and it will do the action without writing every single step.

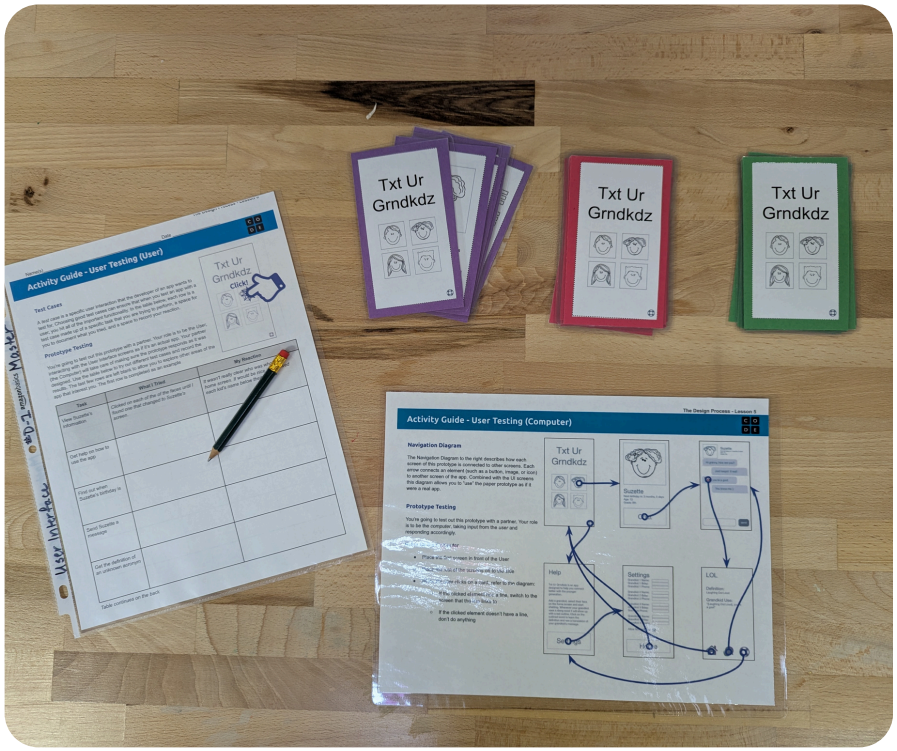


Why do you think functions or loops could be helpful when you write code?



Play the Function Simon Says game. You play Simon Says like normal, but the person calling can also say "Call Girl Scout Promise, Loud" or "Call Silly Dance, Quiet".

If they say "Simon Says Call _____, _____" for one of these functions, you'll need to follow the steps of the function. You can make up your own functions too!



User Centered Design

Work with a paper prototype for an app and develop the user interface

From the kit:

Activity D-1

What you need to supply:

- Pencil
- Copies of User Testing if you would like

One “User Interface” Activity is required for:

Cadettes

D-1: User Centered Design

READ

When you use an app, website, or computer program, have you ever clicked a button that wasn't actually a button? Or clicked a button and it took you to a different page than you thought it would?

These are all parts of the User Interface, how a user actually uses the program. When you create a new app or program, the best approach is to focus on how the user would actually use the app. This is called user centered design. Oftentimes programmers will make a paper prototype before an electronic prototype and have the intended user pretend to use the app while the programmers watch or record the interaction.

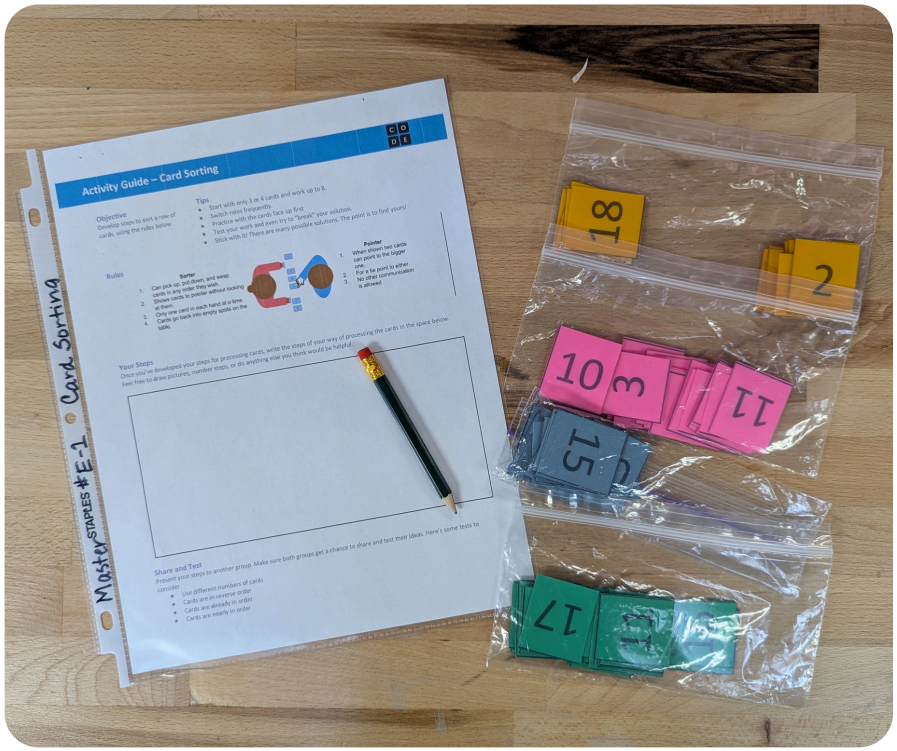
THINK

Why do you think it would be helpful to start with a paper prototype of the app or program first? What information would you get from using a paper prototype that you would miss with an electronic prototype?

DO

With a partner or small group, one person will be the computer and everyone else will be the users of the program. The computer will put the home screen of the app down first: Txt Ur Grndkdz. The users will try and complete the different tasks. The computer will give the users the next "screen" card that the program would display when they click on something. Record what the users tried and your reactions to what happened.

Are there any "screen" cards that you would change? How would a programmer use this information to help them program their app?



Card Sorting

Figure out how to work with a partner to sort numbers similar to how a computer

From the kit:

Activity E-1

What you need to supply:

- Pencil
- Paper or Copies of Card Sorting worksheet if you would like

One “Sorting ” Activity is required for:

Cadettes | Seniors

E-1: Card Sorting

READ

There are several different ways to sort data in computer science. Different techniques might be faster or be completed in fewer steps. Depending on what type of data you are working with and how it needs to be sorted (grouped by number, biggest to smallest, etc), you would choose a specific sorting method.

THINK

How do you sort data in math class? What steps would you take to sort the following numbers in order from biggest to smallest?

23, 45, 2, 37, 105, 76, 81, 93, 0.62, 82, 37, 56

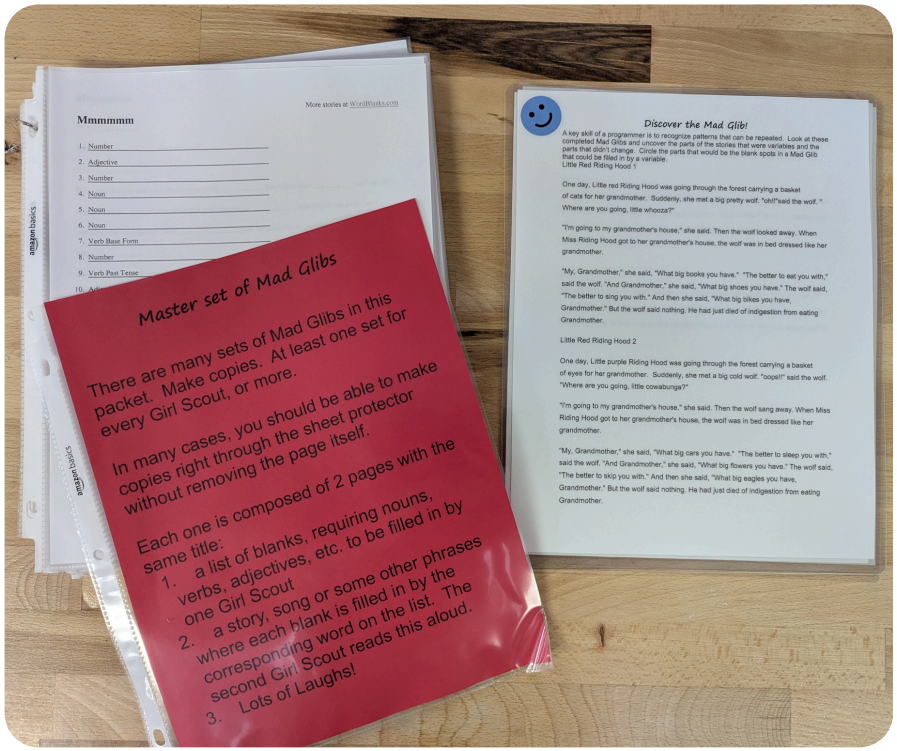
DO

One person will be the sorter and the other will be the pointer.

Sorters can: Pick up cards, put down cards, swap cards in any order. Show cards to pointer without looking at them. Have up to one card in each hand. Put cards back into only empty spots.

Pointers can: Point to the bigger of two cards shown. Point to either card if it is a tie. The can NOT talk or communicate any other way.

Figure out how you will work together to sort the data. You may want to start with just a few cards face up. Once you have a system started, then you can add more cards and turn them face down. Write out the steps to your process. Then test it and share with other groups!



Mad Glibs

Learn about variables and abstraction by reverse engineering the popular game Mad Libs.

From the kit:

Activity F-1

What you need to supply:

- Pencil
- Copies of the Mad Libs if you would like

This Activity is required for:

Juniors

F-1: Mad Glibs

READ

In computer science, a variable is a storage container that can hold information. In the English language, we have variables such as adjective, verb, and noun. They are a general category that we can fill in with something specific as we need it. When you play the game Mad Libs, you are given a list of variables that you have to define. For example, your list might be adjective, noun, noun, verb. You could define these variables as cold, dog, ball, running. If you start with the code and have to work backwards to make up the variables, this is called abstraction. You are making categories based on specific examples.

THINK

In the song “Old McDonald”, we sing that he has a cat, a dog, a cow, etc. Can you abstract from that song to make the category or variable that needs to be filled in? Old McDonald had a farm, EIEIO. And on that farm he had a _____, EIEIO. With a _____, _____ here and a _____, _____ there, EIEIO.

DO

On the page “Discover the Mad Glib”, you are going to read the two stories and find where the blanks, or in other words the variables, would go. You will nead to compare the two stories to figure out each of the variables and circle where they would go.

You can give these variables a name such as time, adjective, noun, etc and have a friend play the Mad Lib you created!

Rapid Prototyping

Create two story marshmallow and toothpick structures and quickly test, revise, and test again.

From the kit:

Activity G-1

What you need to supply:

- mini marshmallows (100 per team, per attempt)
- toothpicks (100 per team, per attempt)
- sandwich bags or bowls to hold the marshmallows and toothpicks
- paper
- pencil
- timer or a cell phone for timing
- books or something else that can be used for weights

Set Up:

- Consider counting out 100 marshmallows and toothpicks per team per attempt and pre-packaging them in a bag or bowl to save time

The Rapid Prototyping Activity is required for all levels:

Daisies Brownies Juniors Cadettes Seniors

G-1: Rapid Prototyping

READ

Rapid prototyping is a used to quickly create an object that can be tested, revised, and tested again quickly.

3D object scanning, 3D printing, CNC machining, and injection molding are all types of technology that can help design and create an object quickly so that you can test it and make changes to the design and then create the improved object again quickly.

These objects might not be the best quality because they are just being used as part of the design process instead of the final creation.

THINK

Why would machines such as 3D printers be used for rapid prototyping instead of making something with wood or metal?

DO

Divide into small groups or teams of 2-4 people. You will be creating a two-story structure out of toothpicks and marshmallows. You only have 100 of each for your team. Your structure must be flat on top so that it can hold books as a weight.

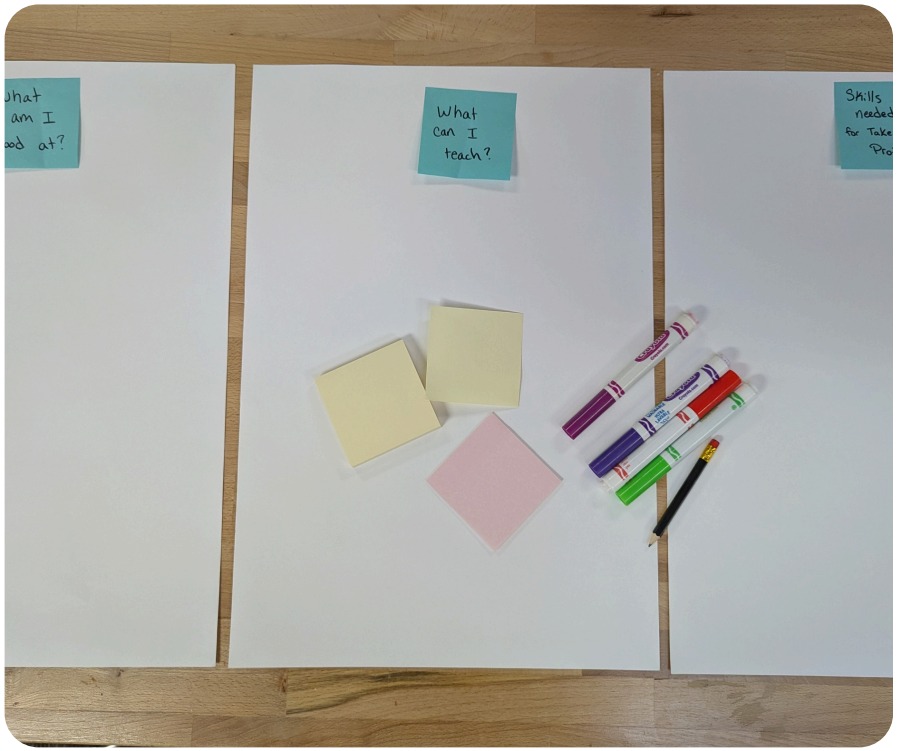
PLAN, 5 min.: No touching the materials! Plan with your team how you will create your structure

BUILD, 10 min.: You only have 10 minutes, no extra!

OBSERVE: How did everyone else build their structures?

TEST: Add weights to your structure to see how much it can hold.

REVISE: Plan, build, and test a new structure using what you learned from the first structure. You can continue revising to see what makes the strongest structure!



Take Action Project: Brownies & Juniors

Work together to identify your talents and skills, a need in your community, and a solution that you can carry out to make your world a better place!

From the kit:

Activity H-1

What you need to supply:

- Post-It Notes
- Pencils
- Poster board and markers or a whiteboard with markers

A Take Action Project is required for all levels:

H-1: Take Action Project: Brownies & Juniors

READ

A Take Action Project matches your talents to a problem or need in your community. The project is also sustainable. Sustainable means that the good that your project is doing for the community keeps happening, even when you're done with the project.

THINK

To get started you need to think about:

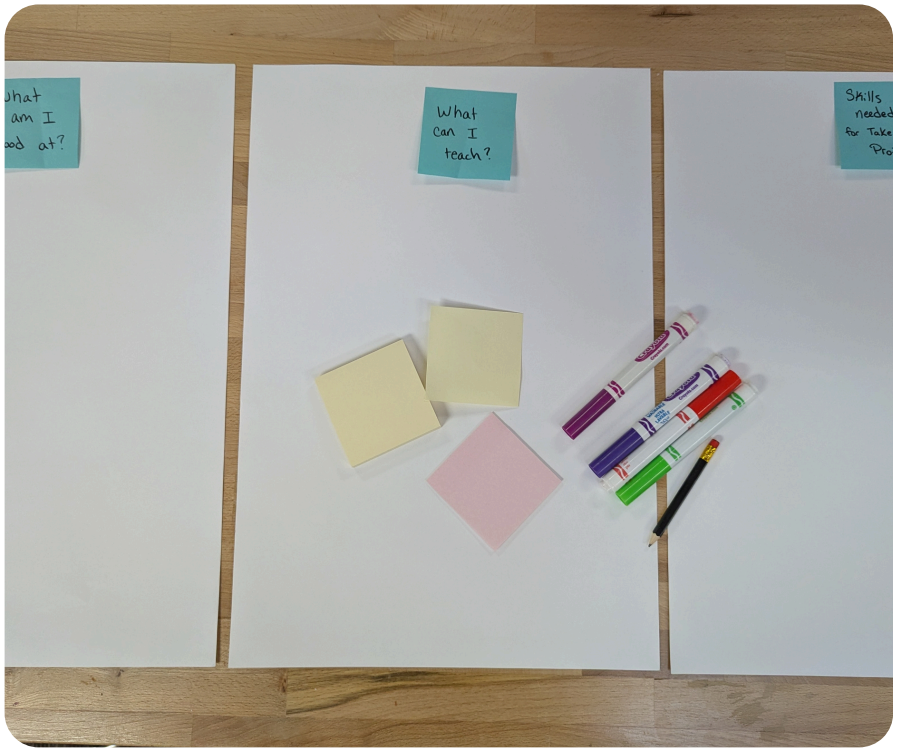
1. **Talents:** What are some of your strengths? What positive things would a friend or troop leader say about you?
2. **Community needs:** Pay attention to the places and groups of people around you. Are there any problems that you notice or things that could be improved?
3. **Solutions**: What are some ways that we can solve those problems or fill those needs? Which of these solutions are you able to do? Are there some problems or solutions that fit with your talents better?
4. **Sustainability**: How can your project have a positive effect going forward? Is there a way to make your project more permanent, expand it further, or teach other people the skills needed to keep helping in the future?

DO

You will get three post-it notes or cards. On the first Post-It note, write down what you are good at. On the second Post-It note, write down what you can teach. On the third Post-it note, write down how you think technology can improve/what skills you need for take action projects.

After everyone has time to think and write, then you can share as a group what your strengths are, what you can teach, and how you can technology can improve. As a group, discuss some possible ideas for a take action project in your area.

Your group will need to decide if you are going to debate which project to do or if you will vote for a project, and if you are going to vote, how would you like to do that? Keep in mind everyone's talents and skills as you decide on a project. Then you will choose your project as a group, plan it, and complete the project to help make the world a better place!



Take Action Project: Cadettes and older

Work together to identify your talents and skills, a need in your community, and a solution that you can carry out to make your world a better place!

From the kit:

Activity H-2

What you need to supply:

- Post-It Notes
- Pencils
- Poster board and markers or a whiteboard with markers

A Take Action Project is required for all levels:

Daisies Brownies Juniors Cadettes Seniors

H-2: Take Action Project: Cadettes, Seniors, Ambassadors

READ

A Take Action Project matches your talents to a problem or need in your community. The project is also sustainable. Sustainable means that the good that your project is doing for the community keeps happening even when you're done with the project. To get started you need to think about :

1. Talents: What are some of your strengths? What positive things would a friend or troop leader say about you?
2. Community needs: Pay attention to the places and groups of people around you. Are there any problems that you notice or things that could be improved?
3. Solutions: What are some ways that we can solve those problems or fill those needs? Which of these solutions are you able to do? Are there some problems or solutions that fit with your talents better?
4. Sustainability: How can your project have a positive effect going forward? Is there a way to make your project more permanent, expand it further, or teach other people the skills needed to keep helping in the future?

THINK

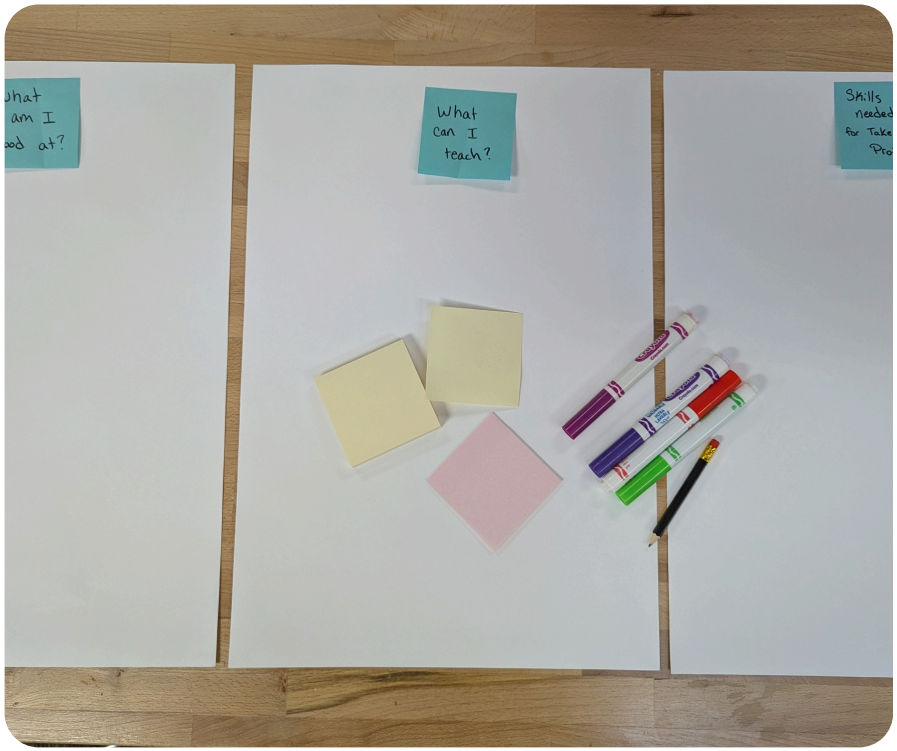
How is a take action project different than a community service project such as picking up trash at a park? You can read some of the materials included in the kit to get a better idea of some of their differences.

DO

You will get three post-it notes or cards. On the first Post-It note, write down what you are good at. On the second Post-It note, write down what you can teach. On the third Post-it note, write down how you think technology can improve/what skills you need for take action projects.

After everyone has time to think and write, then you can share as a group what your strengths are, what you can teach, and how you can technology can improve. As a group, discuss some possible ideas for a take action project in your area.

Your group will need to decide if you are going to debate which project to do or if you will vote for a project, and if you are going to vote, how would you like to do that? Keep in mind everyone's talents and skills as you decide on a project. Then you will choose your project as a group, plan it, and complete the project to help make the world a better place!



Take Action Project: Daisies

Learn about making a decision as a group and voting.

From the kit:

Activity H-3

What you need to supply:

- Post-It Notes
- Pencils
- Poster board and markers or a whiteboard with markers

A Take Action Project is required for all levels:

Daisies | Brownies | Juniors | Cadettes | Seniors

H-3: Take Action Project: Daisies

READ

A Take Action Project is a project that you do with a group to help make your community a better place. You start by figuring out what you and your group are good at or like to do. Then, you look for problems or things that need to be made better in your community. You can look at places like your schools, neighborhoods, parks, or even your local Girl Scout camp. You will decide with your group what project you will do and how you will get it done.

THINK

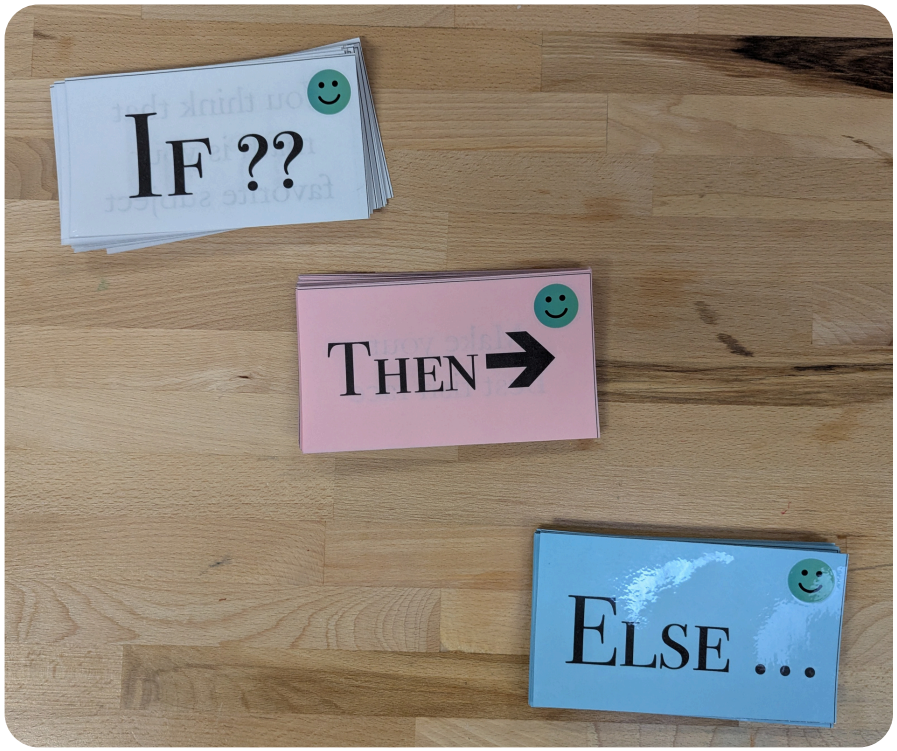
What types of things are you good at? What types of activities do you like to do? How should we talk to the other people in our group when we are deciding which project to do?

DO

With your grown up, go over the 8 "Getting Ideas" cards and discuss which ones each of you think is important. Then, on a post-it note you can write or draw something that you are good at doing or like to do.

After everyone shares what they like to do or are good at, you will discuss as a group some things that you can do around the community to help make it a better place. Your grown up will keep a list of all of the different ideas.

You group will discuss the different ideas and decide how to vote. You might decide that everyone gets one vote, or that everyone can vote for two ideas. Your troop leader will help you decide the best way to vote for your troop. If you need practice voting beforehand, you can do a pretend vote about which treat a group of kids should get for a celebration.



If Then Else Game

Play a game to discover the conditionals If, Then, Else and If, Or, Then, Else.

From the kit:

Activity I-1

What you need to supply:

- None

One “If-Then Logic” Activity is required for:

Brownies

Juniors

I-1 and I-2: If-Then-Else Game, If-Or-Then-Else

READ

In computer programming we use conditionals. A conditional tells the program what to do during certain conditions. So to turn on a lightswitch, we could code: **IF** the light is off, **THEN** flip the switch to on, **ELSE** leave the switch alone. In this example, the condition we're looking for is if the light is off. If it is off, then we turn it on. Else means otherwise, so otherwise if the light isn't off, then leave the switch alone.

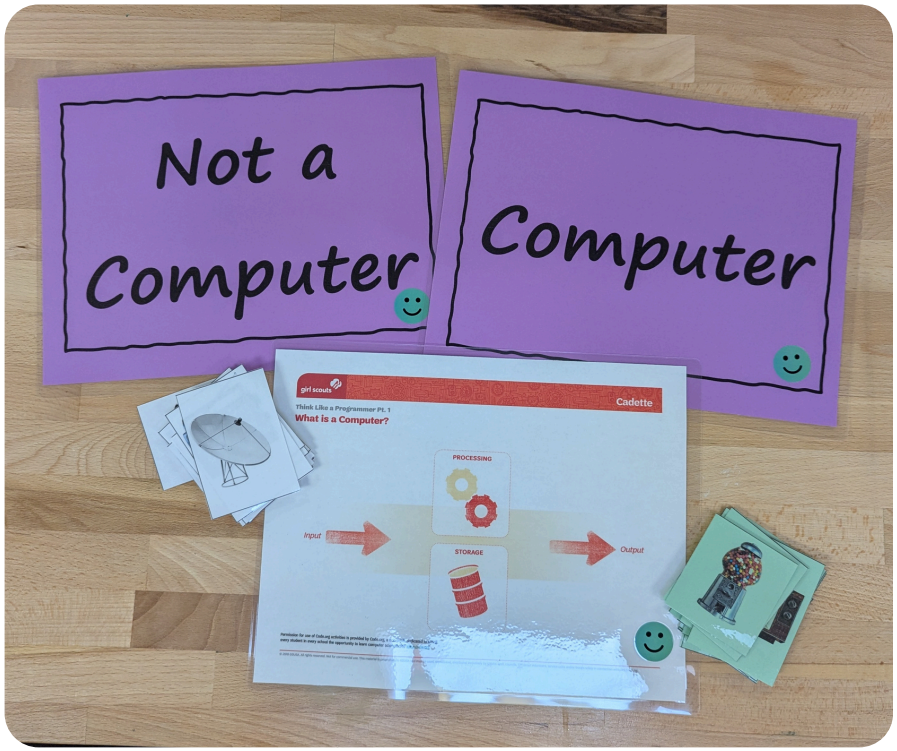
THINK

Another way to think of conditionals is by thinking if the condition is true or false. Would true go with **THEN** or **ELSE**? Why?

DO

To play the game, one person will flip over an **If, Then,** and **Else** card. Follow the directions **IF _____ (is true), THEN _____, ELSE (otherwise)_____.** You can also make up your own IF, THEN, ELSE statements without the cards if you would like. Take turns flipping over the cards or making up conditional statements.

For a challenge, you can add in the **OR** cards. This would make it so that if the **If** or the **OR** are true, then you would do the **THEN.** If neither the **If** or the **OR** are true, then you would do the **ELSE.**



What is a Computer?

Learn about what makes something a computer.

From the kit:

Activity J-1

What you need to supply:

- None

One “What is a Computer” Activity is required for:

Juniors Cadettes

J-1: What is a Computer?

READ

A computer is made up of at least four components: inputs, outputs, processing, and storage.

Inputs: An input is something that goes into a device such as clicks from a mouse, or words typed by a keyboard.

Outputs: An output is something that the computer creates such as an image on the screen or a sound.

Storage: A hard drive is long term computer storage and the memory is for short term storage.

Processing: The processor on a computer carries out the instructions and does the calculations.

THINK

When we say the word computer, we often think of a laptop or desktop computer. Can you think of another example of something that is a computer?

DO

Divide into two groups. Your group will look at each picture and decide if it has all four components that would make it a computer. Make one pile of pictures for computers and another pile for things that are not computers.

Compare your results with the other team. Each team has some of the same cards and some unique cards. Do you agree with each other? Which items were the hardest to categorize? Why?

Puzzles

Learn about Debugging while completing simple puzzles.

From the kit:

Activity K-2

What you need to supply:

- None

Optional Activity. Recommended for Daisies if debugging is not completed in an algorithm activity.

Daisies

K-2: Puzzles

READ

When there is a problem with a computer scientists code, sometimes that is called a bug. When the scientists works to fix the problem, we call it debugging.

THINK

What types of problems do you think there could be in computer code?

DO

You will divide into two teams. Each team will get one bag of puzzles (red or blue dots on the back of the pieces).

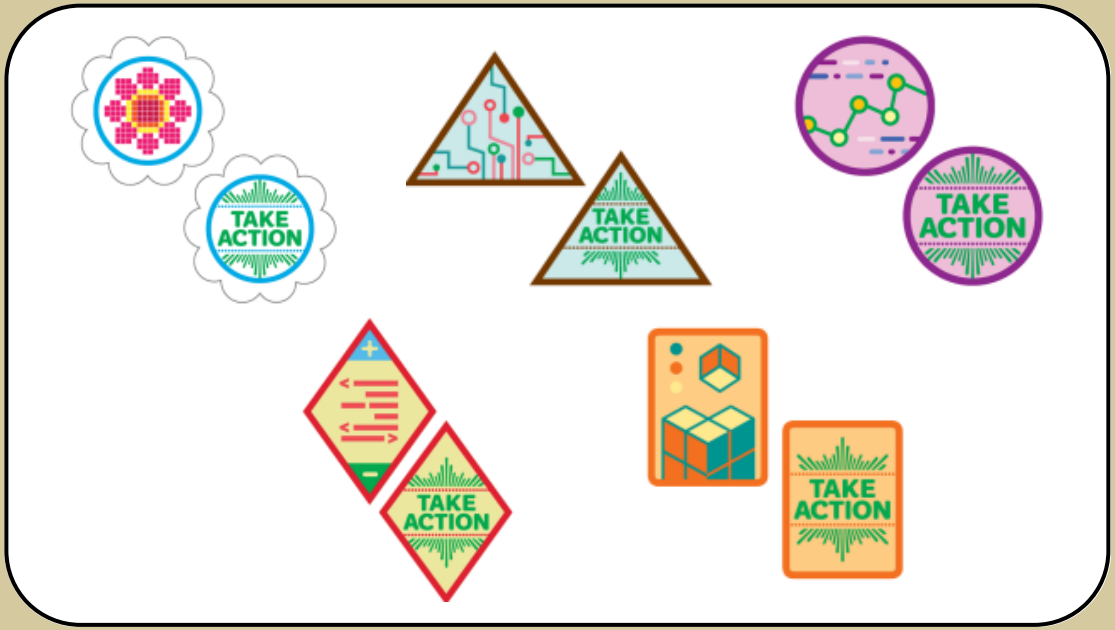
Work in your groups to solve your puzzle. Do you have a set of steps you follow to find the next piece and put it in the puzzle?

When you are finished, you will discuss in your groups and all together:

1. What words did you use to talk to each other that were helpful?
2. What actions allowed everyone's ideas to be heard?
3. What problems did you have? How did you debug or solve those problems?
4. Did you get frustrated? What helped you get past the frustration?

girl scouts of wisconsin badgerland

Badge In a Box



Think Like a Programmer Multi-Level Kit

How to Use This Kit

Using this Badge in a Box Kit, Girl Scouts will learn about the different parts of computer programming and then complete a take action project using their own skills and talents.

On the following pages you will find the different types of activities and how many of each type of activity your Girl Scouts will need to complete based on their age and level. If you have a mixed group, you can decide if everyone does the higher number of activities or if the younger Girls Scouts will need more time on an activity and the older kids can move on to a different activity.

Each activity comes with a materials list and Girl Scout focused directions. The troop leader or a Girl Scout will read the "Read" and "Think" sections aloud. Give time for everyone to think about the question before sharing as a group. Then, follow the instructions listed under the "Do" section. If you want more detailed instructions for an activity, you can also view the Troop Leader Guide.

A Note About Journeys From GSUSA

Girl Scout Journeys are multi-session experiences in which girls dig deeper into their interests and use the skills they gain along the way to make a difference in their community. While badges show the world you've learned a new skill, Journey awards say, "I found a way to make a difference."

During a Journey, Girl Scouts do hands-on activities, connect with experts, and take the lead on a Take Action project with their community. And once a Junior, Cadette, Senior, or Ambassador completes their Journey, they're ready to drive lasting change in their communities by going for their Bronze, Silver, or Gold Award.

Badge Requirements for Each Level

Daisies

5+ Activities Total

Required:
- Rapid Prototyping
- Contribute to a Take Action Project

Choose:
- 2 Algorithm Activities
- at least one other activity

Brownies

6+ Activities Total

Required:
- Rapid Prototyping
- If-Then Logic
- Contribute to a Take Action Project

Choose:
- 2 Algorithm Activities
- 1 Data Representation Activity
- 1 Function Activity

Juniors

8+ Activities Total

Required:
- Rapid Prototyping
- If-Then Logic
- Variables
- What is a Computer
- Contribute to a Take Action Project

Choose:
- 1 Algorithm Activities
- 1 Data Representation Activity
- 1 Function Activity

Cadettes

9+ Activities Total

Required:
- Rapid Prototyping
- What is a Computer
- User Centered Design
- Sorting
- Contribute to a Take Action Project

Choose:
- 1 Algorithm Activity
- 1 Data Representation Activity
- 1 Function Activity
- 1 other activity, If-Then Logic is Recommended

Seniors

9+ Activities Total

Required:
- Rapid Prototyping
- Sorting
- Contribute to a Take Action Project

Choose:
- 1 Algorithm Activity
- 1 Data Representation Activity
- 1 Function Activity
- At least 3 other activities

Types of Activities in this Kit

Rapid Prototyping
- Rapid Prototyping

Algorithms
- Troop Handshake
- Let's go code
- Back2Back Drawings
- Walk the Line
- Tangrams

Representing Data
- Morse Code Bracelets
- Morse Code Treasure Hunt
- Learn about Binary Numbers
- Binary Birthday Bracelets
- Animal Alphabet

If-Then Logic
- If-Then-Else Game

Functions
- Functional Pattern Challenge
- Add a Function to the Troop Handshake or other Algorithm activities
- Function Simon Says

Contribute to a Take Action Project
- Daisies
- Brownies and Juniors
- Cadettes and older

Debugging
- Found in all Algorithm activities
- Puzzles

Variables
- Mad Glibs

What is a Computer
- What is a computer

User Interface
- User Centered Design

Sorting
- Card Sorting

Items you will need to supply if you do all the activities:

Basic Office/Craft Supplies:

Scotch Tape
Painters tape or masking tape
post it notes or paper with tape
Scissors
Paper
Pencils
Markers

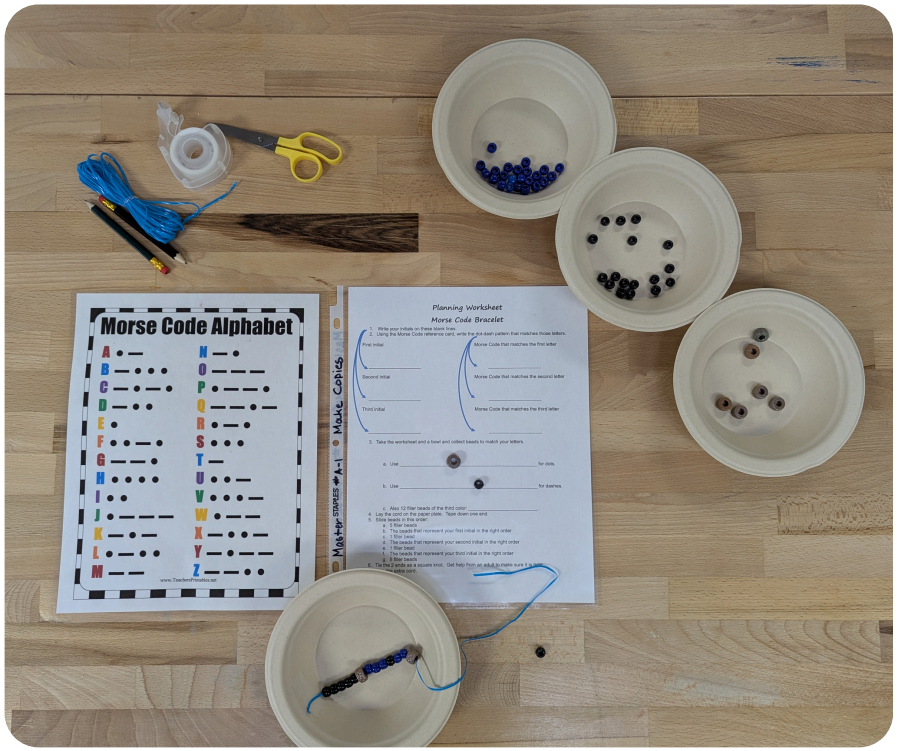
Supplies you might need to purchase:

- String/elastic (1mm elastic works well)
- At least 3 colors of beads and at least 2 shapes
  - Useful shapes for the activities would be barrel beads and hearts in addition to regular pony bead
  - You will need a special bead or charm for each girl for one of the activities
  - You may want 1 lobster clip or jump ring per girl
- Bowls or containers for beads or other materials
- A treasure for the treasure hunt
- Small paper plates or trays for girls to work on
- Copies of planning sheets if you would like
- Clipboard/writing surface such as a book or cardboard
- Poster boards
- Blindfolds
- Mini marshmallows and toothpicks (200-300+ per girl)
- Timers (could use a cell phone timer)

Take it online:

After your Girl Scouts have learned some of the basics, they may want to try out their skills. Here are a few resources you can look at to decide what works best for your troop:

- scratch.mit.edu Free online coding platform for basic coding and creating games
- makecode.adafruit.com Free online coding platform that can be used on its own or with circuit playground expressed
- arcade.makecode.com Free online coding platform for making basic programs and games
- code.org Free online coding games, self paced curriculum, teacher led curriculum, and offline lessons



Morse Code Bracelets

Learn about Morse Code and create a bracelet of your initials using the code.

From the kit:

Activity A-1 and the Morse Code Alphabet Cards

What you need to supply:

- 1 foot of elastic cord per girl (1mm cord is recommended)
- 3 colors of beads: this activity works best if one of the colors is a barrel bead (long and narrow) and the others are regular pony beads
- Copies of the planning worksheets if you would like one per girl
- Containers to hold the beads
- A small plate or tray for a workplace for each girl
- Pencils
- Tape
- Scissors

One “Representing Data” activity is required for:

Brownies | Juniors | Cadettes | Seniors

A-1: Morse Code Bracelets

READ

Morse code was used to send messages over long distances before we had phones or the internet. Each letter can have dots, dashes, or both to represent it. For example, the letter A has a dot followed by a dash. Dots are short and Dashes are long. So we could send 1 short sound and 1 long sound over a radio for the letter A.

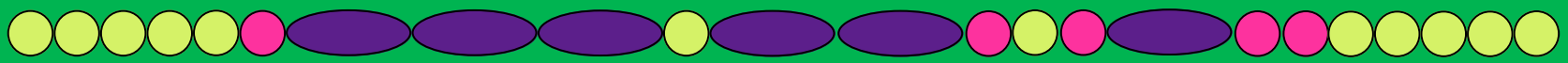
THINK

We can also use a flashlight to send morse code messages. How do you think we would send dots and dashes using a flashlight?

DO

Instead of using sound or light for our codes today, you will create a code using different colored or shaped beads. You will make a bracelet with the initials of your name.

For example, Juliette Gordon Low would be JGL. Her bracelet would look like:



Morse Code (Treasure) Hunt

Learn about Morse Code and use it to decode clues to a scavenger hunt.

From the kit:

Activity A-2 and the Morse Code Alphabet Cards

What you need to supply:

- Pencils
- Copies of the Binary Code fill in the blank worksheet if you would like

Set Up:

- Choose which color of scavenger hunt to do (Green is for early readers, Blue is intermediate, and Purple is advance)
- Place the tents around the room in any order.

One “Representing Data” activity is required for:

Brownies | Juniors | Cadettes | Seniors

A-2: Morse Code (Treasure) Hunt

READ

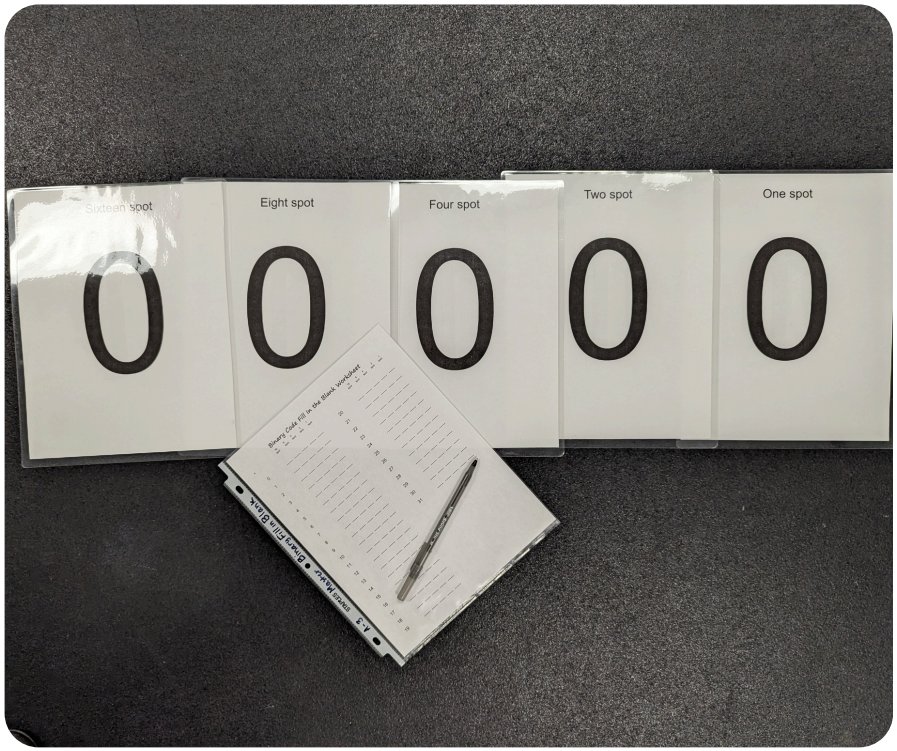
Morse code was used to send messages over long distances before we had phones or the internet. Each letter can have dots, dashes, or both to represent it. For example, the letter A has a dot followed by a dash. Dots are short and Dashes are long. So we could send 1 short sound and 1 long sound over a radio for the letter A.

THINK

We can also use a flashlight to send morse code messages. How do you think we would send dots and dashes using a flashlight?

DO

Your team will follow clues that are written in morse code. You will need to solve each clue to figure out where to go next. Your team will start by picking a color of clues to follow. Go to the Starting Clue (Dog, Horse, or Giraffe). Solve the code, put the clue back in the pocket and go to your next clue. Follow your color of clues until you reach the end!



Learn about binary numbers

Learn about binary numbers.

From the kit:

Activity A-3

What you need to supply:

- Pencils
- Paper
- Clipboard or something to write on
- Optional Treasure such as stickers, trinkets, a treat, etc

Set Up:

- Lay out the laminated cards with zeros facing up. 16 spot should be on your left, followed by 8, 4, 2, and 1.

One “Representing Data” activity is required for:

Brownies Juniors Cadettes Seniors

A-3: Learn about Binary Numbers

READ

Binary Numbers are a code that computers use. The Binary Number system only has zeros and ones--it doesn't have 2, 3, 4, 5, 6, 7, 8, or 9!

In our regular counting system, which is based on ten numbers, we have a ones spot, 10s spot, 100s spots, etc. We add up each of the spots to get our total number.

THINK

In our regular counting system, if we have 9 hundreds, 8 tens and 7 ones, what would the number be? How would we write it ?

Hundreds Spot		Tens Spot		Ones Spot		
	+		+		=	
_____		_____		_____		_____

DO

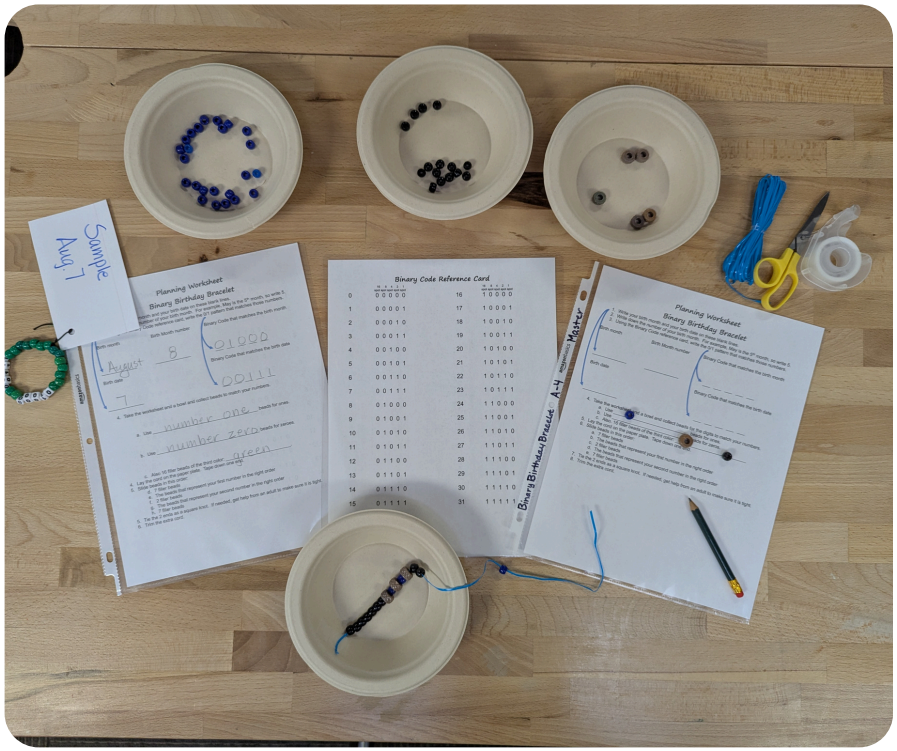
The 16 spot is biggest number card, so it should be on the left. The ones spot is the smallest number, so it should be on the right. Start by turning all the cards to 0. How many ones are in the ones spot? How many in the twos spot? 4spot? 8spot? 16spot? Add up your total to figure out what number your code represents.

For example,

16 spot	8 spot	4 spot	2 spot	1 spot
1	0	1	0	1

16 + 0 + 4 + 0 + 1 = 21

See if you can figure out the code for all the numbers between 0 and 31!



Binary Birthday Bracelets

Learn about Binary code and use it to make a bracelet with your birthday on it

From the kit:

Activity A-4

What you need to supply:

- 1 foot of elastic cord per girl (1mm cord is recommended)
- 3 colors of beads
- Copies of the planning worksheets if you would like one per girl
- Containers to hold the beads
- A small plate or tray for a workplace for each girl
- Pencils
- Tape
- Scissors

One “Representing Data” activity is required for:

Brownies | Juniors | Cadettes | Seniors

A-4: Binary Birthday Bracelets

READ

Binary Numbers are a code that computers use. The Binary Number system only has zeros and ones--it doesn't have 2, 3, 4, 5, 6, 7, 8, or 9! So to represent the numbers 0 to 31, each Binary number is made up of 5 spots that are filled with a 1 or 0.

Each Binary Number has a different pattern of 0s and 1s. If you want to learn more about how Binary Numbers work, you can complete the "Learn about Binary Numbers" activity in this kit.

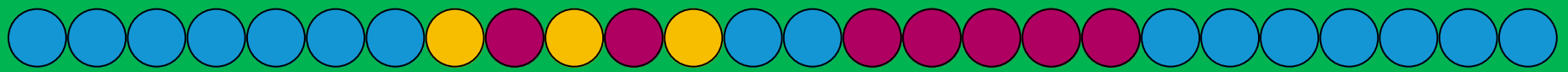
THINK

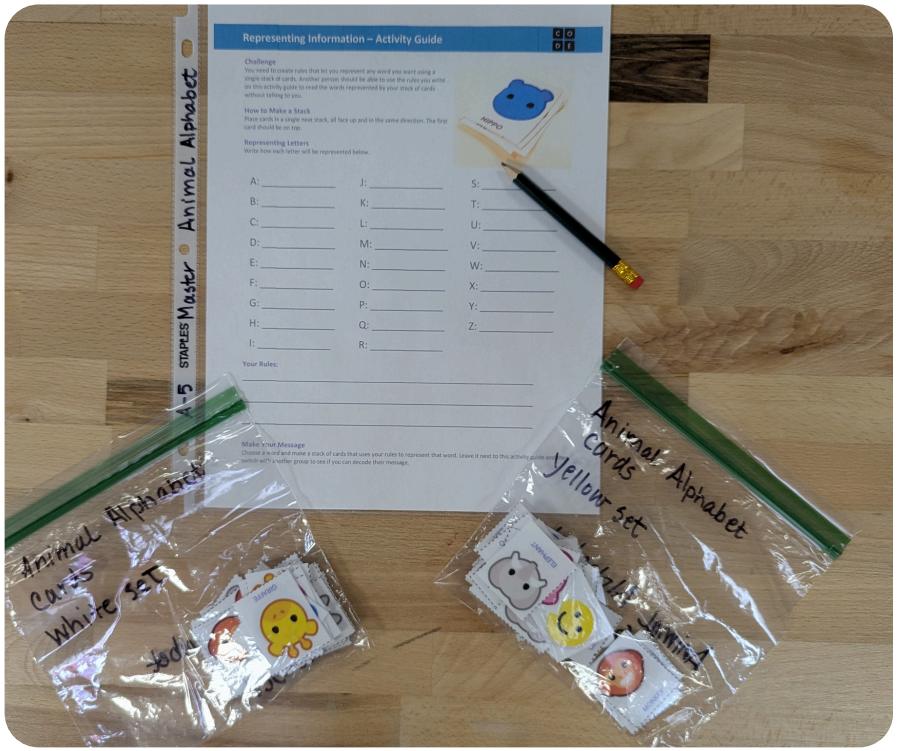
The word "binary" means that it involves two things. Why do you think this number system is call "Binary Numbers"? What do you think a binary planetary system is?

DO

You will put your birth date on a bracelet in binary using different colored beads. You will need to use one color for the zeros, a different color for the ones, and a third color for filler beads in between the numbers.

For example, Juliette Gordon Low's birthday is October 31. Her bracelet would look like:





Animal Alphabet

Create your own code using animals and then swap to see if you can decode each others messages.

What you need to supply:

- Pencils
- Copy of worksheet if you want one for each Girl Scout

From the kit:

Activity A-5
*see the troop leader guide page 14-17 for more information and tips/tricks if your troop gets stuck

One “Representing Data” activity is required for:

Brownies | Juniors | Cadettes | Seniors

A-5: Animal Alphabet

READ

Data Representation is how we use a code, such as binary numbers, to represent something in the computer. For example, computers can't understand pictures or sound if it hasn't been converted into a language the computer knows. We can use number systems such as binary or something called hexadecimal to represent the data that we want to put into the computer and get out of the computer.

THINK

Can you think of something in Girl Scouts that is used to represent something else? What do your badges represent? How do different badges represent different things?

DO

Your team will be creating your own "code" to represent letters in our alphabet. Your code will be made up a stack of animal pictures. Decide how each letter will be represented and then write out the rules of your language. All of your words have to be stacked into a single stack of pictures. The pictures all have to be face up and in the same direction

After your language is ready, write a message to a the other team and give them the rules and code to figure out your message without your help. Were they able to do it? If not, try making some changes to your code or rules and see if they can figure out the message. Keep debugging your code and solving your problems until the other team can read your code.

How did you "debug" or find the problems and fix your code?

Troop Handshake

Create a Troop Handshake or dance and add in functions or debugging if you'd like.

From the kit:

None

What you need to supply:

- Optional: markers and posterboard or paper

One "Algorithms" activity is required for all ages, a second is required for Daisies and Brownies

Daisies | Brownies | Juniors | Cadettes | Seniors

B-1: Troop Handshake, also works for Functions and Debugging

READ

Computer scientists use algorithms all the time. An algorithm is a fancy word for directions or a set of steps. When a computer scientist writes an algorithm, they pay attention to the order of their steps and how much detail they should put into their directions.

After a programmer has written an algorithm, they test it. If they find problems, or "bugs", they go back and re-write the algorithm. This is called debugging.

Sometimes programmers have part of their code that they need to repeat. They can write a repeat step called a loop. Other times, programmers need to do the same steps lots of different times in their program. They would write these steps separately as a mini-program called a function and give it a name. Then, they can just write the name of the function and the program will do all of those steps.

THINK

Why do you think fixing an algorithm is called debugging?

DO

With your group, come up with an algorithm for a handshake or dance that you can all do together. It might help to write your algorithm down. After you have the steps in the order you want them, practice your algorithm and see if you like your handshake or dance.

Do you need to debug anything? Could you add in a loop or a function?

Let's Go Code

Learn about algorithms by creating a set of directions to get through a foam square coarse.

From the kit:

Smaller tub: Activity B-2

What you need to supply:

- None

One "Algorithms" activity is required for all ages, a second is required for Daisies and Brownies

Daisies | Brownies | Juniors | Cadettes | Seniors

B-2: Let's Go Code, also works for Functions and Debugging

READ

An algorithm is a set of steps. In other words, it is a list of instructions or directions. The algorithm is written by a computer programmer, or coder. If an algorithm doesn't work, the coder will need to fix the "bugs" or problems by debugging it. This means that they change the algorithm to try and fix the problems.

THINK

Where have you see algorithms before in your every day life?

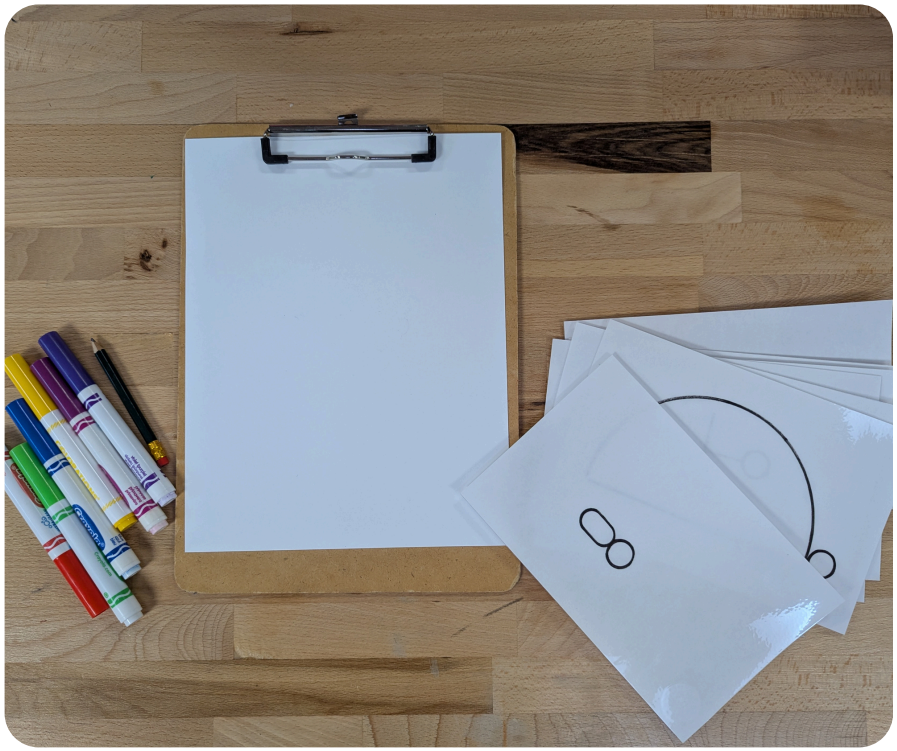
DO

You will work in teams of 2-3. One person will be the Explorer who acts like the computer or robot: you can only do what the algorithm says, even if it is wrong. The other person or people will be the coder that sets up the algorithm and the caller that says the algorithm out loud.

Set up 8 foam square for each group. The arrow goes on the start foam square and the robot is the finish.

After the coder is done with the algorithm, the caller will read it out loud and the explorer will follow it. Did the explorer make it to the end robot? If not, you might need to debug! Take turns being the coder, caller, and explorer.

Challenge cards: X cards mean "don't step here". Broken spring and gears need to be picked up and taken to the robot. The algorithm jetpack card means jump over the Xs, the claw is used to pick up a spring or gear, and the question mark means the Explorer chooses something to do like a song, yoga pose, or dance move!



Back2Back Drawings

Create an algorithm to tell your partner how to copy your drawing without looking at it.

From the kit:

Activity B-3

What you need to supply:

- paper
- markers, pencils, or crayons
- clipboards or something to write on

One “Algorithms” activity is required for all ages, a second is required for Daisies and Brownies

Daisies | Brownies | Juniors | Cadettes | Seniors

B-3: Back2Back Drawings, also works for Debugging

READ

An algorithm is a set of steps. In other words, it is a list of instructions or directions. The algorithm is written by a computer programmer, or coder. If an algorithm doesn't work, the coder will need to fix the "bugs" or problems by debugging it. This means that they change the algorithm to try and fix the problems.

THINK

What do you think a computer does if the algorithm is wrong or is entered into the computer incorrectly?

DO

You will sit back to back with your partner. One of you will take a card and describe to your partner step by step how to draw the picture. You can only give simple directions such as lines, curves, circles, triangles, squares, above, below, etc.

How close does the artist comes to the original picture? How could you debug the algorithm and make the instructions clearer?

Take turns being the coder and the artist!

Walk the line

Create an algorithm to tell your partner how to copy your drawing without looking at it.

From the kit:

Activity B-4: Walk the line laminated cared

What you need to supply:

- Blindfolds
- Painters tape or masking tape

Set Up:

- Put the tape in different shaped paths on the floor. Ideally this is done so the Girl Scouts don't see it before the activity.

One "Algorithms" activity is required for all ages, a second is required for Daisies and Brownies

Daisies | Brownies | Juniors | Cadettes | Seniors

B-4: Walk the Line, also works for Debugging

READ

An algorithm is a set of steps. In other words, it is a list of instructions or directions. The algorithm is written by a computer programmer, or coder. If an algorithm doesn't work, the coder will need to fix the "bugs" or problems by debugging it. This means that they change the algorithm to try and fix the problems.

THINK

What do you think a computer or robot does if the algorithm is wrong? What happens if the programmer makes a typo?

DO

You will take turns being the "robot" by being blindfolded and having to follow the coders directions to follow the line on the floor. No peeking! You may want to keep your hands up in case your coder has problems and needs to debug the algorithm to get you to the end of the line.

Take turns! If there are more than one path you can try a different path, otherwise you can try to debug your algorithm and see if you can "code" it so that your Robot doesn't go off the line.

Tangram Algorithms

Write directions (an algorithm) to describe how to create a specific picture using tangrams. Try out each others algorithms.

From the kit:

Activity B-5

What you need to supply:

- Pencil and paper or other writing supplies

One “Algorithms” activity is required for all ages, a second is required for Daisies and Brownies

Daisies | Brownies | Juniors | Cadettes | Seniors

B-5: Tangram Algorithms, also works for Debugging

READ

An algorithm is a sequence of steps, or in other words, a set of directions. If there is a problem or “bug”, we have to fix or “debug” it.

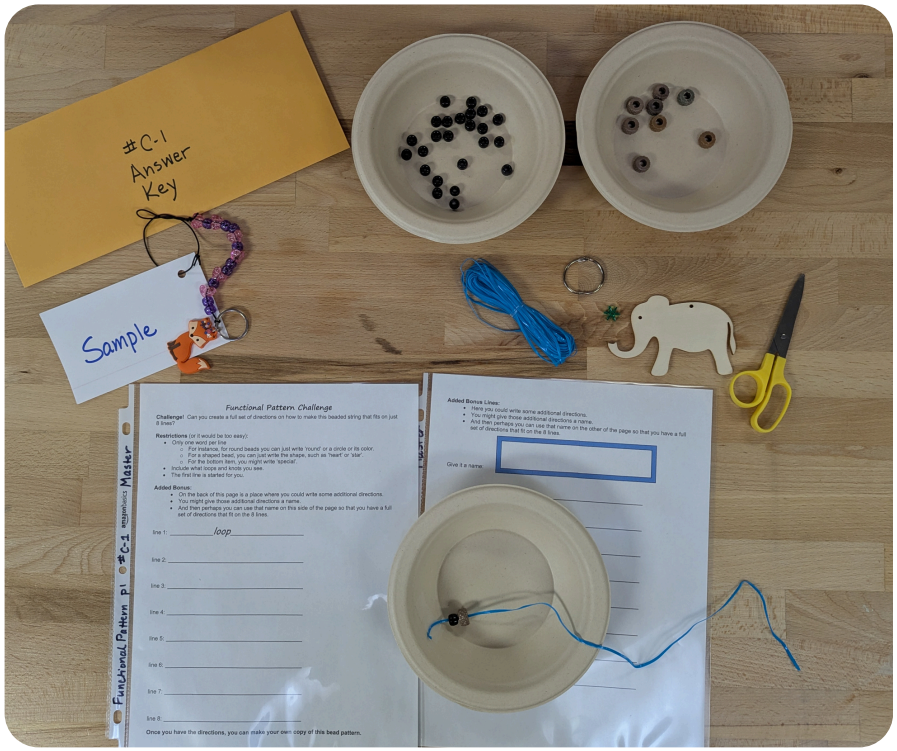
THINK

What would happen if you gave a computer the wrong directions? Why is it important to double check our work when we write an algorithm?

DO

Create a picture with your set of tangrams. Write out directions for someone to put together the same picture without looking at it. Be as detailed as you can.

Then someone else will read your directions and you won’t be able to give any hints! The rest of the group can try to make the picture based on your algorithm. How close did they get? Take turns trying each others algorithms.



Functional Pattern Challenge

Learn about Functions and Loops while creating a keychain.

From the kit:

Activity C-1

What you need to supply:

- elastic cord or string cut into 18" sections
- Beads: two different shapes
- a fun bead, charm, or keychain for the last step; you may need a jump ring or lobster clip to connect the charm
- scissors
- tape
- tray or container to work on
- containers to hold the beads
- copies of the Functional Challenge Worksheet
- pencils

One “Functions” Activity is required for:

Brownies Juniors Cadettes Seniors

C-1: Functional Pattern Challenge

READ

In Computer Science, a function is a reusable section of code that does a specific job. After you have written a function, you give it a name so that you can "call" it by that name when you need to put it in your code. Sometimes functions are similar to a loop, but a loop repeats the directions right away. In a function, you can call it whenever you want and have lots of code in between the times you use a function.

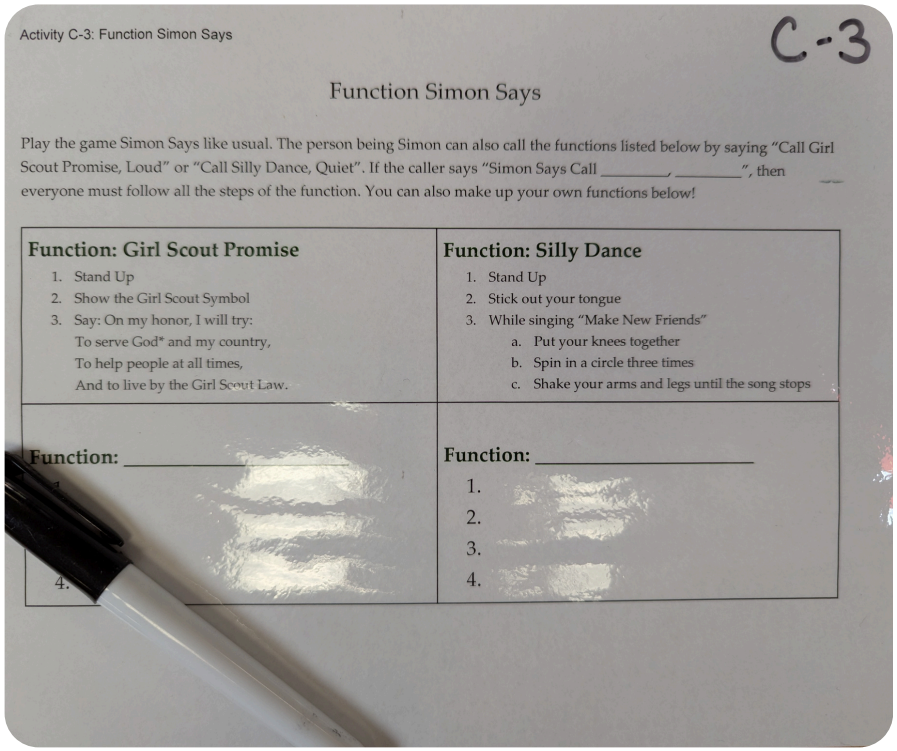
THINK

Why would it be helpful to use functions in your code? When would you use a function versus a loop?

DO

Look at the Sample. The starting place will be the knotted loop at the top followed by a pink heart bead. The last step of your algorithm will be adding the special bead/charm. You are going to write an algorithm for how to create this keychain pattern. Your algorithm will start with the making a loop on the string. We will call this step "Loop". You will need to figure out the rest of the algorithm, but it can't have more than 8 steps. Pay close attention to the pattern, you might need to stretch the elastic to look for any hidden knots!

You can choose to write a function or a loop to help make the pattern fit in the 8 lines.



Activity C-3: Function Simon Says

C-3

Function Simon Says

Play the game Simon Says like usual. The person being Simon can also call the functions listed below by saying "Call Girl Scout Promise, Loud" or "Call Silly Dance, Quiet". If the caller says "Simon Says Call _____, _____", then everyone must follow all the steps of the function. You can also make up your own functions below!

Function: Girl Scout Promise	Function: Silly Dance
1. Stand Up 2. Show the Girl Scout Symbol 3. Say: On my honor, I will try: To serve God* and my country, To help people at all times, And to live by the Girl Scout Law.	1. Stand Up 2. Stick out your tongue 3. While singing "Make New Friends" a. Put your knees together b. Spin in a circle three times c. Shake your arms and legs until the song stops
Function: _____ 4.	Function: _____ 1. 2. 3. 4.

Function Simon Says

Practice using a function by playing Simon Says. Simon can call the Function: Girl Scout Promise or Silly Dance or you can create your own.

From the kit:

Activity C-3

What you need to supply:

- Nothing

One "Functions" Activity is required for:

Brownies | Juniors | Cadettes | Seniors

C-3: Function Simon Says

READ

Functions are a way to organize our code when we need to repeat an action in different parts of the code. The function lists all the steps you need to do the action. We give the function a name. Then we can "call" the function name and it will do the action without writing every single step.

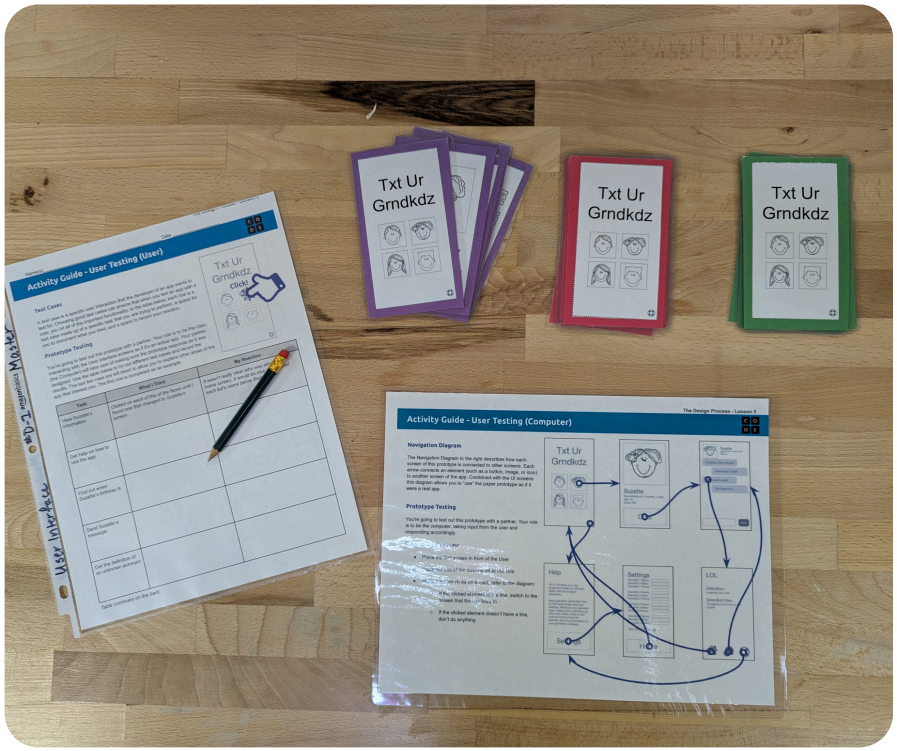
THINK

Why do you think functions or loops could be helpful when you write code?

DO

Play the Function Simon Says game. You play Simon Says like normal, but the person calling can also say "Call Girl Scout Promise, Loud" or "Call Silly Dance, Quiet".

If they say "Simon Says Call _____, _____" for one of these functions, you'll need to follow the steps of the function. You can make up your own functions too!



User Centered Design

Work with a paper prototype for an app and develop the user interface

From the kit:

Activity D-1

What you need to supply:

- Pencil
- Copies of User Testing if you would like

One “User Interface” Activity is required for:

Cadettes

D-1: User Centered Design

READ

When you use an app, website, or computer program, have you ever clicked a button that wasn't actually a button? Or clicked a button and it took you to a different page than you thought it would?

These are all parts of the User Interface, how a user actually uses the program. When you create a new app or program, the best approach is to focus on how the user would actually use the app. This is called user centered design. Oftentimes programmers will make a paper prototype before an electronic prototype and have the intended user pretend to use the app while the programmers watch or record the interaction.

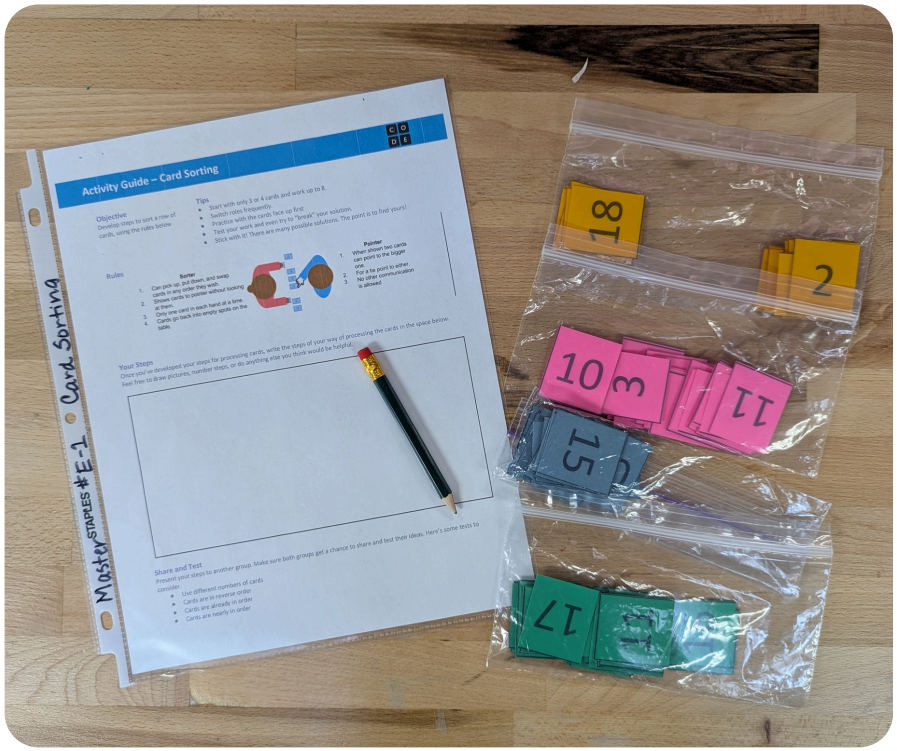
THINK

Why do you think it would be helpful to start with a paper prototype of the app or program first? What information would you get from using a paper prototype that you would miss with an electronic prototype?

DO

With a partner or small group, one person will be the computer and everyone else will be the users of the program. The computer will put the home screen of the app down first: Txt Ur Grndkdz. The users will try and complete the different tasks. The computer will give the users the next "screen" card that the program would display when they click on something. Record what the users tried and your reactions to what happened.

Are there any "screen" cards that you would change? How would a programmer use this information to help them program their app?



Card Sorting

Figure out how to work with a partner to sort numbers similar to how a computer

From the kit:

Activity E-1

What you need to supply:

- Pencil
- Paper or Copies of Card Sorting worksheet if you would like

One “Sorting ” Activity is required for:

Cadettes Seniors

E-1: Card Sorting

READ

There are several different ways to sort data in computer science. Different techniques might be faster or be completed in fewer steps. Depending on what type of data you are working with and how it needs to be sorted (grouped by number, biggest to smallest, etc), you would choose a specific sorting method.

THINK

How do you sort data in math class? What steps would you take to sort the following numbers in order from biggest to smallest?

23, 45, 2, 37, 105, 76, 81, 93, 0.62, 82, 37, 56

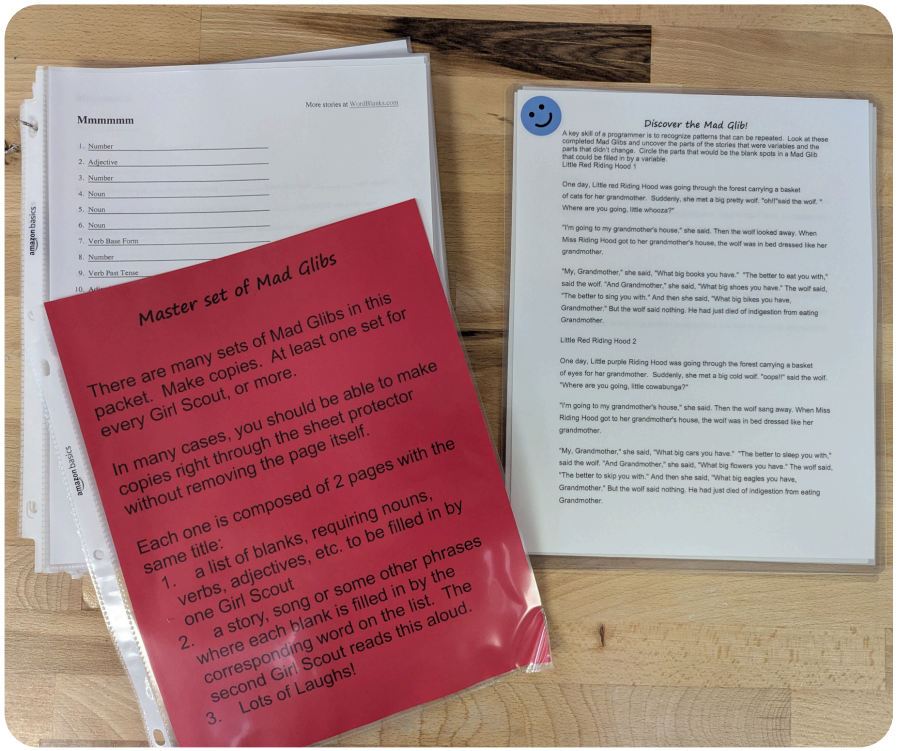
DO

One person will be the sorter and the other will be the pointer.

Sorters can: Pick up cards, put down cards, swap cards in any order. Show cards to pointer without looking at them. Have up to one card in each hand. Put cards back into only empty spots.

Pointers can: Point to the bigger of two cards shown. Point to either card if it is a tie. The can NOT talk or communicate any other way.

Figure out how you will work together to sort the data. You may want to start with just a few cards face up. Once you have a system started, then you can add more cards and turn them face down. Write out the steps to your process. Then test it and share with other groups!



Mad Glibs

Learn about variables and abstraction by reverse engineering the popular game Mad Libs.

From the kit:

Activity F-1

What you need to supply:

- Pencil
- Copies of the Mad Libs if you would like

This Activity is required for:

Juniors

F-1: Mad Glibs

READ

In computer science, a variable is a storage container that can hold information. In the English language, we have variables such as adjective, verb, and noun. They are a general category that we can fill in with something specific as we need it. When you play the game Mad Libs, you are given a list of variables that you have to define. For example, your list might be adjective, noun, noun, verb. You could define these variables as cold, dog, ball, running. If you start with the code and have to work backwards to make up the variables, this is called abstraction. You are making categories based on specific examples.

THINK

In the song “Old McDonald”, we sing that he has a cat, a dog, a cow, etc. Can you abstract from that song to make the category or variable that needs to be filled in? Old McDonald had a farm, EIEIO. And on that farm he had a _____, EIEIO. With a _____, _____ here and a _____, _____ there, EIEIO.

DO

On the page “Discover the Mad Glib”, you are going to read the two stories and find where the blanks, or in other words the variables, would go. You will nead to compare the two stories to figure out each of the variables and circle where they would go.

You can give these variables a name such as time, adjective, noun, etc and have a friend play the Mad Lib you created!

Rapid Prototyping

Create two story marshmallow and toothpick structures and quickly test, revise, and test again.

From the kit:

None

What you need to supply:

- mini marshmallows (100 per team, per attempt)
- toothpicks (100 per team, per attempt)
- sandwich bags or bowls to hold the marshmallows and toothpicks
- paper
- pencil
- timer or a cell phone for timing
- books or something else that can be used for weights

Set Up:

- Consider counting out 100 marshmallows and toothpicks per team per attempt and pre-packaging them in a bag or bowl to save time

The Rapid Prototyping Activity is required for all levels:

Daisies | Brownies | Juniors | Cadettes | Seniors

G-1: Rapid Prototyping

READ

Rapid prototyping is a used to quickly create an object that can be tested, revised, and tested again quickly.

3D object scanning, 3D printing, CNC machining, and injection molding are all types of technology that can help design and create an object quickly so that you can test it and make changes to the design and then create the improved object again quickly.

These objects might not be the best quality because they are just being used as part of the design process instead of the final creation.

THINK

Why would machines such as 3D printers be used for rapid prototyping instead of making something with wood or metal?

DO

Divide into small groups or teams of 2-4 people. You will be creating a two-story structure out of toothpicks and marshmallows. You only have 100 of each for your team. Your structure must be flat on top so that it can hold books as a weight.

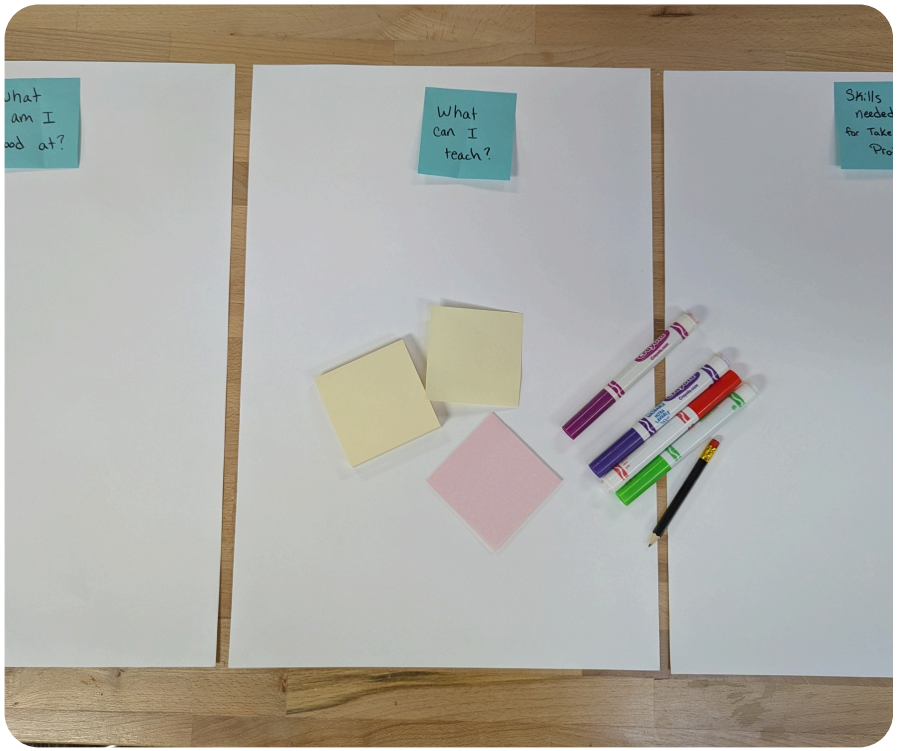
PLAN, 5 min.: No touching the materials! Plan with your team how you will create your structure

BUILD, 10 min.: You only have 10 minutes, no extra!

OBSERVE: How did everyone else build their structures?

TEST: Add weights to your structure to see how much it can hold.

REVISE: Plan, build, and test a new structure using what you learned from the first structure. You can continue revising to see what makes the strongest structure!



Take Action Project: Brownies & Juniors

Work together to identify your talents and skills, a need in your community, and a solution that you can carry out to make your world a better place!

From the kit:

Activity H-1

What you need to supply:

- Post-It Notes
- Pencils
- Poster board and markers or a whiteboard with markers

A Take Action Project is required for all levels:

Daisies | Brownies | Juniors | Cadettes | Seniors

H-1: Take Action Project: Brownies & Juniors

READ

A Take Action Project matches your talents to a problem or need in your community. The project is also sustainable. Sustainable means that the good that your project is doing for the community keeps happening, even when you're done with the project.

THINK

To get started you need to think about:

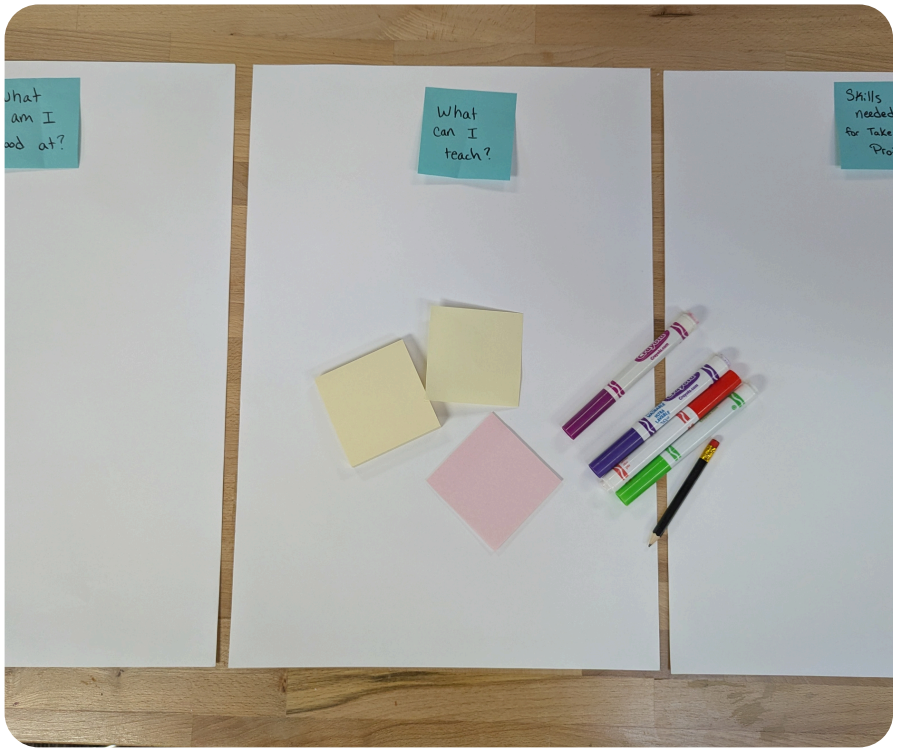
1. **Talents:** What are some of your strengths? What positive things would a friend or troop leader say about you?
2. **Community needs:** Pay attention to the places and groups of people around you. Are there any problems that you notice or things that could be improved?
3. **Solutions**: What are some ways that we can solve those problems or fill those needs? Which of these solutions are you able to do? Are there some problems or solutions that fit with your talents better?
4. **Sustainability**: How can your project have a positive effect going forward? Is there a way to make your project more permanent, expand it further, or teach other people the skills needed to keep helping in the future?

DO

You will get three post-it notes or cards. On the first Post-It note, write down what you are good at. On the second Post-It note, write down what you can teach. On the third Post-it note, write down how you think technology can improve/what skills you need for take action projects.

After everyone has time to think and write, then you can share as a group what your strengths are, what you can teach, and how you can technology can improve. As a group, discuss some possible ideas for a take action project in your area.

Your group will need to decide if you are going to debate which project to do or if you will vote for a project, and if you are going to vote, how would you like to do that? Keep in mind everyone's talents and skills as you decide on a project. Then you will choose your project as a group, plan it, and complete the project to help make the world a better place!



Take Action Project: Cadettes and older

Work together to identify your talents and skills, a need in your community, and a solution that you can carry out to make your world a better place!

From the kit:

Activity H-2

What you need to supply:

- Post-It Notes
- Pencils
- Poster board and markers or a whiteboard with markers

A Take Action Project is required for all levels:

Daisies Brownies Juniors Cadettes Seniors

H-2: Take Action Project: Cadettes, Seniors, Ambassadors

READ

A Take Action Project matches your talents to a problem or need in your community. The project is also sustainable. Sustainable means that the good that your project is doing for the community keeps happening even when you're done with the project. To get started you need to think about :

1. Talents: What are some of your strengths? What positive things would a friend or troop leader say about you?
2. Community needs: Pay attention to the places and groups of people around you. Are there any problems that you notice or things that could be improved?
3. Solutions: What are some ways that we can solve those problems or fill those needs? Which of these solutions are you able to do? Are there some problems or solutions that fit with your talents better?
4. Sustainability: How can your project have a positive effect going forward? Is there a way to make your project more permanent, expand it further, or teach other people the skills needed to keep helping in the future?

THINK

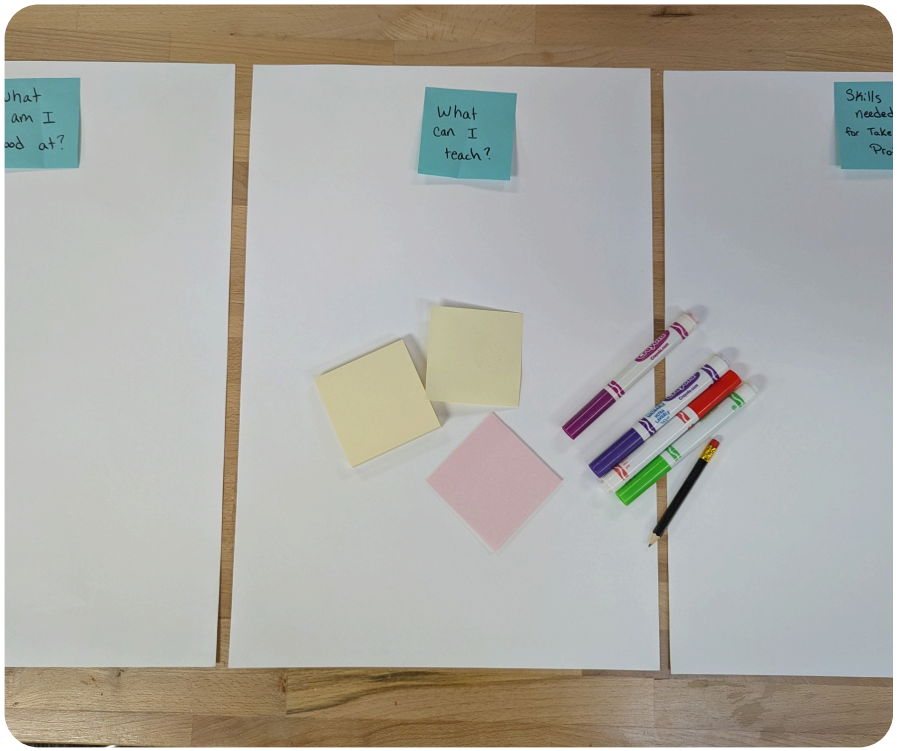
How is a take action project different than a community service project such as picking up trash at a park? You can read some of the materials included in the kit to get a better idea of some of their differences.

DO

You will get three post-it notes or cards. On the first Post-It note, write down what you are good at. On the second Post-It note, write down what you can teach. On the third Post-it note, write down how you think technology can improve/what skills you need for take action projects.

After everyone has time to think and write, then you can share as a group what your strengths are, what you can teach, and how you can technology can improve. As a group, discuss some possible ideas for a take action project in your area.

Your group will need to decide if you are going to debate which project to do or if you will vote for a project, and if you are going to vote, how would you like to do that? Keep in mind everyone's talents and skills as you decide on a project. Then you will choose your project as a group, plan it, and complete the project to help make the world a better place!



Take Action Project: Daisies

Learn about making a decision as a group and voting.

From the kit:

Activity H-3

What you need to supply:

- Post-It Notes
- Pencils
- Poster board and markers or a whiteboard with markers

A Take Action Project is required for all levels:

Daisies | Brownies | Juniors | Cadettes | Seniors

H-3: Take Action Project: Daisies

READ

A Take Action Project is a project that you do with a group to help make your community a better place. You start by figuring out what you and your group are good at or like to do. Then, you look for problems or things that need to be made better in your community. You can look at places like your schools, neighborhoods, parks, or even your local Girl Scout camp. You will decide with your group what project you will do and how you will get it done.

THINK

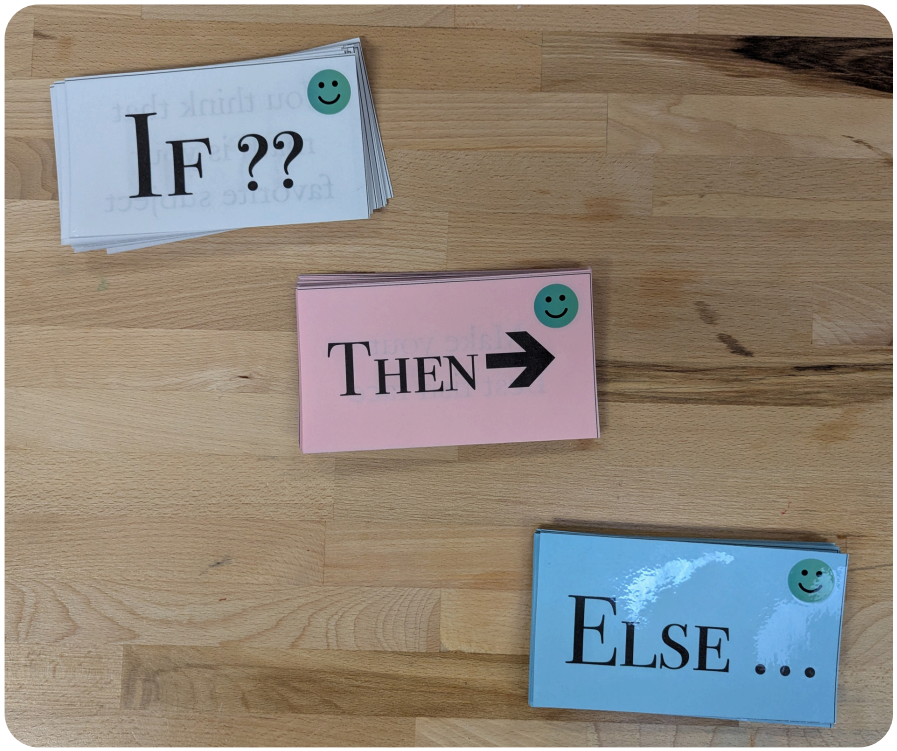
What types of things are you good at? What types of activities do you like to do? How should we talk to the other people in our group when we are deciding which project to do?

DO

With your grown up, go over the 8 "Getting Ideas" cards and discuss which ones each of you think is important. Then, on a post-it note you can write or draw something that you are good at doing or like to do.

After everyone shares what they like to do or are good at, you will discuss as a group some things that you can do around the community to help make it a better place. Your grown up will keep a list of all of the different ideas.

You group will discuss the different ideas and decide how to vote. You might decide that everyone gets one vote, or that everyone can vote for two ideas. Your troop leader will help you decide the best way to vote for your troop. If you need practice voting beforehand, you can do a pretend vote about which treat a group of kids should get for a celebration.



If Then Else Game

Play a game to discover the conditionals If, Then, Else and If, Or, Then, Else.

From the kit:

Activity I-1

What you need to supply:

- None

One “If-Then Logic” Activity is required for:

Brownies

Juniors

I-1 and I-2: If-Then-Else Game, If-Or-Then-Else

READ

In computer programming we use conditionals. A conditional tells the program what to do during certain conditions. So to turn on a lightswitch, we could code: **IF** the light is off, **THEN** flip the switch to on, **ELSE** leave the switch alone. In this example, the condition we're looking for is if the light is off. If it is off, then we turn it on. Else means otherwise, so otherwise if the light isn't off, then leave the switch alone.

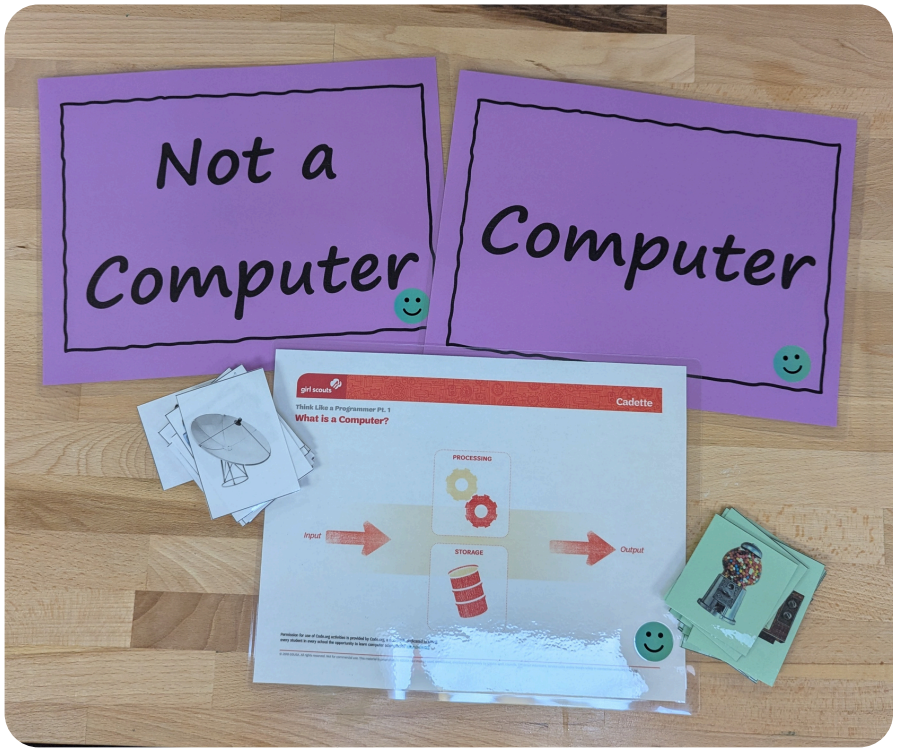
THINK

Another way to think of conditionals is by thinking if the condition is true or false. Would true go with **THEN** or **ELSE**? Why?

DO

To play the game, one person will flip over an **If, Then,** and **Else** card. Follow the directions **IF _____ (is true), THEN _____, ELSE (otherwise)_____.** You can also make up your own IF, THEN, ELSE statements without the cards if you would like. Take turns flipping over the cards or making up conditional statements.

For a challenge, you can add in the **OR** cards. This would make it so that if the **If** or the **OR** are true, then you would do the **THEN.** If neither the **If** or the **OR** are true, then you would do the **ELSE.**



What is a Computer?

Learn about what makes something a computer.

From the kit:

Activity J-1

What you need to supply:

- None

One “What is a Computer” Activity is required for:

Juniors

Cadettes

J-1: What is a Computer?

READ

A computer is made up of at least four components: inputs, outputs, processing, and storage.

Inputs: An input is something that goes into a device such as clicks from a mouse, or words typed by a keyboard.

Outputs: An output is something that the computer creates such as an image on the screen or a sound.

Storage: A hard drive is long term computer storage and the memory is for short term storage.

Processing: The processor on a computer carries out the instructions and does the calculations.

THINK

When we say the word computer, we often think of a laptop or desktop computer. Can you think of another example of something that is a computer?

DO

Divide into two groups. Your group will look at each picture and decide if it has all four components that would make it a computer. Make one pile of pictures for computers and another pile for things that are not computers.

Compare your results with the other team. Each team has some of the same cards and some unique cards. Do you agree with each other? Which items were the hardest to categorize? Why?

Puzzles

Learn about Debugging while completing simple puzzles.

From the kit:

Activity K-2

What you need to supply:

- None

Optional Activity. Recommended for Daisies if debugging is not completed in an algorithm activity.

Daisies

K-2: Puzzles

READ

When there is a problem with a computer scientists code, sometimes that is called a bug. When the scientists works to fix the problem, we call it debugging.

THINK

What types of problems do you think there could be in computer code?

DO

You will divide into two teams. Each team will get one bag of puzzles (red or blue dots on the back of the pieces).

Work in your groups to solve your puzzle. Do you have a set of steps you follow to find the next piece and put it in the puzzle?

When you are finished, you will discuss in your groups and all together:

1. What words did you use to talk to each other that were helpful?
2. What actions allowed everyone's ideas to be heard?
3. What problems did you have? How did you debug or solve those problems?
4. Did you get frustrated? What helped you get past the frustration?