Introduction to the Junior Think Like a Programmer Journey

This is an UNOFFICIAL rewrite of the Junior Think Like a Programmer Journey found in the VTK. Formatting was added for easier reading, and it was condensed to save paper when printing. It does not include any meeting structure like a flag ceremony, reciting the GS Promise & Law, or a Friendship Circle so that you can customize it for your own meeting. Before starting, read the referenced handouts located in the Appendix:

- **Junior Think Like a Programmer Journey Materials List:** Each meeting has its own materials list, but you can use this handout if you like to do all your supply shopping at one time. It includes all materials needed for the entire Journey.
- **Junior Think Like a Programmer Journey Glossary:** This is a list of words that Juniors may not know and how to define them.
- **Think, Pair, Share:** These facilitation tips will help you to make sure that every girl's voice is heard during brainstorming activities.
- **Take Action Guide:** This handout explains the difference between Take Action and Community Service. It also includes tips to make a project sustainable and Take Action project ideas that you and your troop can use as inspiration.
- **Tangram-Set-and-Algorithm-Card-Images-Pack.pdf**
- **Worksheet-Tangram-Algorithms.pdf**
- **Worksheet-Functional-Suncatchers.pdf**
- **Functional-Suncatchers-Skills-Sheet.pdf**
- **Mad-Glibs-Abstraction-Worksheet.pdf**
- **Worksheet-Mad-Glibs-Assessment.pdf**
- **Personal-Innovations-Activity-Guide.pdf**
- **Conditional-Examples-Sheet.pdf**

Juniors earn two awards -Think Like a Programmer award and the Take Action award - following the completion of the Take Action project and Journey in **Think Like a Programmer Part 6**.

Notes for Volunteers:

Use the Talking Points (But Make Them Your Own): In each session, you'll find suggested talking points under the heading "SAY." Some volunteers, especially new ones, find it helpful to follow the script. Others use the talking points as a guide and deliver the information in their own words. Either way is just fine.

Be Prepared (It's What Girl Scouts Do!): Each meeting includes a "Prepare Ahead" section that includes a materials list and what kind of set-up is required. Read it in advance so you have enough time to gather supplies and enlist help, if needed.

Use Girl Scouts' Three Processes: Girl-led, learning by doing, cooperative learning -- these three processes are the key to making sure Juniors have fun in Girl Scouts and keep coming back.

"Learning by doing" and "cooperative learning" are built into this Journey, thanks to the hands-on activities and tips. You'll also find specific "keep it girl-led" tips in the meeting plans. They'll help you create an experience where Juniors know they can make choices and have their voices heard.

Solve Big Problems Step By Step: On this Journey, Juniors will do hands-on activities to learn how computer programmers think through problems. They'll learn to follow and create algorithms, break big problems down into smaller ones, and persist when faced with challenges.

You can help Juniors think this way! Encourage them to keep trying when their first few approaches to solving a problem don't work. Tell them that they can solve any problem if they break it down in smaller ones. And remind them that they can use those skills in their daily lives as well.

Leave Time For The Closing Ceremony: If Juniors are having fun doing an activity, you may be tempted to skip the Closing Ceremony so they can keep going -- but the Closing Ceremony is absolutely key to their learning. Here's why:

When Juniors leave a meeting, they'll remember how much fun it was to plant a seed, make a suncatcher or play a game of "Programmer Says." However, they may not realize that they just learned how algorithms work -- unless you tell them. When you do that, you turn a hands-on activity into a minds-on activity. During the Closing Ceremony, you can connect the dots for girls by:

- Pointing out how they acted as programmers. (For example: They used an algorithm to plant a seed or they created an algorithm to teach a skill to others. They struggled a bit with a challenging activity -- but they persisted. Now they know that they can solve hard problems if they keep trying. They worked together to solve problems.)
- Reminding Juniors that they are already programmers -- and that it's fun to solve problems using programming.
- Letting them know that they have what it takes to continue exploring STEM.

These simple messages can boost girls' confidence and interest in STEM -- and end the meeting on an upbeat note!

Tell Your Troop Story: As a Girl Scout leader, you're designing experiences that girls will remember their whole lives. Try to capture those memories with photos or videos. Girls love remembering all they did -- and it's a great way for parents to see how Girl Scouting helps their girls.

And please share your photos and videos with GSUSA by emailing them to STEM@girlscouts.org (with photo releases if at all possible!).

Program Pairing: The Junior Digital Photographer and Entertainment Technology badges go well with this Journey!

Junior Think Like a Programmer Journey Part 1

Overview: Juniors are introduced to the Think Like a Programmer Journey and explore computational thinking by creating algorithms to make images with tangrams. Girls will learn that there are lots of ways to use an algorithm if you keep it simple. However, if you want to make sure everyone ends up with the same thing, then your algorithm needs more detail.

Prepare Ahead

1. Watch two videos

> ***Tangram Algorithms* video** (1:12): code.org/girlscouts/TangramAlgorithms/OverviewVideo

This video gives a brief overview of the objectives, instructions, and several tips for preparation for Activity 3: Tangram Algorithms.

***Unplugged Activity: Tangram Algorithms* video**
(1:46): code.org/girlscouts/TangramAlgorithms/ActivityVideo

The video introduces girls to Activity 3: Tangram Algorithms. This video may be shown to the girls prior to starting the activity. This is optional. You may not have the wi-fi connection or the time to show the video.

2. Review vocabulary (2 minutes)

This meeting includes the following vocabulary:

- **Computational Thinking** -- the thought processes involved in formulating a problem and expressing its solution(s) in such a way that a computer--human or machine--can effectively carry out.
- **Algorithm** -- a list of steps that you can follow to finish a task.
- **Program** -- instructions (or an algorithm) that can be understood and followed by a machine

3. **Read through this guide and the handouts in the Appendix.**

Activity 1: As Girls Arrive: Create Your Own Code

Materials

- Paper
- Pens or pencils

Steps

Welcome Juniors, and have them pair up to create their own secret code. First, girls create a "Key" for their code.

Suggested conversation: *Have you ever made a written code before? Try it out! First, create a Key so you don't forget. Remember, you could have a new symbol for each letter, like in Morse Code, but symbols can also mean anything you want them to mean. You could have a symbol that stands for a word or even an entire phrase.*

For example, you might draw a different squiggle-and-dot pattern for each letter of the alphabet. Or you might use shapes, like combinations of triangles, circles and squares to stand for different words, like your name, hello, or goodbye. Work with your partner to create a Key on your paper. You might want to split up the alphabet or choose a few words to create a code for.

> **Note:** There is no right or wrong way for girls to create their codes. This activity is intended only as a warmup to get girls thinking about coding.

Explain to Juniors that they created a special code, just like computer programmers write code.

Suggested conversation: *Today, each of you made a special code. Instead of using letters, you used symbols to create a Key for your special code. Just like you, computer programmers are people that use special codes to give instructions and messages to computers and other programmers. Programmers*

even use different coding languages, just like you created different codes, to share the same message in different ways.

If there's time, Juniors can practice writing messages back and forth.

Activity 2: Opening Ceremony: Jump into Computational Thinking!

Materials

- None

Steps

Introduce Juniors to programming and the new Journey they will be starting.

Suggested conversation: *Today we are starting a new Journey where we are going to learn to think like computer programmers! Does anyone know what programmers do?*

Programmers work together in teams and on their own to write special codes that run on computers, phones, and all other technology. They create websites, apps and many other things that you use every day! (Explain how programmers use computational thinking to solve problems.)

Have you ever had a problem that you had never solved before? How did that feel? What did you do to tackle the problem? Did you create a plan?

Those are some great ideas and strategies to solve problems. Today, we are going to build on these ideas and learn how to think like a computer programmer! Programmers have a special ways of thinking and solving problems called computational thinking. They take big, big problems and break them down until they can create a program or solution that works for everyone. In this Journey, you're going to learn how programmers use computational thinking to create code and programs that help others.

Activity 3: Tangram Algorithms

Materials

- **Tangram Set & Algorithm Card Images Pack** (one for each girl) – see Appendix
- Scratch paper for writing algorithms or building images
- Markers, pens, or pencils
- Scissors
- Optional: Sets of tangrams to use as example
- Optional: Computer, tablet or other device with ability to show girls the [Unplugged - Tangram Algorithms](#) video (https://www.youtube.com/watch?v=xZlKyTwQZv8)
- Optional: If your troop has never used Tangram pieces, you can choose to do an example for them or even have an entire Tangram activity. Search online for activities that girls can play in reality (using real tangrams) or online.
- Optional: **Worksheet: Tangram Algorithms** (one for each girl) – see Appendix

An "assessment worksheet" sounds a lot like school, but girls will probably see this as a fun puzzle page. If there's time, girls could do the activities in the meeting or you could give each girl a copy to take home.

Perhaps they'd like to show their families what they learned about algorithms and programs by doing the worksheet together.

Steps

Introduce algorithms to Juniors by using examples from their daily lives.

Suggested conversation: *What did you do to get ready for school this morning?*

Write or draw their answers on a flip chart, white board, poster or large piece of paper. If possible, put numbers next to their responses to indicate the order that they happen. If girls give responses out of order, have them help you put them in some kind of logical order.

Suggested conversation: *Which of these things do you do first? What do you do right before you get to school?*

Point out places where order matters and places where it doesn't. For example, you can brush your teeth before you brush your hair or do it the other way around. Explain that these steps together create an algorithm for getting ready for school.

Suggested conversation: *Has anyone ever heard the word algorithm? An algorithm is a list of steps you can follow to finish a task. Let's take an example of something you do every day: brushing your teeth. What are the steps you follow when you brush your teeth? What are some other things you do by following certain steps?*

When an algorithm is coded into something that can be run by a machine, it's called a "program." How many of you have heard of a computer program? That's what tells the computer what to do. Today, we're going to create algorithms to recreate images using. We are going to challenge each other to make the images, without letting the other people in our group see the original image. Has anyone ever played with Tangrams before?

> **Keep It Girl-Led:** Let girls answer. If girls have played with Tangrams in the past, ask them to explain what they did, how the puzzle works, and what they made using the Tangram pieces.

Suggested conversation: *Usually, Tangrams are used to solve puzzles. The player must use all seven pieces in their set of Tans (without overlapping any) to recreate an image that has been given. Often, this is done as an individual activity, and the player is allowed to see the image that they are trying to recreate. Many times, the player can even lay their pieces right on top of the image silhouette to be sure that the solution is just right.*

Optional: If your troop has never used Tangram pieces, you can choose to do an example for them or even have an entire Tangram activity. Search online for activities that girls can play in reality (using real tangrams) or online.

Optional: Show the Unplugged Activity: Tangram Algorithms video here.

Suggested conversation: *Today, we are going to use our tangrams in a slightly different way than you have ever used them before. Instead of looking at our puzzles and trying to guess which shape goes where, we are going to get puzzles that already tell you where each shape goes. You might think that this will make it easier, but it won't, because you will not be able to look at the image that you are trying to recreate! Instead, a teammate will be describing the image to you. To keep it from getting too difficult, we will not use puzzles that require all seven pieces.*

Divide the girls into groups of 3-5, and give each girl a **Tangram Set & Algorithm Card Images Pack**.

Each girl should first cut out their own set of tangrams from their **Tangram Set & Algorithm Card Images Pack**. Each group will use one set of Algorithm Card Images.

Create Tangram Algorithms

Have one member of each group select an Algorithm Card without showing it to anyone else. The person with the Algorithm Card will try to explain the image to everyone else without letting them actually see it. The other players will build their pictures off of the description given by the Card Holder. When the Card Holder is done, everyone will show their pictures and see if they all ended up with the same image.

If everyone ends up with the same drawing, the Card Holder can show the card and see if everyone matched the card. If any of the pictures in the group are different from each other, have the Card Holder try describing the image again, using more detail. Choose a new Card Holder and a new Algorithm Card, and repeat until everyone has had a chance to describe an image. Play through this several times, with images of increasing difficulty.

Share and Reflect

Have Juniors reflect on the activity by having a short discussion.

> **Note:** If you don't have enough time to ask all these questions, just ask the ones in bold type.

Suggested conversation: *Was there anything surprising or interesting about this activity?*

Do you remember the definition of the word "algorithm"?

- *"A list of steps that you can follow to finish a task"*
- *"An algorithm that has been coded into something that can be run by a machine"*
- *"Finding and fixing problems in your algorithm or program"*

Was it easier or harder than you thought it would be to describe an image to one another? Did your group end up having any arrangements that all matched? ***Can you share some tricks that you came up with that helped your group match the Image Card exactly?***

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Activity 4: Closing Ceremony: Programmers, Awards & Take Action

Materials

- Take Action Guide handout

Steps

Go over the steps of doing a Take Action project and how it is similar to how programmers use computational thinking.

Suggested conversation: *There's a special way that Girl Scouts help others. Does anyone know what it is? Girl Scouts do Take Action projects to help make the world a better place. When you do a Take Action project, you spot a problem, break it into smaller pieces, come up with a plan to fix it, and team up to take action. What does that sound like? (Answer: Computational thinking)*

Just like programmers create programs, you're going to be able to create a solution to a problem by teaming up with others. Together, you'll create list of steps, just like an algorithm, that leads to a solution that works for everyone. At each meeting, you'll come up with problems you'd like to solve. I'll keep a list of your ideas, so you can choose one for a Take Action project.

Tell Juniors about the Journey awards they'll earn.

Suggested conversation: *You'll earn two awards on this Journey. The first one is called the "Think Like a Programmer" award. You'll earn that for learning how to solve problems like a programmer. The second one is called the "Take Action" award. You'll earn that for doing a Take Action project that will make a difference in the world.*

If there is time, begin to brainstorm ideas for the Take Action project.

> **Note:** Check out the Take Action Guide handout in the Meeting Aids if Juniors need help with ideas. Bring the list of ideas Juniors come up with to the next meeting.

Junior Think Like a Programmer Journey Part 2

Overview: Juniors learn more about algorithms, abstraction, functions, and variables through activities where they create mad glibs and craft suncatchers.

Activity 1: As Girls Arrive: Snack Algorithms

Materials

> **Note:** For this activity, girls will create algorithms for snacks. We've provided several options, so please choose one alternative that works for your girls' dietary restrictions.

- Bowls or cups
- Option 1: Various small snacks like crackers, pretzels, marshmallows, chocolate chips, dried fruit, etc. that could go into trail mix.
- Option 2: Crackers, spreads, and toppings to create cracker bite snacks.
- Option 3: Celery, spreads, and topping to create Ants on a Log.
- Paper
- Pencils

Steps

Prior to girls arriving, organize the snacks by type into different bowls/cups. Welcome Juniors, and have them create an algorithm for their ultimate snack bite.

Suggested conversation: *What's your favorite type of snack? What ingredients taste good together? The ingredients for your snack are in these bowls. Choose the ingredients you like to create your own personal snack. Then write an algorithm so others can make it, too. For example, I like to take a cracker (that's step one), put a piece of cheese on it (that's step 2), then top it with a slice of cucumber (that's step three). If you use my algorithm, I guarantee you'll have a tasty snack!*

Activity 2: Opening Ceremony: Programmers to the Rescue!

Materials

> None

Steps

Talk about how programmers help others by solving complex problems.

Suggested conversation: *Has anyone ever had a problem that seemed so big they couldn't solve it alone? How did you tackle the problem? Did it help to break it into smaller?*

Explain decomposition to Juniors.

Suggested conversation: *You broke the problem of not knowing how to recreate the tangram down into something much simpler by creating a list of steps to make the image. Often, big problems are just lots of little problems stuck together. You "decomposed" the activity into smaller tasks, letting each step seem a little easier on its own. This is called decomposition. Can you think of any other time in life you might have "decomposed" a problem?*

You decompose big problems into smaller ones every day! Tools of Computational Thinking, like decomposition and algorithms, can help you to figure out how to solve problems that no one has already taught you how to solve! Programmers also use their imaginations to solve problems. They define a need by seeing what problems there are in the world that they can create programs to improve. They brainstorm ideas to design and build the program in teams. Then they test the program and share it with others to test, debug it, and improve it.

Review the following definitions, asking girls for their ideas for each:

- **Algorithm** -- a list of steps that allow you to complete a task. For example, a recipe is an algorithm.
- **Program** -- instructions (or an algorithm) that can be understood and followed by a machine
- **Debugging** -- finding and fixing problems in your algorithm or program

Suggested conversation: *Today, we are going to learn about abstraction as we create fun mad-llibs and then create an algorithm to make a suncatcher.*

Activity 3: Solving Challenges with Computational Thinking

Materials

- **Mad Glibs Abstraction Worksheet** (one for each girl) – see Appendix
- Markers, pens, or pencils
- Pens, Pencils, & Scissors
- **Functional Suncatchers Skills Sheet** (one for each group) – see Appendix

- Create a suncatcher to use as an example for the activity
- Prepare a program and two skills with blank steps on a large paper or blackboard for the girls to help you fill in. (Sample can be found on the Functional Suncatchers Skills Sheet)
- Optional: Computer, tablet or other device with ability to show girls the Unplugged: Mad Glibs activity and Unplugged - Functional Suncatchers videos
- Optional: **Worksheet: Mad Glibs Assessment** and **Worksheet: Functional Suncatchers** (one for each girl) – see Appendix
- An "assessment worksheet" sounds a lot like school, but girls will probably see this as a fun puzzle page. If there's time, girls could do the activities in the meeting or you could give each girl a copy to take home. Perhaps they?d like to show their families what they learned about programs, debugging, functions, and variables by doing the worksheet together.
- For each functional suncatcher:
  - One foot of string, thread, or fishing line
  - 2-4 beads
  - 2-4 other accessories (buttons, hoops, spacers)
  - One special bead, prism, button, or girl-made sun charm

Steps

Explain abstraction to Juniors.

Suggested conversation: *So, what did you have for waffles this morning?* (Your girls may look perplexed.)

No one? Okay, what did you have for toast yesterday? See what I was doing there? I was too specific about what I had yesterday, and that made it harder for everyone else to understand me. What could I have said that more people would have understood?

Let girls answer. At some point, they'll start to come up with the idea of using "breakfast" in place of the actual food that was consumed.

Suggested conversation: *The word "breakfast" is like a variable that we use to hold a space for whatever it is we ate this morning. By taking the specific word out and replacing it with "breakfast," we are using abstraction to make something work for multiple people. Abstraction is a way of pulling out specific differences to make one solution work for multiple problems.*

Ask the troop to give you some examples of other ways that they might use abstraction to create different sentences that can be understood by more people. Let girls answer. The idea of lunch and dinner will most-likely come up. Challenge them to brainstorm if there is anything not food related?

Optional: Show the *Unplugged Activity: Mad Glibs* video here.

Create Mad Glibs

Hand out the **Mad Glibs Abstraction Worksheet**, one for each girl, and explain the activity.

Suggested conversation: *This started as a specific story about one thing, but we used abstraction to turn some of the specific words into blanks, and now the story can be about lots of things. What could you make your story about?*

Each girl should spend around 10 minutes to fill in the blanks in Story 1 of their worksheets with words to create something fun to share. Once each girl has filled in their story, form a Friendship Circle. One at a time, each girl can share her story.

Suggested conversation: *Your stories are all unique, but they started from the same thing! Using computational thinking, you recognized a pattern, you were able to "abstract out", or ignore the details that make things different, and use the general framework to find a solution that works for more than one problem. Abstraction is removing details from a solution so that it can work for many problems.*

If there is extra time, girls can recreate the story once more using the space under Story 2 on their worksheet and share in pairs or as a larger group.

Introduce Functional Suncatchers

Show your suncatcher to the girls, and explain how you made it.

Suggested conversation: *What do you all think about my suncatcher? You will be making a very similar, but slightly different suncatcher today! If I wanted to tell you how I made my suncatcher, how could I do that? I could create an algorithm to tell you exactly how I made my suncatcher.*

Explain variables to Juniors and that they will be using them to make their own suncatchers.

Suggested conversation: *The materials may be different for each of your suncatchers, but the steps to make them will be pretty much the same. For example, my suncatcher has beads like this. Yours may be a different color or even a different shape, but it is still called a "bead".*

This is what my space looks like. Yours may be a different size, different texture, or maybe a different material altogether, but it will still be called a "spacer".

Finally, we will all have a "special charm". Yours might be a large bead, a handmade ornament, or even a random item from the room, but we all will call it a "special charm."

The differences between the types of beads, spacers, or charms are examples of variables. Can anyone tell me what a variable is? A variable is a placeholder for a piece of information that can change.

Optional: Show the *Unplugged - Functional Suncatchers* video [here](#).

Learn about Functions

Show Juniors the sample suncatcher, and explain how they will create their suncatchers.

Suggested conversation: *Let me tell you how I made this suncatcher.*

> **Note:** Your explanation may be different, depending on how you made your suncatcher.

Example of suggested conversation: *First, I put a bead on the string, then I tied a knot. I put another bead on a string, and tied another knot. Then, I put a spacer on the string and tied another knot. After that, I did it all again. I put a bead on the string, then I tied a knot. I put another bead on a string, and tied another knot. Then, I put a spacer on the string and tied another knot. Finally, I put on the special charm, and tied one last knot. That's a lot of steps, right? I'll give you a sing-songy way to remember the order.*

> **Note:** It helps to have a bit of a rhythm with the words as you go through.

Example:

"Bead, knot, bead, knot, spacer, knot.
Bead, knot, bead, knot, spacer, knot.
Special charm, final knot."

Give each girl a **Functional Suncatchers Skills Sheet** and markers, pens, or pencils.

Suggested conversation: *To help, I will also write down the steps to create this program, so that everyone has the directions in front of them to make their own suncatchers.*

Use the paper or chart you prepared on the board with the Program and two Skill set (as seen in the **Functional Suncatchers Skills Sheet**), and begin to write the steps in the "Program" area as the girls shout out instructions. Write one instruction per line. As the girls give instructions and you write them on the paper/board, girls should also copy the instructions on to their **Functional Suncatchers Skills Sheet**.

Example:

PROGRAM

1. Bead
2. Knot
3. Bead
4. Knot
5. Spacer
6. Knot

By now, the girls should be noticing an issue (there are more instructions than lines). If they don't, **ASK**:

- How many instructions do we have left to go through?
- How many lines do we have left?
- What should we do?

Point out that there are two "extra" sections on the Skills Sheet.

Suggested conversation: *There are two "extra" sections on the Skills Sheet. You can use these to combine steps so that you can write one name to call them all in the Program section. For example, everything that you put into the top section, can be used all at once by using "Skill 1" in the Program instructions; this is a function. A function is a piece of code that you can easily use over and over again to help simplify programs.*

Sometimes, when a problem has lots of little pieces, you will notice that the pieces have something in common. If they don't, then they may at least have some similarities to some pieces of another problem that has been solved before. If you can spot these patterns, understanding your pieces gets much easier. What sort of patterns did you see?

A pattern is a theme that is repeated many times. You can find these patterns and create a function that can be called to repeat the pattern over and over! Then you had enough space on your list for all the steps.

Challenge the girls to fill out their **Functional Suncatchers Skills Sheet** in a way that makes sense and allows them to fit the entire sequence under the "Program" list in some way. Give Juniors about five minutes to complete their sheet. If you see that a girl's program is incorrect, help her to "debug" and correct it.

Build Functional Suncatchers

Hand out supplies to the girls. Give each girl:

- One foot of string, thread, or fishing line,
- 2-4 beads,
- 2-4 other accessories (buttons, hoops, spacers), and
- One special bead, prism, button, or girl-made sun charm.

Point out that different people may have different supplies, and they may all be different than the ones you used for the sample suncatcher.

Suggested conversation: *If we have different supplies, should that stop us from sharing the program (instructions) to create the suncatcher? Why or why not? Does anyone remember what we call these differences?*

Every suncatcher will be a little different, which is part of the fun! Do you remember what we call these kinds of differences? (Variables.) A variable is a placeholder for a piece of information that can change. We can treat the words (Bead, Spacer, Knot, etc.) as placeholders or variables for whatever items we are using that fit those descriptions.

Let the girls make their suncatchers, using the program and functions they made.

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Activity 4: Closing Ceremony: Brainstorming Our Take Action Project

Materials

- List of Juniors' Take Action ideas from Think Like a Programmer PT. 1
- **Take Action Guide** handout

Steps

Have Juniors share their suncatchers. Remind them how they used computational thinking to solve problems in the activities today.

Suggested conversation: *You did a great job using computational thinking to create fun stories and programs to make your suncatchers today. How did you do it? Were there any special skills you used to make your suncatcher? What about in the Mad Glibs activity?*

It sounds like you used the steps of computational thinking, just like programmers! In both activities, you were posed with a problem (how to fill in the Mad Glib and how to make a suncatcher). You decomposed, or broke down, these problems into smaller steps to find solutions. You did this by looking at patterns,

abstracting out details, and creating functions from the patterns you saw. You brought all of this together and created algorithms which solved the original challenges.

Have Juniors brainstorm Take Action projects, and remind them how Take Action can use computational thinking.

Suggested conversation: *Just like programmers, you can use computational thinking to plan your Take Action project. Programmers work in teams, just like you, to test their algorithms over and over again to find solutions that work for everyone. Last meeting you talked about how Take Action projects and programming help make the world a better place. Did anyone come up with some new Take Action project ideas?*

Write down their ideas.

> **Note:** Check out the **Take Action Guide** handout in the Meeting Aids if Juniors need help with ideas. Bring the list of ideas Juniors come up with to the next meeting.

Junior Think Like a Programmer Journey Part 3

Overview: Juniors connect their personal interests to computer science by sharing something they know a lot about and teaching it to a small group. The groups will then make a "rapid" prototype of an innovative idea and share it.

Activity 1: As Girls Arrive: Tech Collages

Materials

- Magazines and catalogs, tech or regular
- Scissors
- Paper
- Markers or crayons

Steps

Welcome Juniors, and have them look through the magazines to find examples of how technology has changed different products we use every day.

Suggested conversation: *Today, we're going to focus on technology, innovation, and developing new products! Take a look at these magazines. See if you can find pictures that show how products have changed because of technology. For example, you might find a picture of a regular wristwatch and a smart watch, or a picture of an old-fashioned phone and a smartphone. If you can't find what you're thinking of, you can draw it!*

Activity 2: Opening Ceremony: Reviewing Our Take Action Ideas

Materials

- List of Take Action ideas from last meeting
- Index Cards (Slips of paper, post-its, or a whiteboard and marker)
- Pens
- Tape

Steps

Have Juniors write their Take Action ideas on index cards to start contemplating their choices and learn about decision-making. Review Take Action ideas by posting them up on a board or wall so Juniors can make a decision during the Closing Ceremony.

Suggested conversation: *Doing a Take Action project is a little bit like adding technology to a product, isn't it? Adding technology can make a product better. Taking Action definitely makes the world better! Over the last meetings, you came up with a list of ways that you might like to Take Action. Let's go over your list.*

Give Juniors a chance to make more suggestions. Write the ideas down on index cards. Use short descriptions instead of the whole idea. For example: "Make Save Water Poster." Or "Skit About Kindness." Have Juniors tape the new index cards on the wall with the others so they can look at them and think about them.

Suggested conversation: *Have you ever made a decision before? For example, have you been asked to pick a dessert for your family to eat or to choose a game to play with your friends? Tell us about it.*

In our Closing Ceremony, you'll make a decision as a team about what Take Action project you want to do. Until then, think about what project you like and why.

Activity 3: Personal Innovations

Materials

- Post-its or slips of paper and tape (at least one for each girl)
- Markers, pens, or pencils
- Poster paper for sharing innovations (one for each girl)
- **Personal Innovations Activity Guide** (one for each girl) - see Appendix
- Markers, pens, or pencils
- Tape to hang posters

Steps

Discover Your Special Skill

Introduce Juniors to the activity.

Suggested conversation: *Today we're going to share our talents and teach others to do something we are good at. What's something that you know a lot about? Something that you could teach somebody? There is something that you probably know a lot about - maybe you feel like you know more about than most people.*

Suggested conversation: *Now, can you think of something that you could teach to somebody else in, say, 15 minutes? For example, you couldn't teach someone everything they need to know about playing soccer, right? But you could teach them how to kick a ball right into the net. Let's take one minute to write down something you could teach somebody else, based on what you're really good at. Maybe you know how to draw a house, make a cootie-catcher, make a smoothie, do a dance move, shoot a basket, etc.*

Give each girl a Post-it note or a slip of paper you can tape to the wall. Give the girls 1 minute to write what they could teach and stick it on the wall. Once all of the girls have put up their Post-its, have the girls read each other's ideas. You may want to save time by reading the ideas to the girls.

Create Algorithms to Teach Others

Explain how girls can create algorithms to teach others what they are good at.

Suggested conversation: *Would anyone like to learn a new skill from someone else in our troop? Does anyone have an idea how we could teach each other?*

Let girls answer. Guide them toward connecting learning a new thing with following a set of steps or instructions.

Suggested conversation: *We give each other instructions or algorithms to follow. Can anyone remind me what an algorithm is?* **(Answer: An algorithm is a set of steps that allow you to complete a task.)** *Now, you are going to create an algorithm to teach others your interest.*

Divide girls into groups of 3 - 4. Try to group girls with different interests.   For example, group girls who have topics such as: "soccer," "dancing," "smoothies," "cootie-catchers." Girls spend about ten minutes creating a series of steps (3 or more) to teach the others in her group. As the girls work, circle around to make sure everyone's steps make sense and are feasible. If their interest seems too broad, help them narrow down the task to make creating the algorithm easier.

Example: "Shooting baskets" is more specific then "Playing basketball" so may be easier to create an algorithm for.

Suggested conversation: *Okay, now it's time for us to learn from each other. You're going to take turns teaching the other girls in your group. Each one of you will get 2 minutes to take your group through the steps of your algorithm. The rest of your group will list to your algorithm and act out the instructions.*

Keep track of time. Give each girl two minutes to teach. Let girls know when they have 15 seconds left. Make sure every girl gets a chance to lead her group.

Brainstorm Technological Innovations

Encourage girls to see how technology and innovation plays a role in their lives.

Suggested conversation: *Did anyone teach your group about something that involved technology? Maybe how to play a video game or use a device? People say that technology is all around us, that it*

affects everything we do. Is this true? How do you think these technologies were created? Who thought of them?

People who make up new things are called inventors. When they make something new or improve something, that's called innovation. Can you give any examples of technological innovations?

Now we're going to get back into your groups. Think of the skills you just learned. As a group, come up with a way that technology could be used to make it easier or more fun.

Rapid Prototyping

Explain rapid prototyping to girls before they began to design their ideas.

Suggested conversation: *Now, we're going to do something called "rapid prototyping." A "prototype" is a rough model of your idea or innovation that you can show to other people.   It can be as simple as a drawing or it can be created with common materials such as cardboard, paper, string, rubber bands, etc. When you make different prototypes of your idea, you can see what works and what doesn't. Remember, this is a rapid prototype! That means you're going to be working fast! That way you can quickly see what works and what doesn't. You have 5 minutes to sketch your idea. I'll let you know when you have one minute left. Go!*

Watch the time as girls quickly sketch their ideas. At the end of 5 minutes, have girls tape their sketches to the wall. It's okay if the prototype isn't completely finished; this activity is meant to give girls a chance to experience rapid prototyping. Have a short "gallery walk" so girls can see each other's ideas. If there's time, have girls quickly explain their ideas.

Permission for use of Code.org activities is provided by Code.org, a non-profit dedicated to giving every student in every school the opportunity to learn computer science. See www.code.org.

Activity 4: Time to Decide on Take Action!

Materials

- Juniors' Take Action ideas on index cards.
- Optional: Computer/tablet or other device with ability to show girls the *Computer Science is Changing Everything* video

Steps

Encourage girls to reflect on their prototypes and technology before choosing a Take Action project.

Suggested conversation: *You all have different interest and talents. You've been learning about how computer programmers think. Now you can see how programmers can use technology to invent or improve something that's related to their interests and talents.*

Lead a quick reflection on what girls just learned. This will help girls make a connection between what they like and technology.

Optional: Show the Computer Science is Changing Everything video here.

Suggested conversation: *How did it feel to work together? What worked? What didn't? How could you use prototyping in your day-to-day life? What's the most exciting thing you could invent or teach others through an algorithm?*

Have Juniors look at the index cards of their Take Action ideas, discuss their choices as a group, and then make a decision.

Suggested conversation: *Now, you will decide as a team what you want to do.*

Give Juniors a chance to talk about the ideas they like (or don't like). If they disagree, help them to build their conflict-resolution skills. Remind Juniors to speak with respect, listen to other people, and perhaps even develop a new idea together that everyone likes.

Although it takes a little longer for Juniors to come to a team decision, this process will help them learn to compromise. Instead of stepping in and making the decision for them, help them talk about the pros and cons of each project. To help Juniors zero in on their top choices, ask open-ended questions, such as:

- Which of these project ideas sounds like the most fun?
- Which projects would help you learn something new?
- Which ones will make you feel proud when you're done?

To help Juniors think about which projects are realistic, ask open-ended questions, such as:

- *Are there any ideas that might be hard to do right now?*
- *It will probably cost a lot of money to do X. As a troop, you have $X to spend. What do you think you should do? You could put it on a list to do later or you could come up with another idea that doesn't cost so much. What do you think?*

If Juniors are divided between a few ideas, ask them to choose one top idea and keep the others as backups. You can also have them vote -- just make sure that anyone whose idea wasn't chosen knows that it was a good idea and that it might be used later.

Juniors may reach an agreement quickly. If they don't, note the top 2 or 3 ideas and facilitate an agreement using "fist to five":

- *If you're holding up 5 fingers, you love it!*
- *4 fingers -- it's good.*
- *3 fingers -- you're OK with the idea.*
- *2 fingers -- you're OK with it but perhaps want to make a little change.*
- *1 finger -- you'd like to talk about making more changes.*
- *And a closed fist -- no fingers -- you really don't like it!*

Suggested conversation: *It's great that you worked together to decide on a project. What was that like for you? You've learned a lot in our last few meetings about how programmers solve problems with Computational Thinking. What was the coolest thing you learned? Was there anything that surprised you?*

At our next meeting, you'll plan your Take Action project. Does anyone remember how Take Action is similar to Computational Thinking? **(Answer: Find a need, break it into smaller pieces, and work together to create a program/plan to solve.)**

Junior Think Like a Programmer Journey Part 4

Overview: Juniors use computational thinking to design their Take Action project.

Activity 1: As Girls Arrive: Innovate Your Take Action Project!

Materials

- Paper
- Pencils, crayons and markers

Steps

Welcome Juniors, and have them draw quick prototypes of how they can innovate their Take Action project.

Suggested conversation: *Now that you've decided on your Take Action project, you're going to start making a plan to carry it out. At our last meeting, you created prototypes for ways to make different ideas or products better. When you did that, you were innovative! How could you do the same thing for your Take Action project? How could you use innovation to make your project even better? Why don't you try sketching a few ideas before the meeting starts? We can share them as part of our opening ceremony.*

Activity 2: Opening Ceremony: Programming for a Better World

Materials

- None

Steps

Have Juniors talk about how they prototyped innovative ways to design the Take Action project.

Suggested conversation: *What did you draw? How would you design your Take Action project to be more innovative?*

Give each girl a chance to share her idea. Remind Juniors how programmers create algorithms that solve problems.

Suggested conversation: *Programmers use computational thinking to create algorithms that solve problems. They have to make sure to include every step necessary. That's important because when they put their algorithm in a machine, their program will only work if they've included every single step. And when it does work, all kinds of problems can be solve in brand-new ways! Today, you're going to work in teams to design your Take Action project! Think about the steps you'll need to take to solve your problem in an innovative and brand-new way.*

Have Juniors connect the steps of computational thinking to the steps they'll be using to design their Take Action project.

Suggested conversation: *What computational thinking skills are you going to use in your Take Action project? You're going to work in teams to design your Take Action project! Think about how you can use innovation in the Take Action project and how others can use their ideas for innovation, too!*

Today you'll plan the details of your Take Action project using all of the steps of computational thinking! What's the first step programmers take when they want to create a new code? **(Answer: Define a need or problem.)** *What is the need you've decided you want to solve through your Take Action project? What's the next step?* **(Answer: Decompose the problem into smaller piece.)** *Even though you have an idea of what you want to do, you need to brainstorm how you're going to do it. By decomposing the project, it's easier to manage.*

Remind Juniors how programmers work together to debug and persist as a team.

Suggested conversation: *Programmers test their programs to make sure they run successfully. Sometimes, the program won't run correctly, so programmers work in teams to debug the code. Programmers try again and again to make their program run without problems. They work in teams to make it easier to find solutions and test each other's programs. Just like you, programmers persist through the challenges to make solutions that work for everyone! Next week, you'll create what you need to carry out your Take Action plan out. By the end of today's meeting, make sure you have a list of supplies you need.*

Activity 3: Designing Our Take Action Project

Materials

- Large pieces of paper or poster boards
- Markers
- Post-It notes
- Pens/pencils

Steps

> **Note:** Stay on schedule so you can hold your Closing Ceremony. Give Juniors 10 and 5-minute warnings before they need to wrap up.

Set Up

Divide Juniors into small design teams of 3 - 4 to design their Take Action project.

Suggested conversation: *Last meeting, you decided on a Take Action project. What is it? What are the first steps programmers take when they want to create a new program?* **(Answer: They define a need, brainstorm and design ideas that they test and debug.)** *That's exactly what you're doing today. You came up with the need for your Take Action project. Now, you'll work in teams to brainstorm ideas about how you want to do your Take Action project. Write or draw your designs down.*

Remember, you can use algorithms and programs to teach others something you know a lot about as part of your Take Action project. Next meeting, you'll create your Take Action project.

Brainstorm and Design

Offer things for Juniors to think about, depending on what they want to do. For example:

If Juniors want to make a video, how will they film it?

- What do they want to say?
- Do they want to wear costumes?
- Do they want to use music?
- How will they show it to people - at a school assembly, at a gathering of their families, by having an adult post it (safely) online?

If Juniors want to create posters for their school, what materials will they need?

- Who can they ask for permission to put the posters on the walls?
- How should they ask for permission - if they want to make a presentation to the principal, what should they say?
- Once they get permission, what should the posters say?
- What will they look like? When do they want to hang up the posters?
- Do they want to get other students to join them?

The ideas are endless! **Keep It Girl-Led** by giving just one or two examples and then seeing where the Juniors take it. Remind them that good teamwork is important. Encourage Juniors to take turns, and make sure each girl has a role. Encourage Juniors to write or draw their ideas. Remind them they're designing their Take Action plan. At the next meeting they will create it.

Suggested conversation: *Is there anything you need to make in order to carry out your project? Is there someone you need to ask for help? How could you do that? What would you say?*

You may need to pave the way for Juniors to Take Action by calling the school or town officials to get permission for what they want to do or set up a time for Juniors to meet the officials to make their Take Action proposal. If possible, guide the conversation so Juniors come up with ideas about how you can help them so they have the experience of connecting with others to Take Action. Keep a list of the "to do" items Juniors are suggesting, for example: materials they need, people they need to talk to, etc.

Share and Reflect

Suggested conversation: *Does anyone remember what programmers do after they've coded a new program?* **(Answer: Share it with others and test it to see if it runs without bugs.)** *Let's take turns telling the group what you designed for the Take Action project. Who else could you share your plan with after this meeting?*

> **Note:** Be sure to listen to what they say -- they may have some ideas to make your plan even better!

Activity 4: Closing Ceremony: Ready to Take Action!

Materials

- None

Steps

Have Juniors share something about their Take Action project design.

Suggested conversation: *Let's go around the circle and each shout out one word about how you felt today as you designed your Take Action project.*

Give each Junior a chance to say something. Go over the list of "to dos" that you have for Juniors to create their Take Action project at the next meeting. (This might be a list of materials Juniors need, a reminder to bring props if they're performing a skit, names of people they need to talk to, etc.)

Suggested conversation: *Now, let's go around the circle in the other direction. Shout out one word about how you think you'll feel next week when you're taking action and making the world a better place!*

Junior Think Like a Programmer Journey Part 5

Overview: Juniors create their Take Action project.

Activity 1: As Girls Arrive: Improv with Conditionals

Materials

- Notecards with different statements written on them from the **Conditional Examples Sheet** (at least two for each pair of girls)

Steps

Welcome Juniors, and have them pair up to act out different situations. Hand each pair two or more notecards with different statements from the **Conditional Examples Sheet**.

Suggested conversation: *To warm up, let's play a quick game of improv. In pairs, take turns reading the situation on your notecard while your partner acts it out. For example, your partner may read this sentence from a card: If you're at the North Pole, then.... How would you act if you were at the North Pole?* **(Answer: Girls might pretend to shiver, hug themselves and stomp their feet, etc.)**

Have Juniors act in pairs until everyone has arrived.

Activity 2: Opening Ceremony: If We Take Action, Then We Make a Difference!

Materials

- None

Steps

Explain the connection between Activity 1: As Girls Arrive: Improv with Conditionals and conditional statements in programming.

Suggested conversation: *How was it acting out each of the situations? What changed each time?* **(Answer: Our partner read a new situation from the notecard.)** *The situation changed with each card. That meant you had to act a different way.*

For example, your notecard might have said, "If you're in the North Pole, then?", so you might have acted like your cold. Your notecard might have said "If you have a jump rope, then?", so you pretended to skip rope. In computer science, programmers use something similar called a conditional. Programmers create code that tells computers what to do when they encounter certain environments. These special statements tell computers how to act when different situations arise. To keep it simple, IF one thing happens, THEN another thing happens. For example, have you ever gotten a pop-up on your computer when you click on a link? That's a conditional! If you click a link on a website, then the computer makes a pop-up message or box appear. To create the conditional, the website programmer coded an instruction for the computer that instructs it to open a message box when you click on the link on the website.

Connect conditionals to how Girl Scouts Take Action.

Suggested conversation: *Just like programmer create conditionals, we also react to different situations in certain ways, both as humans and as Girl Scouts. As Girl Scouts, we Take Action to solve problems and create solutions that work for our communities. We see the "IF", and "THEN" we do something! For example, **if** we spot a problem, **then** we figure out a way to solve it! **If** we see a way to help people, **then** we do it! **If** we want to make the world a better place, **then** we Take Action!*

Have Juniors say what their Take Action project is about and each Junior should say one thing she thinks is important to do for their Take Action project.

Suggested conversation: *Finish this sentence: If we want to Take Action, then we _____.*

Activity 3: Creating Our Take Action Project

Materials

- Any materials Juniors need to carry out their Take Action project.

Steps

> **Note**: Stay on schedule so you can hold your Closing Ceremony. Give Juniors 10 and 5-minute warnings before they need to wrap up.

Set Up

Set up the activity. Break Juniors into teams of 3-4 to create and build their Take Action project.

> **Note:** These teams can be the same as the design teams in the last planning meeting.

Suggested conversation: *Every Girl Scout Take Action project changes the world a little bit and makes it a better place. You've learned to think like programmers -- to define needs, create plans, test and spot problems, work as a team, and come up with a solution. Now you're going to help others by taking action -- and you know that programmers do that, too! In our last meeting, you came up with a plan for your Take Action project.*

Let Juniors list the "to do" items from the last meeting. Remind them of any they missed.

Build and Test

Help Juniors create what they need (posters, videos, presentations, costumes, and scripts). If Juniors have a "next step" in their project, remind them about it. For example, they may have written a script and created costumes for a school assembly skit. If so, remind them about when they'll be presenting the skit.

If you've done some "behind the scenes" work since the last meeting, such as setting up a meeting for Juniors with officials or securing permission for their project, let them know about it now. Congratulate the Juniors if they've completed their Take Action project in this meeting (if, for example, they've created a video that an adult will now share with friends and family or post safely online).

Activity 4: Closing Ceremony: Plan to Celebrate!

Materials

- None

Steps

Have Juniors plan their celebration.

Suggested conversation: *At our next meeting, you'll celebrate everything you learned. How do you want to celebrate?*

Offer prompts for Juniors to come up with their own ideas for the celebration:

- Do you want to make a special display of our Take Action photos or show our videos?
- Do you want special music?
- Is there anyone you want to thank?
- What do you want to do for the Closing Ceremony?

Write down their ideas, and tell them you'll help organize this for the next meeting.

Junior Think Like a Programmer Journey Part 6

Overview: Juniors celebrate what they've learned and receive their Think Like a Programmer and Take Action awards.

Activity 1: As Girls Arrive: Get Ready to Celebrate!

Materials

- Any items Juniors want to display (such as photos or videos from their Take Action project)
- Photos and videos from the Journey meetings
- Music system
- Decorations
- Snacks

Steps

Have Juniors set up the meeting room by putting up posters and decorations. Make sure they greet guests as they walk in and offer them a snack. When guests have all arrived, have Juniors give a warm welcome to their guests--by saying together: *"Welcome, everyone!"*

Activity 2: Opening Ceremony: Welcome!

Materials

- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Steps

Have Juniors recite the Pledge of Allegiance and the Girl Scout Promise and Law. Then, have them introduce any special guests.

Activity 3: Awards Ceremony and Celebration

Materials

- Think Like a Programmer award
- Take Action award

> **Note:** You can buy these awards from your council shop or on the GSUSA website.

Steps

Juniors stand in front of guests and share one thing that they learned while they were on the Think Like a Programmer Journey or while doing their Take Action project. They can make this into a "show and tell" by showing their Personal Innovations prototypes, functional suncatchers, the tech collage, or photos or video from their Take Action project. Girls might even want to teach others how to make their ultimate trail mix bite! Ask Juniors to stand in front of their audience.

Suggested conversation: *Can each of you give an example of something you learned on this Journey?*

Give each Junior a chance to speak. If she wants to pass, she can.

Suggested conversation: *Please step forward when I say your name to accept your awards.*

Lead a round of applause for each Junior as she steps forward.

Suggested conversation: *You have earned your Think Like a Programmer award, which means you learned how to see needs in the world and come up with algorithms to teach others and solve problems.*

And you earned your Take Action award because you did something to make the world a better place. Now you'll start your celebration!

Include any activities -- such as taking photos, dancing or singing a special song--which Juniors decided to do as part of the celebration.

Activity 4: Girl Survey

Materials

- If girls are taking the survey online: Laptop/tablet
- If girls are filling out the survey on paper: Copies of Girl Survey (pdf available in Meeting Aids) and pen or pencil

Steps

Juniors complete the Girl Survey about the Think Like a Programmer Journey.

Suggested conversation: *The people at the Girl Scouts' national office want to know what you think about it, how you think it could be improved, and what you think of STEM in general. This is a great chance for you to help Girl Scouts create STEM programs that other girls will enjoy!*

It will take about 10 - 15 minutes. Explain to girls how they will be taking the survey - either online or by filling out a printed version.

> **Note:** We hope that all girls will complete the survey--we want every girl's voice to be heard. However, the survey is voluntary, so girls don't have to take the survey if they don't want to. Also, for young girls, we encourage you to read the questions aloud while girls individually complete the survey.

Activity 5: Closing Ceremony: Closing the Circle

Materials

- None

Steps

Have Juniors and guests stand in a Friendship Circle. Juniors lead the Closing Ceremony and end with a Friendship Squeeze.

Suggested conversation: *Juniors would like to end this Journey together with a Closing Ceremony.*

Have Juniors lead the close of the meeting in the way they chose--for example, a song, poem, or a cheer.

Think Like a Programmer Journey
Materials List

Think Like a Programmer 1

Activity 1: As Girls Arrive: Create Your Own Code
- Paper
- Pens or pencils

Activity 2: Opening Ceremony: Jump Into Computational Thinking!
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Tangram Algorithms
- **Tangram Set & Algorithm Card Images Pack** (one for each girl)
- Scratch paper for writing algorithms or building images
- Markers, pens, or pencils
- Scissors
- Optional: Sets of tangrams to use as example
- Optional: Computer, tablet or other device with ability to show girls the Unplugged – Tangram Algorithms video
- Optional: If your troop has never used Tangram pieces, you can choose to do an example for them or even have an entire Tangram activity. Search the internet for activities that girls can play in reality (using real tangrams) or play online.
- Optional: **Worksheet: Tangram Algorithms** (one for each girl)
  An "assessment worksheet" sounds a lot like school, but girls will probably see this as a fun puzzle page. If there's time, girls could do the activities in the meeting or you could give each girl a copy to take home. Perhaps they'd like to show their families what they learned about programs, debugging, functions, and variables by doing the worksheet together.

Activity 4: Closing Ceremony: Programmers, Awards & Take Action
- **Take Action Guide**

Think Like a Programmer 2

Activity 1: As Girls Arrive: Snack Algorithms

(**Note to Volunteers:** For this activity, girls will create algorithms for snacks. We've provided several options, so please choose one or another alternative that works for your girls' dietary restrictions.)

- Bowls or cups
- Option 1: Various small snacks like crackers, pretzels, marshmallows, chocolate chips, dried fruit, etc. that could go into trail mix.
- Option 2: Crackers, spreads, and toppings to create cracker bite snacks.
- Option 3: Celery, spreads, and topping to create Ants on a Log.
- Paper
- Pencils

Activity 2: Opening Ceremony: Programmers to the Rescue!
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Think Like a Programmer Journey
Materials List

Think Like a Programmer 2 (continued)

Activity 3: Solving Challenges with Computational Thinking
- **Mad Glibs Abstraction Worksheet** (one for each girl)
- Markers, pens, or pencils
- Pens, Pencils, & Scissors
- **Functional Suncatchers Skills Sheet** (one for each group)
- Create a suncatcher to use as an example for the activity
- Prepare a program and two skills with blank steps on a large paper or blackboard for the girls to help you fill in. (Sample can be found on the **Functional Suncatchers Skills Sheet**)
- Optional: Computer, tablet or other device with ability to show girls the Unplugged: Mad Glibs activity and Unplugged – Functional Suncatchers videos
- Optional: **Worksheet: Mad Glibs Assessment** (one for each girl)
An "assessment worksheet" sounds a lot like school, but girls will probably see this as a fun puzzle page. If there's time, girls could do the activities in the meeting or you could give each girl a copy to take home. Perhaps they'd like to show their families what they learned about programs, debugging, functions, and variables by doing the worksheet together.
- Optional: **Worksheet: Functional Suncatchers** (one for each girl)
An "assessment worksheet" sounds a lot like school, but girls will probably see this as a fun puzzle page. If there's time, girls could do the activities in the meeting or you could give each girl a copy to take home. Perhaps they'd like to show their families what they learned about programs, debugging, functions, and variables by doing the worksheet together.

For each functional suncatcher:
- One foot of string, thread, or fishing line
- 2-4 beads
- 2-4 other accessories (buttons, hoops, spacers)
- One special bead, prism, button, or girl-made sun charm

Activity 4: Closing Ceremony: Brainstorming Our Take Action Project
- List of Juniors' Take Action ideas from Think Like a Programmer 1
- **Take Action Guide**

Think Like a Programmer 3

Activity 1: As Girls Arrive: Tech Collages
- Magazines and catalogs, tech or regular
- Scissors
- Glue sticks
- Construction paper
- Optional: Stickers, other things to add into the collages

Activity 2: Opening Ceremony: Reviewing Our Take Action Ideas
- Flag
- List of Take Action ideas from last meeting

Think Like a Programmer Journey
Materials List

Think Like a Programmer 3 (continued)

Activity 2: Opening Ceremony: Reviewing Our Take Action Ideas (continued)
- Index Cards (Slips of paper, post-its, or a whiteboard and marker)
- Pens
- Tape
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Personal Innovations
- Post-its or slips of paper and tape (at least one for each girl)
- Markers, pens, or pencils
- Poster paper for sharing innovations (one for each girl)
- **Personal Innovations Activity Guide** (one for each girl)
- Markers, pens, or pencils
- Tape to hang posters

Activity 4: Closing Ceremony: Time to Decide on Take Action!
- Juniors' Take Action ideas on index cards.
- Optional: Computer/tablet or other device with ability to show girls the Computer Science is Changing Everything video

Think Like a Programmer 4

Activity 1: As Girls Arrive: Innovate Your Take Action!
- Paper
- Pencils, crayons and markers

Activity 2: Opening Ceremony: Programming for a Better World
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Designing Our Take Action Project
- Large pieces of paper or poster boards
- Markers
- Post-It notes
- Pens/pencils

Think Like a Programmer 5

Activity 1: As Girls Arrive: Improv with Conditionals
- Notecards with different statements written on them from the **Conditional Examples Sheet** (at least two for each pair of girls)

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Think Like a Programmer Journey
Materials List

Think Like a Programmer 5 (continued)

Activity 2: Opening Ceremony: If We Take Action, Then We Make a Difference!
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Creating Our Take Action Project
- Any materials Juniors need for their Take Action project

Think Like a Programmer 6

Activity 1: As Girls Arrive: Get Ready to Celebrate!
- **Girl Scout Promise and Law** poster(s)
- Any items Juniors want to display (such as photos or videos from their Take Action project)
- Photos and videos from the Journey meetings
- Music system
- Decorations
- Snacks

Activity 2: Opening Ceremony: Welcome!
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Awards Ceremony and Celebration
- Think Like a Programmer award
- Take Action award

(**Note to Volunteers:** You can buy these awards from your council shop or on the Girl Scouts' website.)

Activity 4: Girl Survey
- If girls are taking the survey online: Laptop/tablet
- If girls are filling out the survey on paper: Copies of Girl Survey (pdf available in Meeting Aids) and pen or pencil

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Think Like a Programmer Journey

Glossary for Juniors

Juniors may not know some of the words used on this Journey. Here are definitions you can share with them:

Computational thinking is the thought process involved in solving a problem and expressing its solution(s) in a way that a computer—human or machine—can effectively carry it out.

An **algorithm** is a list of steps that you can follow to finish a task. A recipe is an example of an algorithm; it tells you how to cook a dish by following step-by-step instructions.

A **program** is an algorithm that has been coded into something that can be run by a machine.

Debugging is finding and fixing problems in your algorithm or program.

A **function** is a piece of code that you can easily call over and over again.

A **variable** is a placeholder for a piece of information that can change.

Decomposition is when you break a hard problem up into smaller, easier ones.

A **pattern** is a theme that is repeated many times.

Abstraction is removing the details from a solution so that it can work for many problems.

Innovation is a new or improved idea, device, product, etc.

A **prototype** is a sketch of an idea or model for something new. It's the original drawing from which something real might be built or created.

In computer science, a **conditional** is a statement that tells a computer how to act in specific situations., i.e. IF this happens, THEN the computer does this.

girl scouts

Brainstorming Tips: Think, Pair, Share

How to Run a Think, Pair, Share Activity:

Tell girls that they're going to brainstorm answers to your question using "Think, Pair, Share."

Lead girls through the basic steps by telling them they will:

1. **Break into small groups.**

2. **Listen to the question or prompt.**

3. **Think about their answers.**
   - Girls may want to write their answers down.
   - Twenty seconds should be enough time, since girls will need to sit quietly.

4. **Pair with other girls.**
   - Girls talk with one to three other girls (depending on group size), making sure everyone has a chance to share their answers. If there's time, it's OK for girls to ask questions about each other's answers.
   - For pairs, 20 seconds should be enough time. If your troop enjoys discussion, consider extending this to 1 to 2 minutes.

5. **Share with the group.**
   - Girls share their answers with the larger group.
   - This can be completed in 20 – 30 seconds, but will run longer based on group size and how the group sharing is done.

There are two ways to set up group sharing:

- **Strongly Recommended:** One girl shares the best/most interesting/summary answer for the group. This approach is great if you're running short on time. It also helps develop conflict resolution and compromise skills.

- **Optional:** Each girl shares her partner's answer. This helps girls develop active listening skills, but will run longer because all girls are sharing.

Think Like a Programmer Journey

Take Action Guide

What's the difference between a community service project and a Take Action project?

Community Service makes the world better by addressing a problem "right now." For example, collecting cans of food for a food pantry feeds people "right now." Gathering toys for a homeless family shelter makes kids happy "right now." Providing clothing and toiletries to people after a fire or flood helps them "right now." These acts of kindness are important ways to help people — right now.

Take Action encourages girls to develop a project that is sustainable. That means that the problem continues to be addressed, even after the project is over. Sustainability simply means coming up with a solution that lasts.

For example, girls might want to do something about trash in a local park. If they go to the park and pick up trash, they've solved the problem for today — but there will be more trash to pick up tomorrow.

Instead, girls could explore why there's so much trash. Here's what they might discover:

1. There aren't enough trash cans in the park.
2. The trash cans are hard to find.
3. People have to walk out of their way to throw away trash because of where the cans are placed.
4. People don't realize the importance of putting trash in the trash cans.

Here's how girls might address these issues:

*   **Issues 1 – 3:** Make a presentation to the city council to report on their findings and suggest adding more trash cans or moving them to more visible or convenient positions.
*   **Issue 4:** Create a public awareness campaign that encourages people to use the trash cans instead of littering.
*   **Variation:** Older girls may want to design interactive garbage cans that make tossing your trash fun. Do an online search for "the fun theory" or "the world's deepest bin" to see this in action.

What are the steps of a Take Action project?

Girls team up to:

- Identify a problem
- Come up with a sustainable solution
- Develop a team plan
- Put the plan into action
- Reflect on what they learned

Keep It Girl-Led: Girls should actively participate in each step in order for this to be girl-led. Younger girls will need more guidance, but they can and should decide as a team what problem they want to address.

How do girls make their project sustainable?

Here are three ways to create sustainable change:

1. Make your solution permanent.
2. Educate and inspire others to be part of the change.
3. Change a rule, regulation or law.

How can I help girls come up with Take Action Ideas?

Next are some specific examples you can use to help girls understand what sustainable Take Action projects look like.

Keep It Girl-Led: These examples are intended to give a sense of what a Take Action project could look like. **Please do not choose a project from this list for girls to do!** Instead, guide them to brainstorm ideas, get feedback, and come up with a plan. Girls will learn key leadership skills, such as decision-making, compromise, conflict resolution, and teamwork, when their Take Action project is girl-led.

Computer Science/STEM Take Action Ideas

Issue: Some girls think computer science is hard or boring or just for boys.

- **Solution: Educate and inspire others.** Create a girls' coding club that meets at lunchtime or recess. Teach other girls how to play with tangrams or learn algorithms by making functional suncatchers.

Issue: Some kids think computer science is too hard to understand.

- **Solution: Educate and inspire others.** Make a video to explain algorithms, using fun examples like baking a cake, planting a flower or giving directions. Show it to your class at school or to a group of friends.

Issue: More kids need to know that how computer programmers can help others and make the world a better place

- **Solution: Educate and inspire others.** Do some research about people who used code to help others, and then create a video or slideshow to show at your school.

Issue: Not everyone knows about women who changed the world using their knowledge of computer science.

- **Solution: Educate and inspire others.** Research the "hidden figures" in your community. They might be women who have helped shape history, like those portrayed in the movie Hidden Figures. Or you might want to profile computer science teachers who have made a difference by mentoring and encouraging girls. You could create a display about their accomplishments for a library or community center or make a video about them and show it at school.

Issue: More people need to know how exciting and fun STEM can be.

- **Solution 1: Educate and inspire others.** Create a list of great books, movies and documentaries that focus on STEM. Make copies for teachers to hand out or make posters for the school library.

- **Solution 2: Educate and inspire others.** Create a short play based on one of the books and perform it for your class or school.

Other Ideas for Take Action

Issue: More kids need to know that engineering is a fun, creative way to help others.

- **Solution 1: Educate and inspire others.** For show-and-tell, explain what you've learned about how engineers help others, then lead a design challenge activity with your class.

- **Solution 2: Make it permanent.** Partner with a teacher or principal to create an "engineering space" at school where kids can make prototypes and share ideas for new inventions. Put out a call for donations of recyclable materials or cheap prototyping supplies (cardboard boxes, tape, string, paper towel tubes, etc.) to stock the space.

Issue: It's hard for new students to meet people and make friends at school.

- **Solution: Make it permanent.** Design and build "buddy benches." Partner with the school to have the benches installed on the playground so kids who want to make new friends can find each other.

Issue: Parents often run their engines outside the school as they wait to pick up or drop off their children, which pollutes the air.

- **Solution: Change a rule, regulation or law.** Make a presentation to the school board or administrators about why this is a problem and suggest a new rule that makes the pick-up/ drop-off area a "no idling" zone.

Issue: We could conserve water if more people collected rain water and used it to water plants.

- **Solution 1: Make it permanent.** Make rain collection devices for family or friends that can be installed in their yards. Give them a list of different ways to use rain water and how they're helping the Earth.

- **Solution 2: Educate and inspire others.** Create a handout, video tutorial, or show-and-tell presentation about how to make a rain collection device, how to use rain water and how that helps the Earth.

Issue: The local park doesn't have a swing for children with disabilities.

- **Solution: Make it permanent.** Make a presentation to the city council explaining the problem and offering to use troop money from the cookie sale to help pay for the swing.

- **Extra Inspiration:** Do an online search for "How One Brownie Troop Became Social Entrepreneurs.")

Issue: There's no sidewalk along a street near the elementary school, which makes it dangerous for children to walk home.

- **Solution: Make it permanent.** Make a presentation to the city council about the problem and suggest that they build a sidewalk. (Note: Even if the council doesn't vote to create a sidewalk, the girls have earned their Take Action award because they came up with a sustainable solution and took action through their presentation.)

- **Extra Inspiration:** Do an online search for "Girl Scout Brownies Convince City Hall to Build Sidewalk."

Issue: There have been several accidents at a busy intersection that doesn't have a stoplight.

- **Solution: Make it permanent.** Research the number of accidents and make a presentation to the city council, asking that they have a stoplight installed.

Issue: The local shelter is having a hard time getting rescue animals adopted.

- **Solution: Educate and inspire others.** Use your photography skills to create pet portraits for the shelter's web site. Use your writing skills to craft heart-warming bios for each portrait.

Need more ideas?

Check out Girls Changing the World on the GSUSA web site. Girls post their Take Action and Bronze/Silver/Gold Award projects on this site. You can search by project topic or grade level. (And after the troop has done their project, please post it so they can inspire other girls!)

33 Ways to Take Action!

Make your solution permanent.

1. Make and install something outside (benches, bird houses, dog run, ropes course, sensory trail for children with disabilities, Little Library, etc.)
2. Plant something (butterfly garden, tree, wind chime garden, etc.)
3. Make something inside (Maker Space, reading room, etc.)
4. Create a collection (children's books children's hospital or family shelter, oral histories for town museum, etc.)
5. Advocate for building a permanent community improvement (sidewalk, bridge, park, streetlights, stoplight, etc.)

Educate and inspire others to be part of the change.

6. Do a show-and-tell
7. Create a poster campaign
8. Perform a skit
9. Make a "how to" handout
10. Draw a comic
11. Give a speech
12. Write and perform a song
13. Make an animated movie
14. Make a live-action movie
15. Make a presentation
16. Create a workshop (perhaps in partnership with a local business or organization) to teach a skill such as coding, camping, canoeing, robotics, sewing, car care, healthy eating, gardening, home repair, budgeting, etc.
17. Create a workshop to teach others about healthy living (exercise, nutrition, mental health, etc.)
18. Create a social media campaign
19. Make video tutorials to teach a skill
20. Organize an email campaign
21. Organize a petition
22. Organize an event (concert, play, poetry slam, art exhibit, sporting event, field day) to raise awareness about an issue
23. Make a "playbook" to help others follow your lead (how to mentor robotics teams, organize a workshop or event, advocate to city council, create an online petition, change a law, etc.)
24. Make an app that helps people take action on an issue
25. Create a web site
26. Write an op-ed or letter to the editor of a newspaper or magazine
27. Start a blog

Change a rule, regulation or law.

28. Make a presentation to your school principal
29. Make a presentation to your school board
30. Make a presentation to your city council
31. Speak up at your representative's town hall meeting
32. Create an online petition
33. Advocate for a law with your state government

Algorithms
Tangrams Algorithm Activity
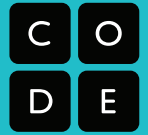
This lesson shows us something important about algorithms. If you keep an algorithm simple there are lots of ways to use it. If you want to make sure everyone ends up with the same thing, then your algorithm needs to have a lot of detail.

This activity will show both options.

Directions:

1. Divide into groups of 3-5.
2. Each player should cut out their own set of tangrams.
2. Have one member of each group select an Algorithm Card without showing it to anyone else.
3. The person with the Algorithm Card will try to explain the image to everyone else without letting them actually see it.
4. The other players will build their pictures off of the description given by the Card Holder.
5. When the Card Holder is done, everyone will show their pictures and see if they all ended up with the same image.
6. If everyone ends up with the same drawing, the Card Holder can show the card and see if everyone matched the card.
7. If any of the pictures in the group are different from each other, have the Card Holder try describing the image again, using more detail.
8. Choose a new Card Holder and a new Algorithm Card and repeat until everyone has had a chance to describe an image.
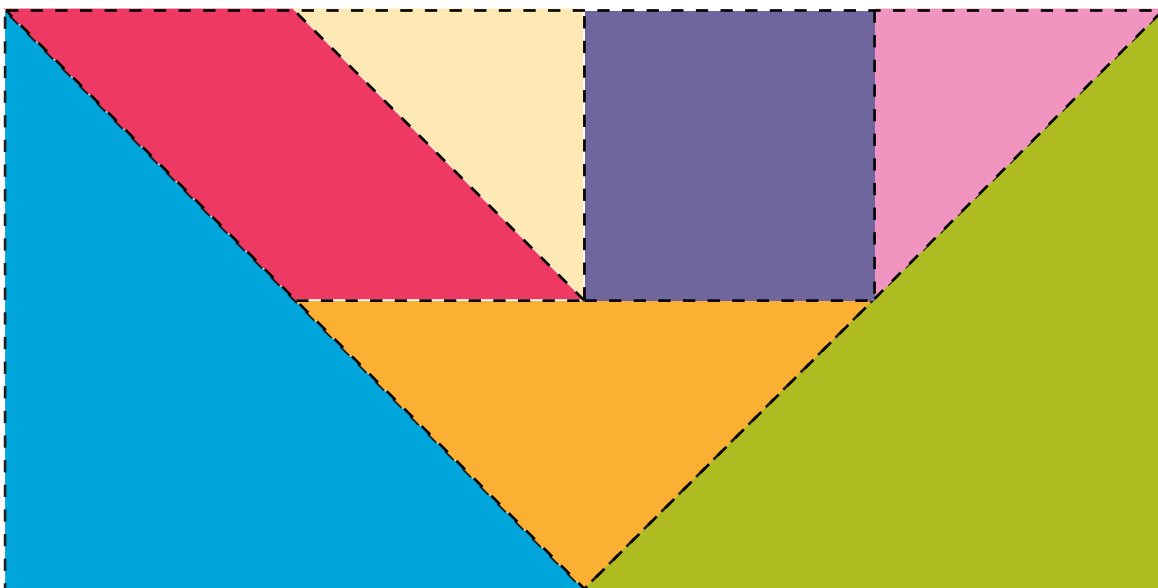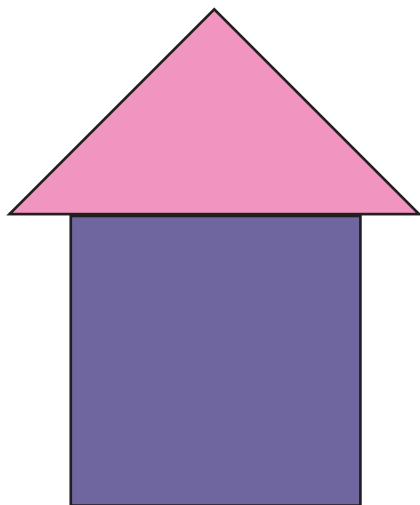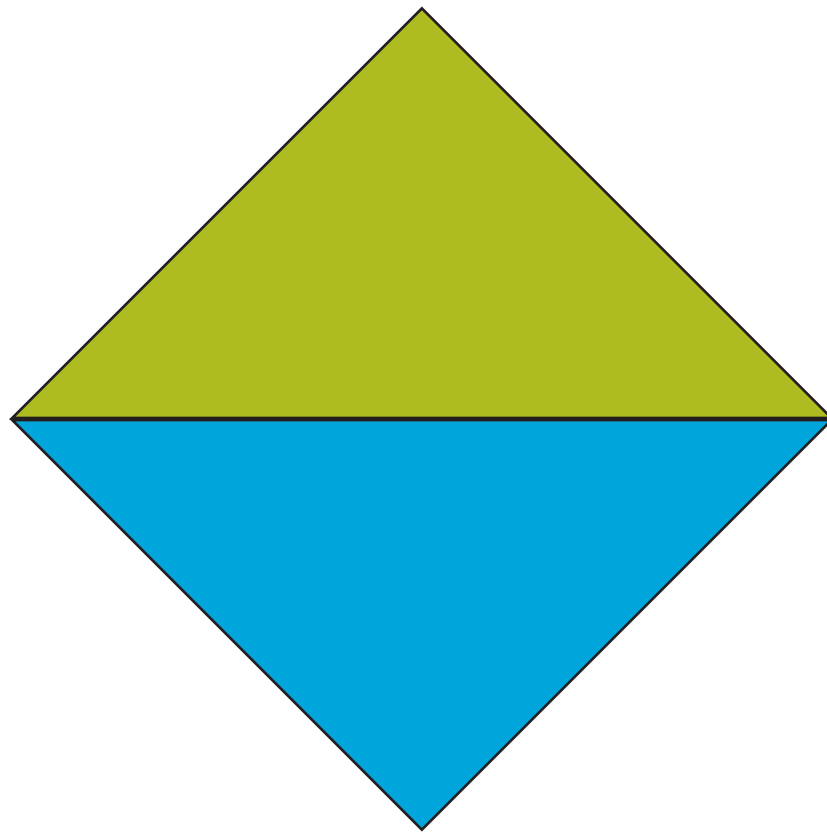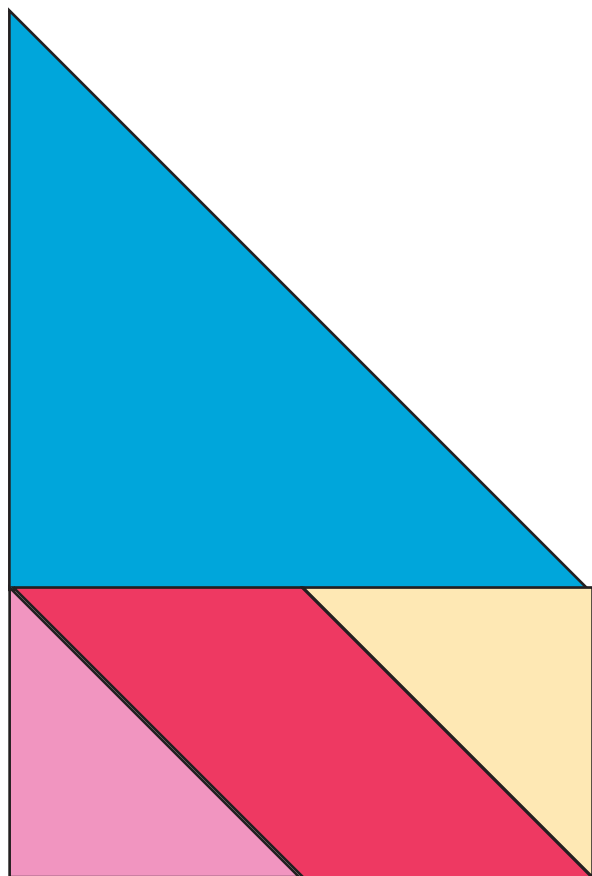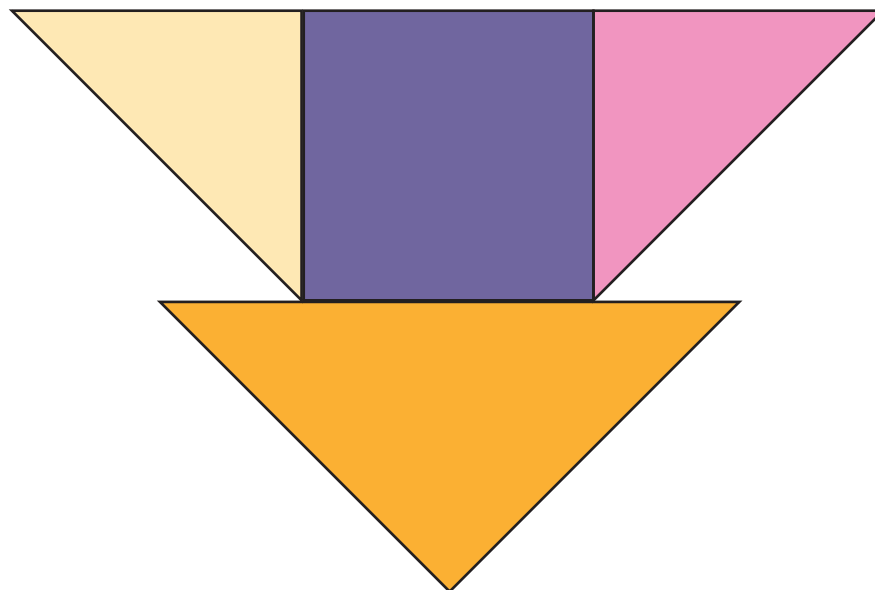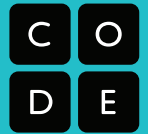
Very specific algorithms help multiple people create identical products.

Less specific algorithms allow a great deal of flexibility for every person to have something different.

Circle the drawing that does not follow the algorithm provided.

Algorithm #1

1) Put two large triangles at the bottom of the image.

2) Put a square on top of those two triangles.

3) Put two little triangles beside the square.
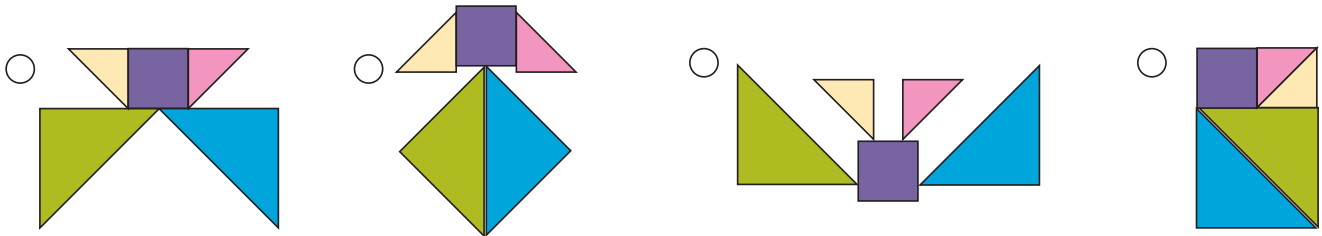
Circle the algorithm that goes with Drawing 1.

Algorithm A

1) Use two triangles, a square, and another piece

2) Line two triangles up with the square

3) Put the last piece on top of the square

Algorithm B

1) Use three triangles, a rhombus, and another piece

2) Put the rhombus at the bottom

3) Put all three triangles above the rhombus

4) Put the final piece to the left of everything else

Algorithm C

1) Use three triangles, a square, and another piece

2) Line two triangles up with the square

3) Put a third triangle beneath the other shapes
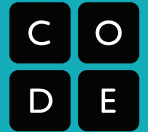
4) Put the last piece on the left
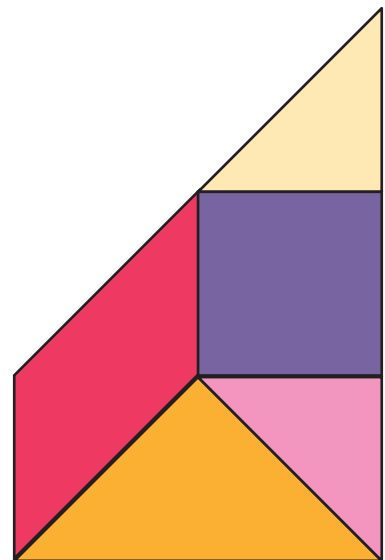
Drawing 1

Fun-ctional Skills
Functions and Variables Assessment

C O
D E

Below, you will find three sets of skills, and a program that calls them.

Use the New Program and the skills that go with it to figure out what the steps of the Original Program were. Fill out the steps of the Original Program appropriately.

ORIGINAL PROGRAM

1) _____
2) _____
3) _____
4) _____
5) _____
6) _____
7) _____
8) _____
9) _____
10) _____
11) _____
12) _____
13) _____
14) _____

NEW

SKILL 1

1) *banana*
2) *face*
3) *smells*
4) _____
5) _____

SKILL 2

1) *cat*
2) _____
3) _____
4) _____
5) _____

SKILL 3

1) *one*
2) *stinky*
3) _____
4) _____
5) _____

NEW PROGRAM

1) *Skill 3*
2) *Skill 2*
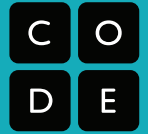3) *Skill 3*
4) *Skill 1*
5) *Skill 2*

Name: _____   **Date:** _____

Functional Instructions
Learning Variables and Functions through Craft

Sometimes you want to do certain instructions over and over again. That's where functions come in handy! Group all repeated instructions into one place, give them a simple name, then you can call that entire group at the same time just by using the name you gave it.

What if you want to do something over and over, but don't know what supplies you'll be working with ahead of time? This is the perfect place for variables! Variables are just placeholder words that you can put into your program so that you know where your *actual* supplies are supposed to go, once you know what they are.

Directions:

1) Take a program that contains several sets of identical instructions.

2) Move one or more of the sets of identical instructions into the "Skills" areas of the Skills Sheet.

3) Rewrite the original program, using the skill names instead of actually writing out the group of instructions that the skills describe.

New Words!

Function
Say it with me: Func-shun

A piece of code that you can easily call over and over again

Variable
Say it with me: Vayr-ee-ah-buhl

A placeholder for a piece of information that can change

Functional Instructions
Skills Sheet

Unplugged

SKILL 1

1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

SKILL 2

1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

PROGRAM

1) _____
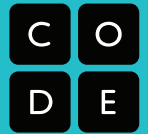
2) _____

3) _____

4) _____

5) _____

6) _____

Mad Glibs
Abstraction Worksheet

Unplugged

C O D E

Write a story using the Mad Glibs template below. Fill in the blanks with words to create something fun to share. Then, create a second story by writing another version on the lines at the bottom of the page.

Story 1

First you take your _____ then add a layer of _____

before you pour on a hearty dose of _____ .

Next, press some _____ down into the _____ before

covering with a sprinkle of _____ .

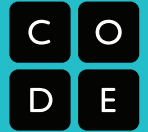That's how we make a _____ !

Story 2

_____

_____

_____

_____

_____

_____

_____

_____

Name: _____   Date: _____

The Mad Glib template that we used to make these stories has vanished! Look at the stories and figure out which words are supposed to be blanks, then recreate the template at the bottom of the page.

Story 1

Early last year, my mom gave me an old skateboard. She told me about the days when she would ride it from her school in her hometown. I tried to ride it once, but tripped over my shoelaces. It didn't take long before I decided that it was best to leave the skateboarding to my mom.

Story 2

Sometime last year, my mom told me an old story. She told me about the days when she would hear it from her father in her childhood. I tried to tell it once, but tripped over my words. It didn't take long before I decided that it was best to leave the storytelling to my mom.

Create new template here:

Activity Guide - Personal Innovations

C O D E

Technological innovation is about recognizing a problem that needs to be solved, or recognizing something needs improving and then building a tool to solve it.

As a troop we're going to see how innovative we can be, and we'll share our ideas through something called "rapid prototyping." *(**Prototype** is a fancy word that means a preliminary sketch of an idea or model for something new. It's the original drawing from which something real might be built or created.)*

First: Looking at the list of 4 interests at your table, let's **think about how technology is impacted by, or related to, those interests.**

How could **technology** improve your interest to make it **better, faster,** or **easier** to use?

What is a **problem**, or aspect of your interest, that a **creative or innovative technology might help solve**, or at least make better?

Interest	Improvements	Problems

Next: As a group, nominate the idea you've discussed that you think would be the *most interesting to everyone else* in the troop.

Start to sketch it out on a poster. Make a visual representation of your ideas. Remember this is a rapid prototype, just something to quickly convey the idea. Feel free to jot down ideas or sketches in the space below:

Brainstorming and Notes

Think Like a Programmer Journey

Conditional Examples

In computer science, a **conditional** is a statement that tells a computer how to act in specific situations., i.e. IF this happens, THEN the computer does this.

Volunteer: Prior to the meeting, prepare notecards with "If you _____, then..." situations for girls to act out. Create at least two notecards for each pair of girls.

Here are some conditionals you could give to girls to act out:

If you're in the North Pole, then...

If you have a jump rope, then...

If you win a million dollars, then...

If you have a piece of cake, then...

If you're at the beach, then...

If you have a soccer ball, then...

If you want to paint a picture, then...

If you have a saxophone, then...

If you're planting a flower bed, then...

If you're hiking in the woods, then...