

Think Like a Programmer pt. 1

Overview

With nothing but paper and markers, girls explore computational thinking through paper programming activities.

First, girls begin to understand what programming is really about, creating algorithms for each other to reproduce existing pictures on graph paper.

Then, girls build on the concepts of algorithms and programs in a race against the clock, working together in teams to create a program, one instruction at a time.

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 girls 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 girls know they can make choices and have their voices heard.

Solve Big Problems Step By Step: On this Journey, girls 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 girls 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.

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Leave Time For The Closing Ceremony: If girls 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 girls 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 girls 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!).

Prepare Ahead (Roughly 70 minutes)

1. Watch five videos (20 minutes)

CS Fundamentals Unplugged: Graph Paper Programming demo video (9:44)
code.org/girlscouts/GraphPaperProgramming/DemoVideo

This video provides a demo of the Graph Paper Programming activity and tips for facilitating the activity.

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(Note to Volunteers: This video was filmed in a classroom setting. Of course, Girl Scout troop meetings are not like school. Your girls won't sit at desks, and you may need to shorten your set-up.)

Listen for the main points you want to make with girls:

- *What does computational thinking have to do with coding?*
- *What does a paper activity have to do with computers?*
- *How does computational thinking help us to give directions?*

Course 2 – Graph Paper Programming overview video (2:41)

code.org/girlscouts/GraphPaperProgramming/OverviewVideo

This video goes through the instructions for Graph Paper Programming in Activity 3.

Unplugged – Graph Paper Programming activity video (1:29)

code.org/girlscouts/GraphPaperProgramming/ActivityVideo

The video introduces girls to algorithms for Graph Paper Programming in Activity 3. 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

Course 2- Relay Programming overview video (2:34)

code.org/girlscouts/RelayPaperProgramming/OverviewVideo

This video gives you an overview of the activity and explains the connection with Graph Paper Programming. The video highlights how the activity relates to programming in teams, debugging, and working with deadlines.

Unplugged Activity - Relay Programming activity video (1:51)

code.org/girlscouts/RelayPaperProgramming/ActivityVideo

The video introduces girls to Relay Programming for Activity 3 and explains how it can be applied to computer programming and real life situations. This video may be shown to the girls before 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:

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- **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 allow you to complete a task
- **Program** — instructions (or an *algorithm*) that can be understood and followed by a machine
- **Debugging** — finding and fixing problems in your algorithm or program

See the **Multi-Level Think Like a Programmer Journey Glossary** for more vocabulary and examples.

3. Read through this guide and its Meeting Aids (15 minutes)

This will help you get familiar with the flow of the meeting.

Read the following handouts (found in the **Meeting Aids** section):

Multi-Level 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.

Multi-Level Think Like a Programmer Journey Glossary: This is a list of words that girls may not know and how to define them.

Think, Pair, Share: These facilitation tips will help you 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.

Benefits of a Multi-Level Troop: This handout highlights the benefits of running a multi-level troop and offers practical advice and insight into working with multi-level girls.

4. Gather materials (30 minutes)

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Gather materials using the Materials List for this meeting. If your meeting location doesn't have a flag, bring a small one that girls can take turns holding or hang in the room.

Get Help from Your Family and Friends Network

Your Friends and Family Network can include:

- Girls' parents, aunts, uncles, older siblings, etc.
- Other volunteers who have offered to help with the meeting

Ask your Network to help:

- Make snacks

Award Connection

Girls earn two awards on completing this Journey:

- Think Like a Programmer award
- Take Action award

Girls will earn both awards following the completion of the Take Action project and Journey in **Think Like a Programmer PT. 6**.

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

Meeting Length

90 minutes

- The times given for each activity will be different depending on how many girls are in your troop.
- There is no snack time scheduled in these meetings, but there are 15 minutes of "wiggle room" built in for snacks or activities that run long.
- Give girls 10- and 5-minute warnings before they need to wrap up the last activity so you'll have time for the Closing Ceremony.

With nothing but paper and markers, girls explore computational thinking through paper programming activities.

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First, girls begin to understand what programming is really about, creating algorithms for each other to reproduce existing pictures on graph paper.

Then, girls build on the concepts of algorithms and programs in a race against the clock, working together in teams to create a program, one instruction at a time.

Materials List

Activity 1: As Girls Arrive: Morse Code Messages

- **Morse Code** handout
- Paper
- Markers or crayons

Activity 2: Opening Ceremony: All About Solving Problems

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

Activity 3: Paper Programming

- **Paper Programming Example Sheet**
- **Four-by-Fours Activity Worksheet** (at least one for each pair of girls)
- Blank paper or index cards for programs
- **Relay Programming Activity Packet** (one for each group)
- Extra sheets of 4x4 paper grids and blank paper to use as practice. These are also provided as part of the **Relay Programming Activity Packet**.
- Markers, pens, or pencils
- Optional: Computer/tablet or other device with ability to show girls the [Unplugged – Graph Paper Programming](#) and [Unplugged – Relay Programming](#) videos

Activity 4: Closing Ceremony: Making the World a Better Place

- Optional: **Take Action Guide** handout

Awards

Girls do not receive any awards in this meeting.

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Detailed Activity Plan**Activity 1: As Girls Arrive: Morse Code Messages****Time Allotment**

10 Minutes

Materials

- **Morse Code** handout
- Paper
- Markers or crayons

Steps

Welcome girls, and hand each girl (or group of girls) a **Morse Code** handout.

Explain Morse Code to girls before they start writing messages.

SAY:

Have you ever used Morse Code before?

Morse code is a way to send messages using a code. Each letter in the alphabet corresponds to a group of dots and dashes — that's the code!

For example, if I wanted to write the word "Girl," I would write:

G: Dash-Dash-Dot

I: Dot-Dot

R: Dot-Dash-Dot

L: Dot-Dash-Dot-Dot

Use the Morse Code handout to write your name in Morse Code on your paper.

That will say who you are. Then draw pictures of things you like around your name. You could draw a soccer ball, ice cream cone, the Girl Scout trefoil, your favorite toy — anything you want! That will show a little bit more about who you are.

Multi-Level Tip: Encourage older girls to work with a younger partner as a team to come up with Morse Code names.

You can also ask an assistant or parent to help the Daisies while the Brownies and Juniors pair up. If Daisies have trouble with Morse Code, encourage them to create

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handshakes as another example of creating codes. See Think Like a Programmer PT. 1 in the Daisy Think Like a Programmer Journey for detailed instructions.

Either option works! The first option gives older girls a chance to teach younger girls and practice leadership skills, in addition to learning about computer science. The second option gives Daisies more specialized attention and allows the older girls to team up and learn at roughly the same level.

Activity 2: Opening Ceremony: All About Solving Problems

Time Allotment

15 minutes

Materials

- Flag

Steps

Recite the Pledge of Allegiance and the Promise and Law.

Conduct any troop business.

Introduce girls to the Think Like a Programmer Journey.

SAY:

Today we are starting a new Journey where we are going to learn to think like computer programmers!

Does anyone know what programmers do?

Girls may say: They work on computers, they code, they make websites.

Programmers write special codes to create websites, apps, video games and many other things that you use every day.

It's a little like using Morse Code Instead of using letters, you used symbols to write your name.

Programmers use different coding languages to send messages. It's a little bit like the way you used both Morse Code and drawing to describe yourself.

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Explain how programmers use computational thinking to solve problems.

SAY:

On this Journey, you'll learn to think like a programmer. Here's a question to get us started.

Have you ever had a problem that you had never solved before? How did that feel?

Girls may say: Scary, nerve-wracking, etc.

What did you do to tackle the problem?

Girls may say: Created smaller steps, asked for help, made a plan, jumped right in, etc.

Those are great ideas for solving problems.

When a programmer is trying to solve a really big problem, she'll break it down into smaller problems.

Then she'll solve each of the smaller problems, step by step, until she ends up solving the really big problem.

You're going to learn to do that on this Journey. Let's get started.

Activity 3: Paper Programming

Time Allotment

40 Minutes

Materials

- **Paper Programming Example Sheet**
- **Four-by-Fours Activity Worksheet** (at least one for each pair of girls)
- Blank paper or index cards for programs
- **Relay Programming Activity Packet** (one for each group)
- Extra sheets of 4x4 paper grids and blank paper to use as practice. These are also provided as part of the **Relay Programming Activity Packet**.
- Markers, pens, or pencils

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- Optional: Computer/tablet or other device with ability to show girls the [Unplugged – Graph Paper Programming](#) and [Unplugged – Relay Programming](#) videos

Steps**Set Up. (5 minutes)**

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

SAY:

What did you do to get ready for school this morning?

Girls may say: I ate breakfast, I got dressed, I brushed my teeth.

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.

SAY:

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.

SAY:

Has anyone ever heard the word algorithm?

Say it with me: Al-go-ri-thm.

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?

Girls may say: Put toothpaste on the brush, turn on the water, brush, spit, etc.

What are some other things you do by following certain steps?

Girls may say: Tie my shoes, make toast, etc.

Today, we're going to create an algorithm to help each other color in a paper grid.

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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 paper programs to help each other color in a paper grid. We are going to challenge each other to make drawings, without letting the other people in our group see the original image.

Optional: Show the *Unplugged – Graph Paper Programming* video [here](#).

Learn about Paper Programs. (5 minutes)

Divide girls into pairs.

Provide each girl or pair with a **Four-by-Fours Activity Worksheet**, extra pieces of grid paper or 4x4 grids for practice, blank paper or index cards for programs, and markers, pens, or pencils.

Multi-Level Tip: Encourage older girls to work with a younger partner as a team to come up with solutions together. Praise them when you hear them collaborating. Let them know that programmers work in teams and need to get along with people of all different experiences and backgrounds.

You can also ask an assistant or parent to help the Daisies while the Brownies and Juniors pair up.

Either option works! The first option gives older girls a chance to teach younger girls and practice leadership skills, in addition to learning about computer science. The second option gives Daisies more specialized attention and allows the older girls to team up and learn at roughly the same level.

Explain to girls how paper programming works in this activity, and complete one or more practice examples.

Draw a large blank 4x4 grid on a poster or white board for girls to see.

SAY:

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If you wanted me to color in one of the squares in this grid, what would you say?

Girls may say: Color in the top right square, etc.

Great, so you all just gave me directions or instructions on what to color.

However, if I started here (point to top left corner), how would you tell me to color in this box (choose box)?

Girls may say: First move two to the right, then move one down, etc.

Okay, so now we have a series of instructions, which include:

- *Move One Square Right*
- *Move One Square Left*
- *Move One Square Up*
- *Move One Square Down*
- *Fill-In Square with color*

These instructions are simple enough, but the more boxes that need to be colored in, the longer the list of instructions will be.

Does anyone have any ideas on how we can make it easier to direct each other to color in the boxes?

Girls may say: Create a code, etc.

A code would be better to work with than the long list of directions. With one little substitution, we can do this much more easily!

Instead of having to write out an entire phrase for each instruction, we can use arrows.

Draw the Paper Programming Key from the **Paper Programming Example Sheet** on the board.

SAY:

In this instance, the arrow symbols are the “program” code and the words are the “algorithm” piece.

Draw Example 1 from the **Paper Programming Example Sheet** on the paper or board for girls to see.

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SAY:

For example, these arrows make up the program that would correspond to the algorithm "Move one square right, Move one square right, Fill-in square with color".

Can someone give me an example of another program using the arrow keys?

Keep It Girl- Led: let girls answer. Repeat several times, as needed, for girls to understand.

Draw Example Program 1 from the **Paper Programming Example Sheet** on the poster or board for girls to see. Fill in the graph -- square by square -- then ask the girls to help describe what you've just done.

First, you can speak the algorithm out loud, then you can turn your verbal instructions into a program.

Keep It Girl- Led: let girls answer. The correct answer to Example Program 1 is:

Move Right, Fill-In Square, Move Right, Move Down, Fill-In Square, Move Left, Move Left, Fill-In Square, Move Down, Move Right, Fill-In Square, Move Right.

(Note to Volunteers: The answer in code can be found under Example Program 1 on the **Paper Programming Example Sheet**.)

Some of your girls may notice that there is an unnecessary step, but hold them off until after the programming stage.

If the girls understand the idea of the exercise, this is a good place to discuss alternate ways of filling out the same grid. If there is still confusion, work with another example, such as Example Program 2 on the **Paper Programming Example Sheet**.

If the girls can shout out the algorithm and define the correct symbols to use for each step, they're ready to move on.

Create Paper Programs. (10 minutes)

Have each pair choose an image from their Four-by-Fours Activity Worksheet.

Each pair should discuss the algorithm to draw that image with their partner.

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Circle the room for extra support as the pairs discuss their algorithm. Each pair should convert the algorithm into a program using symbols.

Once all groups have finished their programs, they should trade programs with another pair and draw one another's image.

The pairs can then choose another image and go again!

Debugging. (10 minutes)

Divide girls into pairs. These can be different from the pairs from the last part of the activity.

Multi-Level Tip: Encourage older girls to work with a younger partner as a team to debug their programs together. You can also ask an assistant or parent to help the Daisies while the Brownies and Juniors pair up.

Either option works! The first option gives older girls a chance to teach younger girls and practice leadership skills, in addition to learning about computer science. The second option gives Daisies more specialized attention and allows the older girls to team up and learn at roughly the same level.

Draw a graph image on the board or poster on a 4x4 grid.

Have each girl create a program for the image.

Ask the girls to trade their program with their partner's and check each other's code.

Allow ten minutes for the girls to debug each other's work.

SAY:

Did anyone find problems in their partner's code? If so, how could you fix?

Girls may say: Yes, this line was not incorrect, etc.

When you find problems in your algorithm or program and then fix them, you're doing something called debugging. It's an important step in coding. Why do you think that is?

Girls may say: Bugs are bad, you can make sure it works, you can spot problems, etc.

When you debug a computer program, you make sure it will work correctly every time someone uses the program.

Optional: Show the *Unplugged Activity – Relay Programming* video [here](#).

Relay Race. (10 minutes)

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(Note to Volunteers: This activity would be easiest in a wide open space, such as a gym or outdoor field. If you don't have the time or room for a relay, you can divide girls into small groups and have them pass the paper to each other, with each girl drawing one arrow before they move the paper along.)

Divide the girls into smaller groups of 3– 5 girls.

Multi-Level Tip: Encourage older girls to work with younger girls as a team to come up with solutions together. Praise them when you hear them collaborating. Let them know that programmers work in teams and need to get along with people of all different experiences and backgrounds.

You can also ask an assistant or parent to help the Daisies while the Brownies and Juniors pair up. If Daisies have trouble with the activity, have them work on Activity 3: Building a Foundation in Think Like a Programmer PT. 1 in the Daisy Think Like a Programmer Journey.

Either option works! The first option gives older girls a chance to teach younger girls and practice leadership skills, in addition to learning about computer science. The second option gives Daisies more specialized attention and allows the older girls to team up and learn at roughly the same level.

Have each group line up relay-style.

Give each group a page of 4x4 grids, either from the **Relay Programming Activity Packet** or grid paper, and pens, pencils or markers.

Place one image from the **Relay Programming Activity Packet** at the other side of the room/gym/field from each team. The image should be the same for all teams.

SAY:

In teams, you are going to recreate this image [show image] one instruction at a time.

One at a time, you will go over to the image and review your team's program.

If you think the program is correct, you will add the next symbol (or algorithm) toward completing the program.

If you think the program is incorrect, you will debug the program. This means you will cross out the incorrect symbol and any symbols after it. The reason for this is that a bug in a computer program will affect the entire program, making all of the coding created after the bug incorrect.

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This is similar to building a house or tower. If one brick is laid crooked, then all of the bricks on top of it will be crooked. To fix this, you would have to take down not just the crooked brick, but all of those above it.

If you find a bug, this counts as your entire turn. The next player is allowed to continue from the last correct instruction.

Once you have either added the next instruction or debugged the program, run back to your team, and tag the next teammate in line, handing to them the team's program.

The first team to complete their program correctly wins!

The first girl in line from each team dashes over to the image, reviews it, and writes down the first symbol in the program to recreate that image on the first 4x4 grid on her team's paper.

The first girl then runs back, tags the next person in line, and goes to the back of the line.

The next person in line dashes to the image, reviews the image, reviews the program that has already been written, then either:

- Debugs the program by crossing out the incorrect symbol and any following it, if they find a problem with the program.
- OR
- Adds a new one, if they think the program is correct.

That girl then dashes back to tag the next person, and the process continues until one group has finished their program.

First group to finish is the winner!

As needed, you can inform/remind the girls of the following rules:

- Only one person from each group can be at the image at one time.
- While in line, the groups are allowed to discuss the image they are recreating and create a plan for creating the program.
- When a girl debugs a program by crossing out an incorrect instruction, they must also cross out the rest of the program after that.

Optional: If you have time, play through this several times, with images of increasing difficulty.

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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: Closing Ceremony: Making the World a Better Place

Time Allotment

10 Minutes

Materials

- Optional: **Take Action Guide** handout

Steps

Have girls form a Friendship Circle.

Reflect on the day's activities with a short group discussion before telling girls about Take Action and the awards they'll earn.

SAY:

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

What else could we program if we just changed what the arrows meant?

Which one of these definitions did we learn a word for today? What is the word that we learned?

- *"A large tropical parrot with a very long tail and beautiful feathers"*
- *"A list of steps that you can follow to finish a task"*
- *"An incredibly stinky flower that blooms only once a year"*

Which one of these is the most like a "program"?

- *A shoebox full of pretty rocks*
- *Twelve pink flowers in a vase*
- *Sheet music for your favorite song*

How important is it be to debug our own work and the work of the programmer before us?

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Is it easier or harder to have multiple people working on the same program? What strategy or plan worked best for your team?

Do you think people make more or fewer mistakes when they're in a hurry?

If you find a mistake, do you have to throw out the entire program and start over?

What was your favorite part about the day's activities? Let's go around the circle so every girl gets a chance to say something.

Go over the steps of doing a Take Action project and how similar it is to how programmers use computational thinking. Tell girls about the Journey awards they'll earn.

SAY:

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.

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

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Think Like a Programmer pt. 1

End the meeting with a Friendship Squeeze.

On your honor!

Benefits of a Multi-Level Troop

Leading a multi-level troop can be lots of fun, but also challenging!

Picture this: The troop meeting is in full swing. You notice that the Brownies and Juniors are absorbed in an activity, but the Daisies are distracted. Or the Juniors are ready to take on a more complex project, but the younger girls can't move at the same pace or don't get the concept. Or you see that the Daisies are having tons of fun doing an activity that completely bores the Brownies and Juniors.

How do you manage it all?

This Think Like an Engineer Journey was developed with the multi-level troop in mind. You'll find "multi-level notes" throughout to help you navigate the challenges of leading groups of K – 5 girls .

Multi-level troops are naturally set up to create a more girl-led environment.

- Older girls have a unique opportunity to lead. They can serve as role models for younger girls, creating an enhanced leadership experience for all involved. They can explain more advanced concepts, which gives younger girls a powerful near-peer experience.
- Younger girls have aspiration built right into their experience. As they interact with the older girls, they learn what's possible for them.

Multi-level troops offer all girls a diversity of perspective.

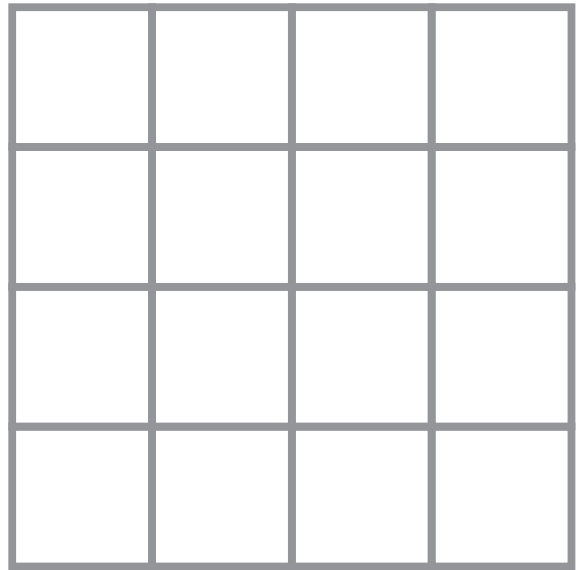
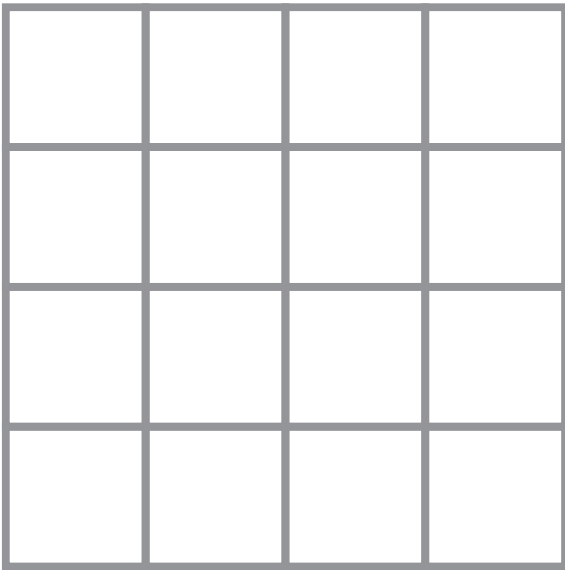
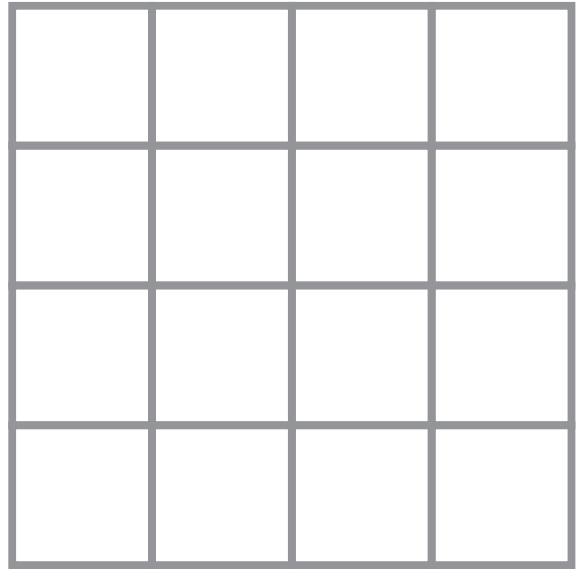
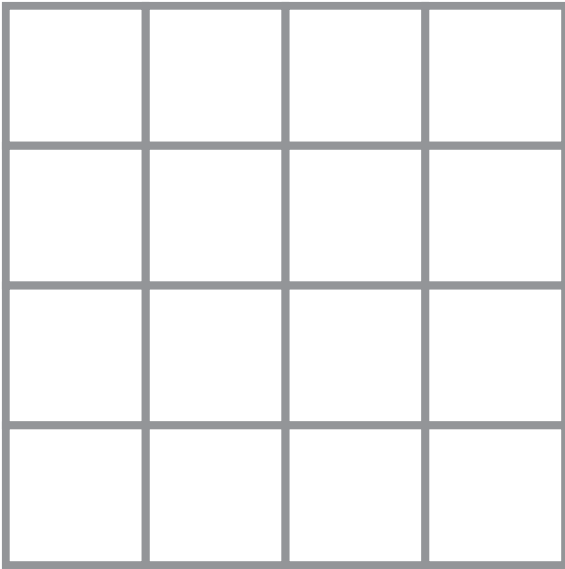
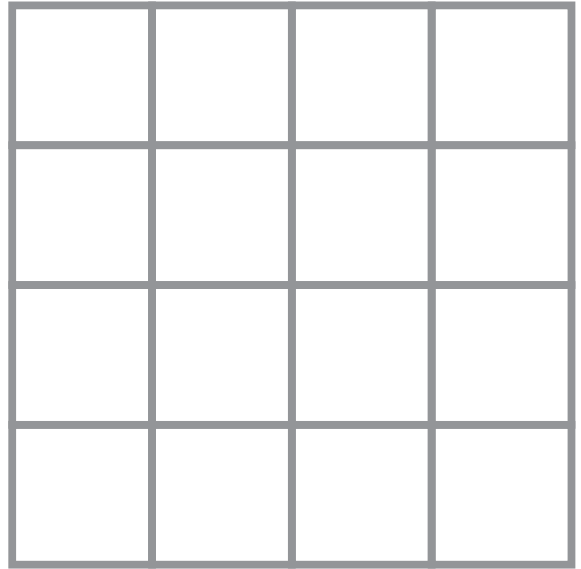
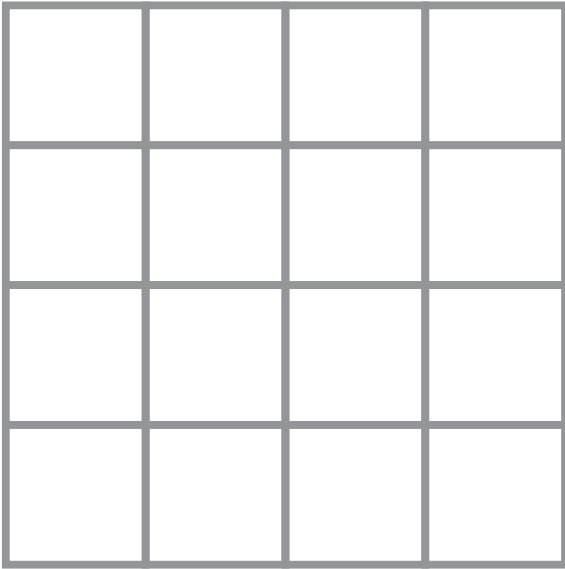
When they do an activity together:

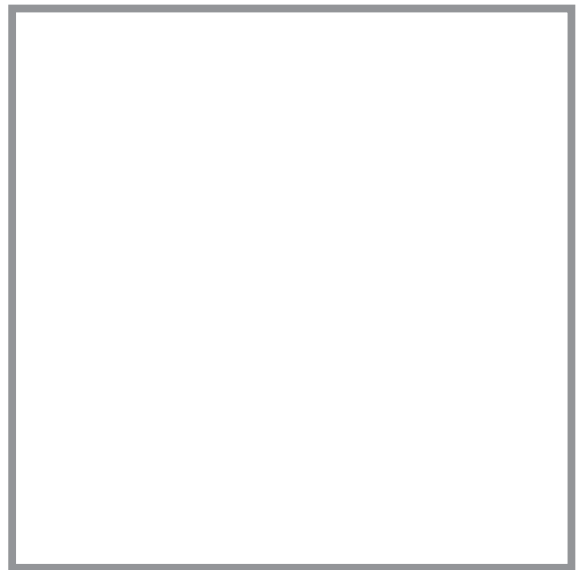
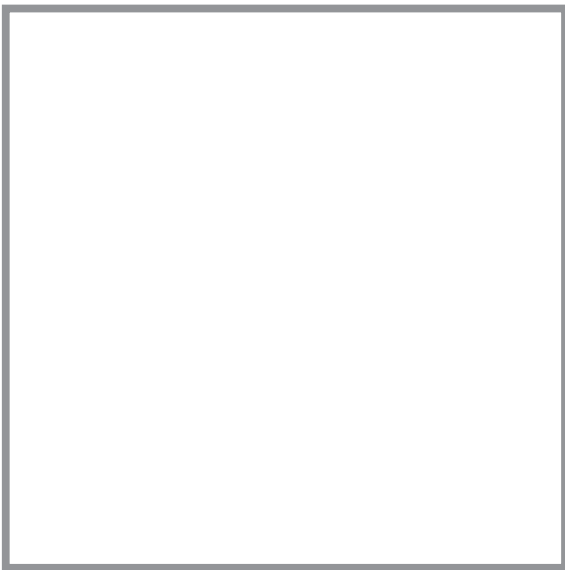
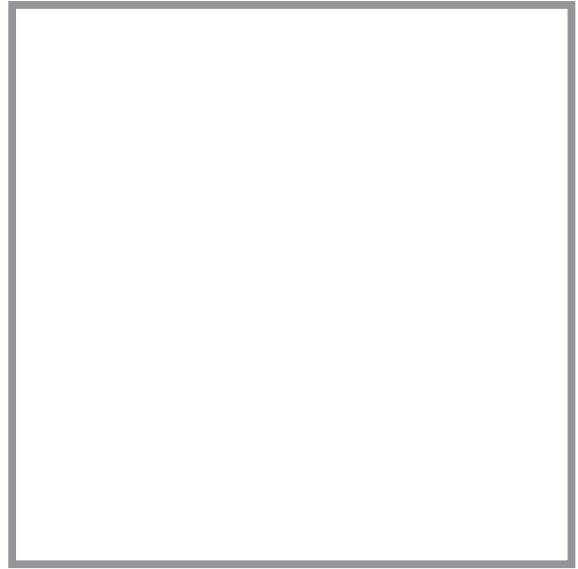
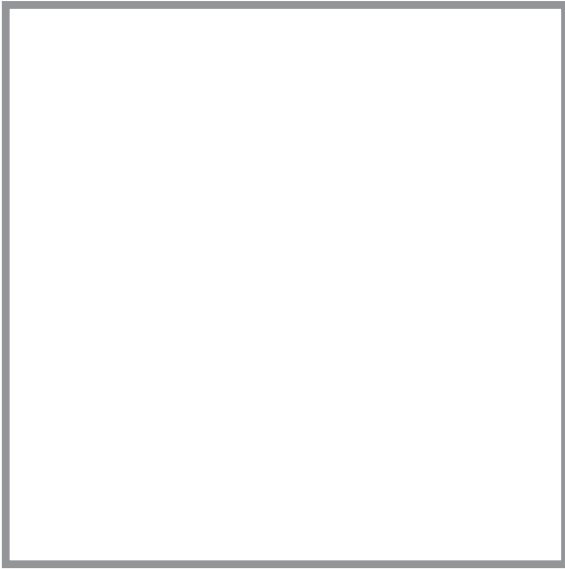
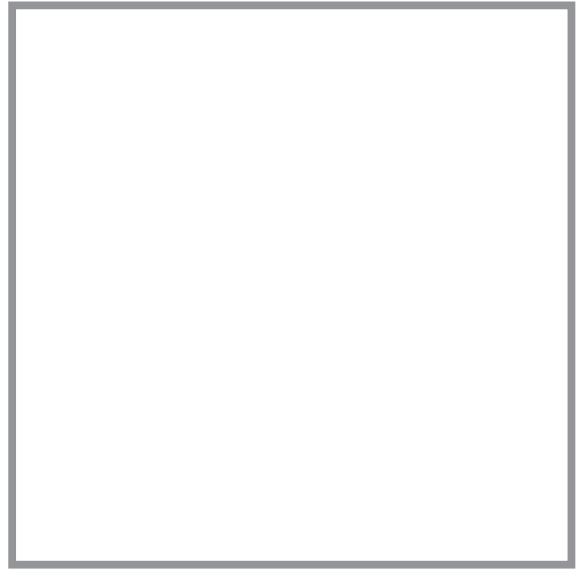
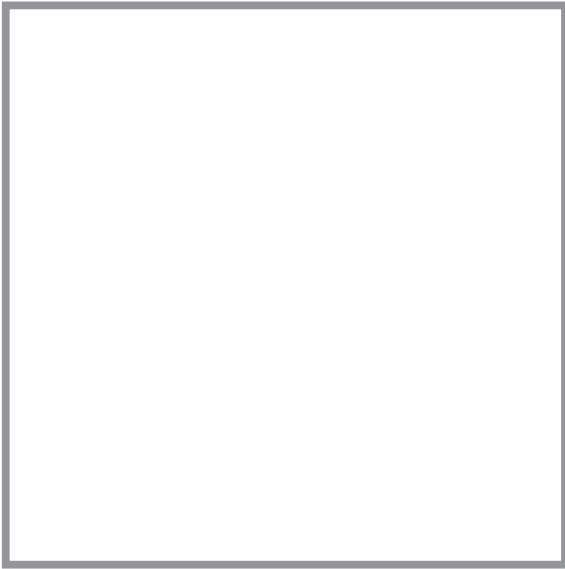
- Older girls approach it with confidence and skill, based on their experience.
- Younger girls bring a sense of wonder and imagination that makes the

Tips for Working with Girls at Different Levels

Follow these tips and insights to help make your multi-level troop experience fun, not challenging:

- Check out the STEM Glossary in Meeting Aids, and share definitions with all girls.
- Offer younger girls more concrete guidance to help them express their thoughts and come up with ideas.
- Older girls will have more nuanced understandings of interpersonal interactions and how Girl Scouts can take action, as well as more in-depth knowledge about the subject matter. They will bring up more complex concepts, which won't be familiar to younger girls. This is a great opportunity to ask older girls to share their knowledge with younger girls. Ask questions like, "Can you give us an example of that?" or "Can you describe that for everyone in the group?"
- Sometimes Daisies will outperform Brownies or you may have Juniors who perform at Brownie level. That's all OK, just customize your activities based on your experience with your troop.
- Younger girls will need more adult supervision, and it's natural that older girls will help them, too. But make sure to treat older girls like troop members, not as mini-Troop Leaders.
- Help older girls feel welcomed and valued by giving them leadership opportunities, such as guiding a discussion or acting as a scribe. Juniors may want to earn their Junior Aide award by mentoring the younger girls.
- Give older girls more responsibility in troop decision-making. While all girls should be involved in decision-making at some level, older girls will be able to offer good insights about how to make things work better for them. When older girls make a suggestion that can reasonably be implemented, try it out and acknowledge their contribution.
- Encourage all girls to help hand out supplies and snacks.



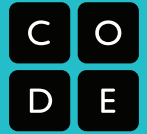




Name: _____

Date: _____

Graph Paper Programming



Unplugged

Four-by-Fours Activity Worksheet

Choose one of the drawings below to program for a friend. Don't let them see which one you choose!

Write the program on a piece of paper using arrows. Can they recreate your picture?

Use these symbols to write a program that would draw each image.

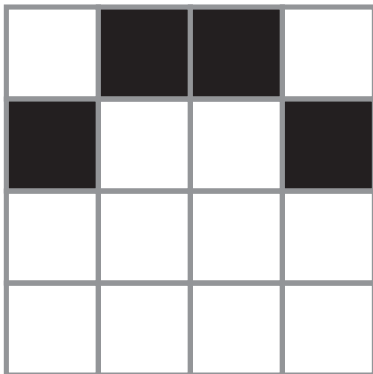
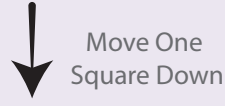
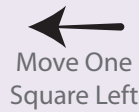


Image 1

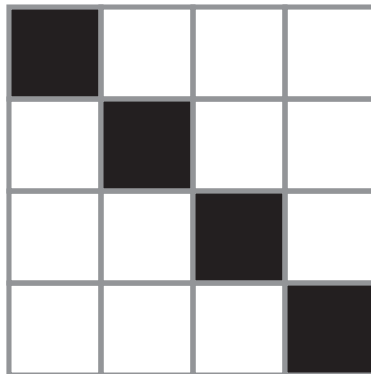


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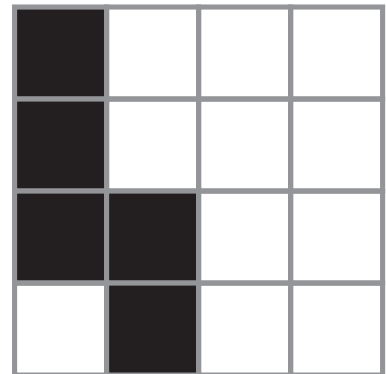


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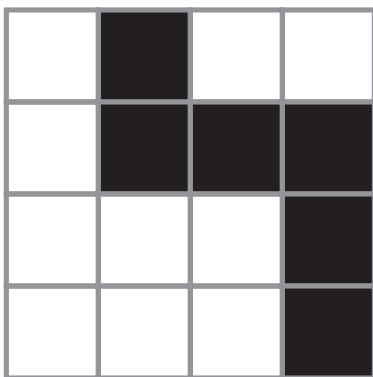


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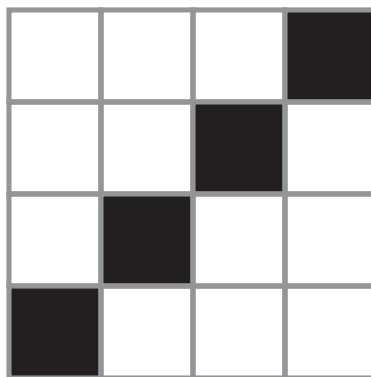


Image 5

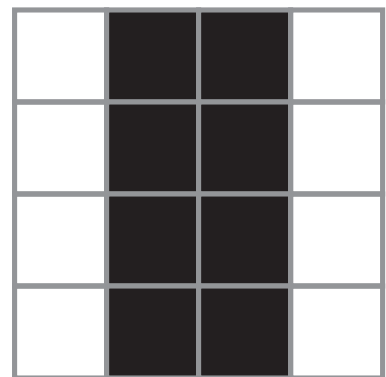


Image 6

The Girl Scout Promise

On my honor, I will try:

To serve God and my country,

To help people at all times,

And to live by the Girl Scout Law.

The Girl Scout Law

I will do my best to be

honest and fair,

friendly and helpful,

considerate and caring,

courageous and strong, and

responsible for what I say and do,

and to

respect myself and others,

respect authority,

use resources wisely,

make the world a better place, and

be a sister to every Girl Scout.

Morse Code

for Think Like a Programmer 1

Morse code is a way to send messages using a code. Each letter in the alphabet corresponds to a group of dots and dashes.

A ● —

B — ● ● ●

C — ● — ●

D — ● ●

E ●

F ● ● — ●

G — — ●

H ● ● ● ●

I ● ●

J ● — — —

K — ● —

L ● — ● ●

M — —

N — ●

O — — —

P ● — — ●

Q — — ● —

R ● — ●

S ● ● ●

T —

U ● ● —

V ● ● ● —

W ● — —

X — ● ● —

Y — ● — —

Z — — ● ●

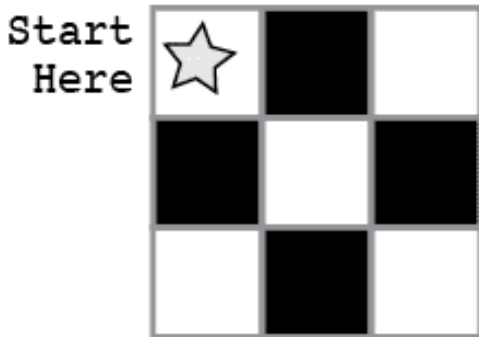
Paper Programming Example Sheet

for Think Like a Programmer 1

Paper Programming Key:

 Move One Square Right	 Move One Square Left	 Move One Square Up	 Move One Square Down	 Fill-In Square with Color
--	---	---	---	--

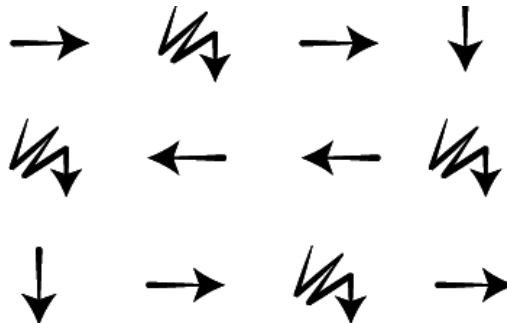
Example 1:



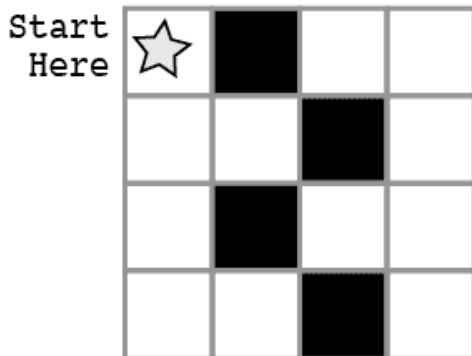
Verbal Instructions for Example 1:

Move Right, Fill-In Square, Move Right, Move Down, Fill-In Square, Move Left, Move Left, Fill-In Square, Move Down, Move Right, Fill-In Square, Move Right.

Coded Instructions for Example 1:



Example 2:



Verbal Instructions for Example 2:

Move Right, Fill-In Square, Move Right, Move Down, Fill-In Square, Move Left, Move Down, Fill-In Square, Move Down, Move Right, Fill-In Square.

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.

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 lunch-time 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

Think Like a Programmer Journey

Glossary for Girls

Girls 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.

Inventors are people who make up new things and products.

Think Like a Programmer Journey: Materials List

Think Like a Programmer 1

Activity 1: As Girls Arrive: Morse Code Messages

- Morse Code handout
- Paper
- Markers or crayons

Activity 2: Opening Ceremony: All About Solving Problems

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

Activity 3: Paper Programming

- Paper Programming Example Sheet
- Four-by-Four Activity Worksheet (at least one for each pair of girls)
- Blank paper or index cards for programs
- Relay Programming Activity Packet (one for each group)
- Extra sheets of 4x4 paper grids and blank paper to use as practice. These are also provided as part of the Relay Programming Activity Packet.
- Markers, pens, or pencils
- Optional: Computer/tablet or other device with ability to show girls the [Unplugged – Graph Paper Programming](#) and [Unplugged – Relay Programming](#) videos

Activity 4: Closing Ceremony: Making the World a Better Place

- Optional: Take Action Guide

Think Like a Programmer 2

Activity 1: As Girls Arrive: Paper Programming

- Worksheet: Graph Paper Programming (one for each girl or group)
- Worksheet: Relay Programming (one for each girl or group)
- Paper
- Pencils

Activity 2: Opening Ceremony: Use Computational Thinking Everyday

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

Activity 3: Functional Suncatchers

- One foot of string, thread, or fishing line per girl
- 2-4 beads per girl
- 2-4 other accessories (buttons, hoops, spacers) per girl
- One special bead, prism, button, or girl-made sun charm per girl
- 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 during Part 1. (Sample can be found on the **Functional Suncatchers Skills Sheet**.)
- Optional: Computer/tablet or other device with ability to show girls the [Unplugged – Functional Suncatchers](#) video

Think Like a Programmer Journey: Materials List

Think Like a Programmer 2 (continued)

Activity 3: Functional Suncatchers (continued)

- 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.

Activity 4: Closing Ceremony: Brainstorming Our Take Action Project

- List of the girls’ Take Action ideas from Think Like a Programmer 1
- Optional: **Take Action Guide**

Think Like a Programmer 3

Activity 1: As Girls Arrive: Walk the Line

- Prepare masking tape trails made of right angles (one for each group of 3-4 girls). See **Sample Trails for Walk the Line** for ideas.
- Blindfold (one for each group of 3-4 girls)
- Masking Tape

Activity 2: Opening Ceremony: Reviewing Our Take Action Ideas

- Flag
- List of Take Action ideas from last meeting
- Index Cards (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!

- The girls’ 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 Journey: Materials List

Think Like a Programmer 4

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

- Paper
- Pencils, crayons and markers

Activity 2: Opening Ceremony: Programming Power!

- 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: Our Recipe for Success

- Poster board or large paper
- Paper
- Colored markers

Activity 2: Opening Ceremony: Why is Our Project Important?

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

Activity 3: Creating Our Take Action Project

- Any materials the girls 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 the girls 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

Think Like a Programmer Journey: Materials List

Think Like a Programmer 6 (continued)

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

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:

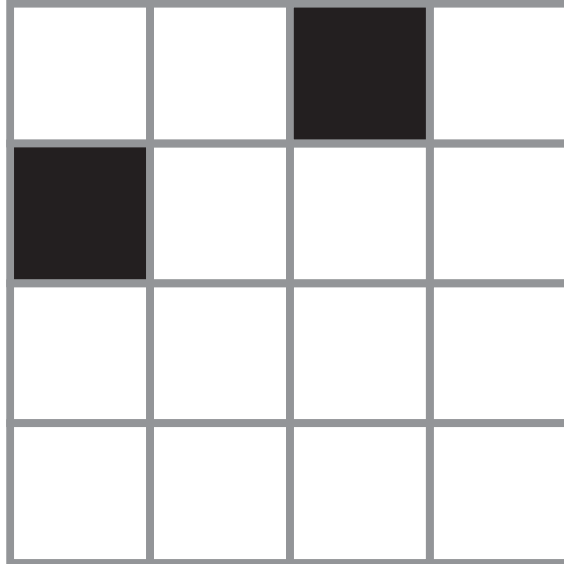
- **Strongly Recommended:** One girl shares the best/most interesting/summary answer for the group. This approach is great if you're running short on time. It also helps develop conflict resolution and compromise skills.
- **Optional:** Each girl shares her partner's answer. This helps girls develop active listening skills, but will run longer because all girls are sharing.

1

Relay Programming

Relay Image 1

C O
D E



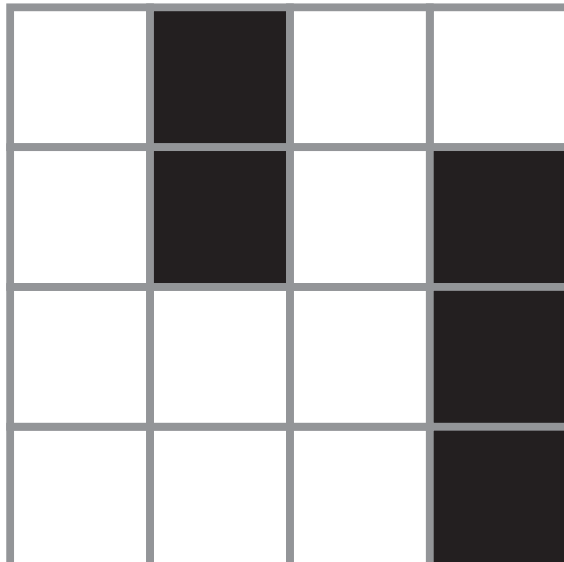
Revision 140710.1a

2

Relay Programming

Relay Image 2

C O
D E



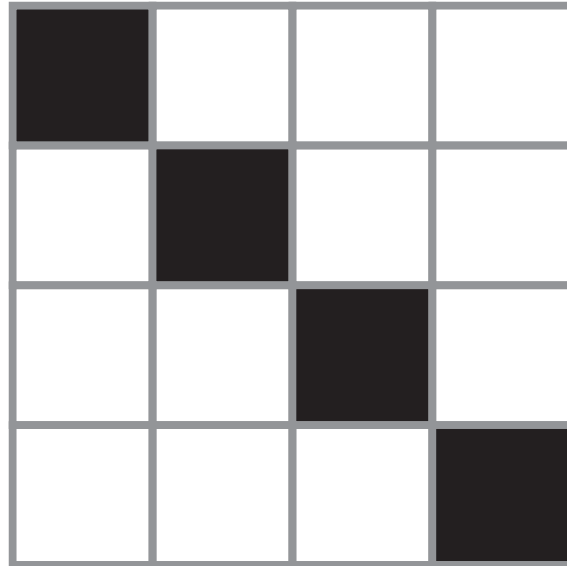
Revision 140710.1a

3

Relay Programming

Relay Image 3

C O
D E



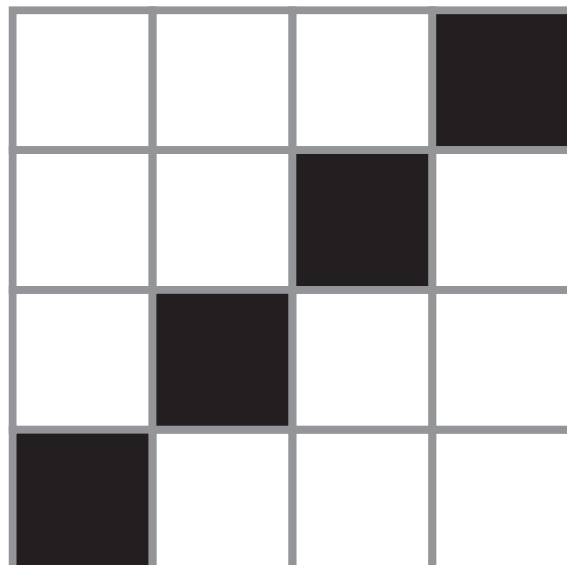
Revision 140710.1a

4

Relay Programming

Relay Image 4

C O
D E



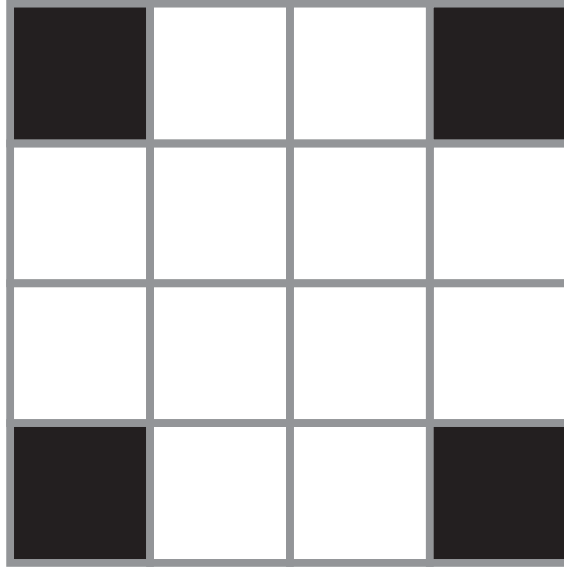
Revision 140710.1a

5

Relay Programming

Relay Image 5

C O
D E



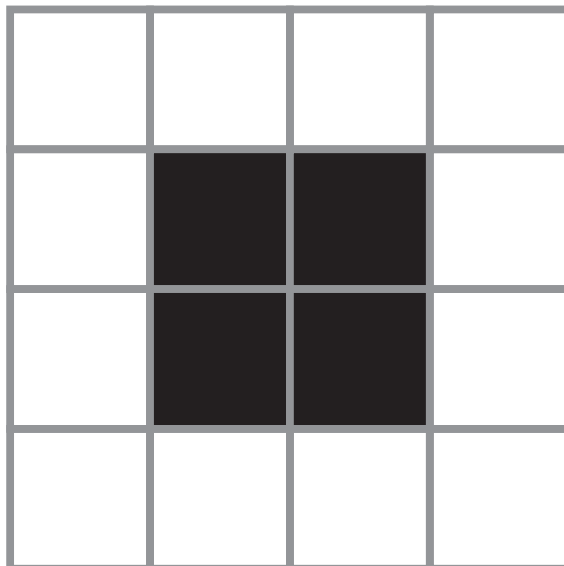
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6

Relay Programming

Relay Image 6

C O
D E



Revision 140710.1a

