



3RD - 5TH GRADE CLUBS

CURRICULUM & RESOURCES



WELCOME TO YOUR CLUB!

Thank you for joining us in our mission to close the gender gap in tech by bringing the message of sisterhood and bravery to girls in your community.

In this packet, you'll find all the resources you need to...

- Create a fun and inviting space where girls build **sisterhood** and are **inventive** together.
- Challenge girls to be **brave** by speaking up and taking risks.
- Ignite girls' interest in **computer science**.

GET STARTED

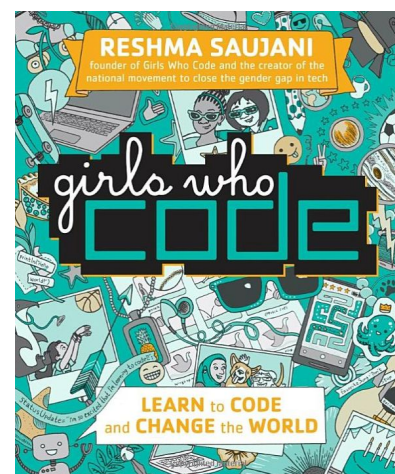
Your Girls Who Code Club needs 3 key ingredients: access to excerpts from *Learn to Code and Change the World*, students, and you - a dedicated Facilitator! The steps below explain how to use those ingredients to create a great experience for your girls.

SETTING UP YOUR CLUB

Step 1: Set yourself up for success by making a few key decisions before your Club meets. For example:

- How often will you meet? When?
- How many meetings will you hold in total? We recommend at least 5, but there are enough activities and passages for more than 20 meetings!
- Will your Club be unplugged, or will you try the online activities too?
- How many passages will you tackle each meeting?

Step 2: Gather a group of girls who are curious about reading, coding, or creating - they'll be perfect for your Club. No prior knowledge about computers is necessary to join. Your Club can be as small as 3 girls or as many as you feel you can manage. Just make sure you have space for the girls and the resources you need! Also, make sure you have a plan for how you will use [HQ with your Club](#).



RUNNING YOUR CLUB

Step 1: Meet, discuss the book, and try the activities. Use the [chapter guides](#) as a starting place, but feel free to add your own questions. Before each meeting, pick out the passage, questions, and activity for the day. Before ending a meeting, close out by asking each member to share something new they learned. Also, share highlights from your Club with the Girls Who Code Community on social media. We want to hear your insights and see your creations!

Step 2: Share your experience with us! Once your Club ends, we will reach out with a survey to learn about how it went. After you share your feedback, keep your eyes open for ways to renew your Club for next year!

RUN A CLUB MEETING



Each meeting, your goal is to find opportunities for girls to be brave, creative, and supportive. These flexible agendas, combined with the [chapter guides](#) that follow, will help you do just that!

IF YOU HAVE 45 MINUTES...

1. Build Sisterhood (5 minutes)

- Make time for a quick activity that breaks the ice at the beginning of a meeting. Take a peek at the [Sisterhood Activity](#) Section for ideas.

2. Read & Reflect (15 minutes)

- Read one of the suggested passages from *Learn to Code and Change the World*, and discuss the related questions. Check out our [Discussion Tips](#) to guide you.

3. GWC Challenge (20 minutes)

- Complete one of the suggested activities that connects to the passage you read. Challenge your girls to be brave, bold, and creative! If you're trying an online challenge or using HQ with your students, read the [Logistics](#) section for more information.

4. Close-Out (5 minutes)

IF YOU HAVE AN HOUR OR MORE...

1. Build Sisterhood (10 minutes)

- Make time for a quick activity that breaks the ice at the beginning of a meeting. Take a peek at the [Sisterhood Activity](#) Section for ideas.

2. Read & Reflect (15+ minutes)

- Read one of the suggested passages from *Learn to Code and Change the World*, and discuss the related questions. Check out our [Discussion Tips](#) to guide you.
- If time allows, consider reading another passage together!

3. GWC Challenge (20+ minutes)

- Complete one of the suggested activities that connects to the passage you read. Challenge your girls to be brave, bold, and creative! If you're trying an online challenge or using HQ with your students, read the [Logistics](#) section for more information.

4. Close-Out (5 Minutes)

TIPS FOR A GREAT DISCUSSION

1. Preview the discussion questions before reading the passage. This will help girls focus their attention while reading.
2. Pick a girl to be the discussion **leader** for a meeting. The discussion leader will read the questions for the group, keep time, and encourage girls who haven't shared their thoughts yet to speak up.
3. Encourage girls to be **brave** by sharing their thoughts, even if they're not 100% sure of the answer.
4. Build **sisterhood** by introducing a silent or nonverbal way for girls to agree with each other during a discussion. For example, girls could snap if they agree with a point that another student shares.
5. Allow students to share with a partner before sharing their thoughts with the whole group. This can help them build up the confidence to share their ideas with the entire Club.

CHAPTER GUIDES

These guides are your map as you run your Club and explore *Learn to Code and Change the World!* Each time you meet, you should:

1. Choose a passage for your Club to focus on.
 - Don't feel like you have to read everything we recommend - just choose what's right for your Club!
2. Then, choose the questions you will discuss during the Read & Reflect portion of your Club.
3. Finally, choose a related GWC Challenge for your Club to try!



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CHAPTER 1: WHY CODING?

Passage 1: “Welcome” - Pg 11-18

Key Vocabulary

- **Code:** What people use to describe the steps a computer program should take.
- **Input:** The information and instructions that you give to the computer.
- **Output:** How a computer behaves based on a combination of your input and the code of the program.
- **Process:** The program that is running on your computer or device. It is how your computer turns your input into output!

Read & Reflect

- Based on what you’ve read, what do you think coding is?
- Think of your own example where an input starts a process. What is the output?
- The book provided some reasons why learning to code is important. Which reason seemed most important to you?

GWC Challenge

- **Unplugged Activity:** In small groups, create posters that spread the word about why learning to code is important, interesting, or cool! You can use examples from the book or your own ideas. Once you’re done, post these in your school, library, or neighborhood to spread the word to other people your age.
 - **Materials:** Paper, markers, tape
- **Online Activity:** Scratch is a free, online coding language and online community. When working in Scratch, you use blocks to create animations and games while you code! To help you get started and learn how to use the platform, work with a partner to try the Getting Started with Scratch Tutorial.
 - **Materials:** [Getting Started With Scratch Tutorial](#), [Tips for Completing Online Activities](#)

Passage 2: “Computers Then and Now” - Pg 20-26

Key Vocabulary

- **Data:** The information that you put into a computer to get it to perform a task or make a calculation.

Read & Reflect

- On page 23, you're introduced to Ada Lovelace. Describe her accomplishments in your own words!
- How does it feel to know that some of the first computer programmers were women? Are you surprised? Why or why not?
- Turn to the timeline on page 24. Which invention do you think was most important? Why?

GWC Challenge

- **Unplugged Activity:** What might the world be like if some of these inventions were never created? Pick an event from the timeline on pages 23-25 (for example, 1990: The World Wide Web is invented). Then, break into small groups and create a short skit where you act out a world without this invention. After drafting your skit, perform it for the other girls in your Club!
 - **Materials:** Paper, pencils
- **Online Activity:** Scratch is a free, online coding language and online community. When working in Scratch, you use blocks to create animations and games while you code! To help you get started and learn how to use the platform, work with a partner to try the Getting Started with Scratch Tutorial. If you already completed that tutorial, try the Animate Your Name Tutorial to learn more about the platform and bring your name to life.
 - **Materials:** [Getting Started With Scratch Tutorial \(by Scratch\)](#), [Animate Your Name Tutorial \(by Scratch\)](#), [Tips for Completing Online Activities](#)

CHAPTER 2: HOW TO TALK TO YOUR COMPUTER

Passage 1: “The Peanut Butter and Jelly Effect” - Pg 29-33

Key Vocabulary

- **Computational thinking:** A way of thinking that helps us work logically through big problems by breaking them down into smaller pieces, looking for patterns, and then using the information to come up with a step-by-step solution.

Read & Reflect

- What are things that a computer is very good at doing?
- How is a computer different from a human brain?
- What kind of instructions must you give to computers? What might be hard about providing that type of instructions? What might be fun?

GWC Challenge

- **Unplugged Activity:** As a Club, agree on an everyday task, like making a sandwich. Try to write instructions that a computer can follow. Then, swap your instructions with a partner, who will pretend to be a robot! See if they're able to follow your instructions.
 - **Materials:** Paper or index cards, pencils, any materials for the task.
- **Online Activity:** Scratch is just one programming language that you can use to give your computer specific instructions. Continue to familiarize yourself with the platform and how to be precise by completing the “Make your sprite glide” tutorial. By the end of this tutorial, you'll have made a sprite fly, and you'll be ready to try out some custom Girls Who Code projects like the ones in your studio!
 - **Online Materials:** [Make your sprite glide Tutorial \(By Scratch\)](#), [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

Passage 2: “Variable = Remember” - Pg 34-38

Key Vocabulary

- **Conditional:** An element of code that only happens if something else is true. Conditionals are also called “if” statements, because “if” something happens, then something else will occur.
- **Logic:** An organized way of thinking that makes sense to a computer.
- **Loop:** A way of writing a piece of code that repeats multiple times. If I want to draw a square, I can write one loop that says “go straight, and then turn right” and have it repeat 4 times.
- **Variable:** A container that a program uses to store and remember information. Variables can hold numbers, words, and even whether something is true or false.

Read & Reflect

- Give an example of a container you use to store things. What is its name? How is it similar to a variable?
- Think of an activity you do that requires you to repeat something. What does that look like as a loop?
- What decisions do you make during the day? Can you write them as conditionals?
- What are some ways that you already use the concepts from coding?

GWC Challenge

- **Unplugged Activity:** In this chapter, you learned that variable can store all types of information. What would a variable that represented you hold?
 1. Start by creating your own personal variable by decorating the outside of a box, cup, or other container with your name and other images that represent you.
 2. Then, put words, drawings or objects inside of your variable that represent who you are and what matters to you.
 3. Finally, think about things that you’d like to add to your personal variable over time - because just like a variable, you can change and grow!
 4. Finish this activity by sharing the contents of your variable in small groups.
 - **Materials:** One container per student ([like these](#)), coloring tools, paper, (optional) magazines for pictures
- **Online Activity:** Create an animation that can be used to teach a younger relative or friend about the Core4! Include pictures and real-life examples to help make your explanation clear and fun.
 - **Materials:** [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

CHAPTER 3: PUTTING IT ALL TOGETHER

Passage 1: “Algorithms” - Pg 41-46

Key Vocabulary

- **Algorithm:** A set of steps that a computer follows to complete a task. You can write algorithms that do all kinds of things, from solving math problems to writing music!
- **Pseudocode:** A description of code that is easily readable by humans but not computers. Pseudocode is used to record the logic of your code before you translate it into code that computers will understand.

Read & Reflect

- Define the term algorithm in your own words.
- In this passage, they reference some everyday algorithms. What is an algorithm that you use every day?
- On page 43, the book mentions more complicated algorithms like Google searches or Netflix recommendations. Choose one that you’ve used before. How do you think it works?
- Pseudocode is a way to plan your program before you actually code it. Is this similar to how you plan your work in other subjects? Why or why not?

GWC Challenge

- **Unplugged Activity:** Throw an algorithmic dance party! Pick a dance move you know how to do. Write step by step instructions for your dance move. Then, swap your instructions with a partner to see if they can recreate your move. Finally, throw a dance party using the dance moves you described as an algorithm.
 - **Materials:** Paper, pencils, music for the dance party
- **Online Activity:** Even games are controlled by algorithms! We’ve started a falling object game for you. In this game, a player controls the cat using the left and right arrow keys. The goal of the game is to catch the fish and avoid the rocks that is falling from the sky. Use pseudocode to write the algorithm that controls what should happen if the cat catches a fish and if the cat catches rocks. Then, add code to the program to add that feature. How did your pseudocode help you once you were ready to build your program?
 - **Materials:** [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

Passage 2: “Functions” - Pg 48-52

Key Vocabulary

- **Function:** A list of steps in a program that are all wrapped up together, like a math problem. When you give information, or “input” to the function, the function processes the information and gives you back an answer, or an “output.”
- **Parameters:** A kind of variable that gets passed through a function. It is the “input” that you send to the function.

Read & Reflect

- Define the term function in your own words.
- What are some ways that functions are similar to algorithms? What are some ways that they are different.
- What is the difference between defining and calling a function?

GWC Challenge

- **Unplugged Activity:** What do you wish you had a function for? Wouldn't it be great to have one that completed your homework, or cleaned up after your little brother? Use pseudocode to describe what that function would accomplish and how it might accomplish it. Circle or highlight the places where you might use a variable, loop, or conditional.
 - **Materials:** Paper, pencils
- **Online Activity:** You can create your own functions in Scratch by creating a custom block! Remix the project online to create and use one of the suggested functions, or imagine and create your own.
 - **Materials:** [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

CHAPTER 4: GETTING STARTED

Passage 1: “The Design-Build-Test Cycle” - Pg 59-63

Key Vocabulary

- **Brainstorming:** A way of working as a group to think up creative solutions to big problems. In a brainstorming session, there are no bad ideas!
- **Design-Build-Test-Cycle:** In the design-build-test cycle, you design something, build it so that it works, test it out, and then use what you’ve learned to make the design better. Since it’s a cycle, you keep doing it until you’re happy with what you’ve made.

Read & Reflect

- Choose something you like to do. What would make that thing better?
- Think of a project you’ve worked on before. It can be something you do at school, or at home, or for an extracurricular activity! How could you break that project down into a "Design, Build, Test" Cycle?
- On page 63, it says that brainstorming is “not a time to be self-conscious or worry about whether or not an idea is good.” Sometimes, that can be really tough! What are things you can do while brainstorming to help yourself or others be brave and overcome that fear?

GWC Challenge

- **Unplugged Activity:** In a small group, use the questions on page 61 to brainstorm ideas for something you might want to create together. Then, vote on your favorite idea. Finally, try to convince others in your Club that your idea is awesome! To do so, come up with a skit, drawing, song, dance or other that showcases the best parts of your idea.
 - **Materials:** Paper, pencils, or other materials for the idea showcases.
- **Online Activity:** We’ve designed and built a [simple adventure story game](#). Help complete the Design-Build-Test Cycle by testing out our project. As you test it out, make a list of things you could change or update to make the game even better. Then, pick the feature you think is most important to fix. Explain why you think it would make the biggest improvement to the game. And remember, the Design-Build-Test cycle can repeat! Remix our code and make the improvement you named.
 - **Materials:** [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

Passage 2: “Dial in On Your Design” - Pg 64-69

Key Vocabulary

- **Design:** A design is a plan, either written or drawn, that gives instructions for how something should look and function. For example, a design for a dress tells you how that dress should be made, and a design for an iPhone app will show how that app will work. The people who create these plans are designers.
- **Wireframe:** A wireframe is a way of planning the structure and function of a website or application using simple boxes and lines. Each wireframe is like a puzzle that tells you what will go where, and how all the pieces will fit together.

Read & Reflect

- What are the questions that you can ask to help you dial in on a design? Why are these questions helpful?
- How is the job of a designer related to the job of a programmer?
- Why do you think it might be important to spend time designing your project before coding it?
- What are some of the ways this chapter says you can visualize your project? Which one do you think might work best for you?

GWC Challenge

- **Unplugged Activity:** Even the best ideas are better with feedback. What is an idea that you'd like to create with code? First, create a wireframe or storyboard to make your idea come to life. Then, swap drawings it with a partner to give and get feedback to make your each idea even better. Finally, as a Club, discuss what it felt like to be brave and open up your ideas for feedback.
 - **Materials:** Paper, pencils
- **Online Activity:** Dialing in on a design can be tricky! Use the questions on pages 64-67 to create an interactive quiz that other people can use as a tool when trying to decide what to design.
 - **Materials:** [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

CHAPTER 5: CRACKING THE “CODE”

Passage 1: “Go With the Flow” - Pg 73-81

Key Vocabulary

- **Application flow:** Sometimes called a flow chart, an application flow is a way of using pictures and arrows to show what will happen in your program and the order things will occur. Mapping the application flow can help you work through the logical steps to make your program run.

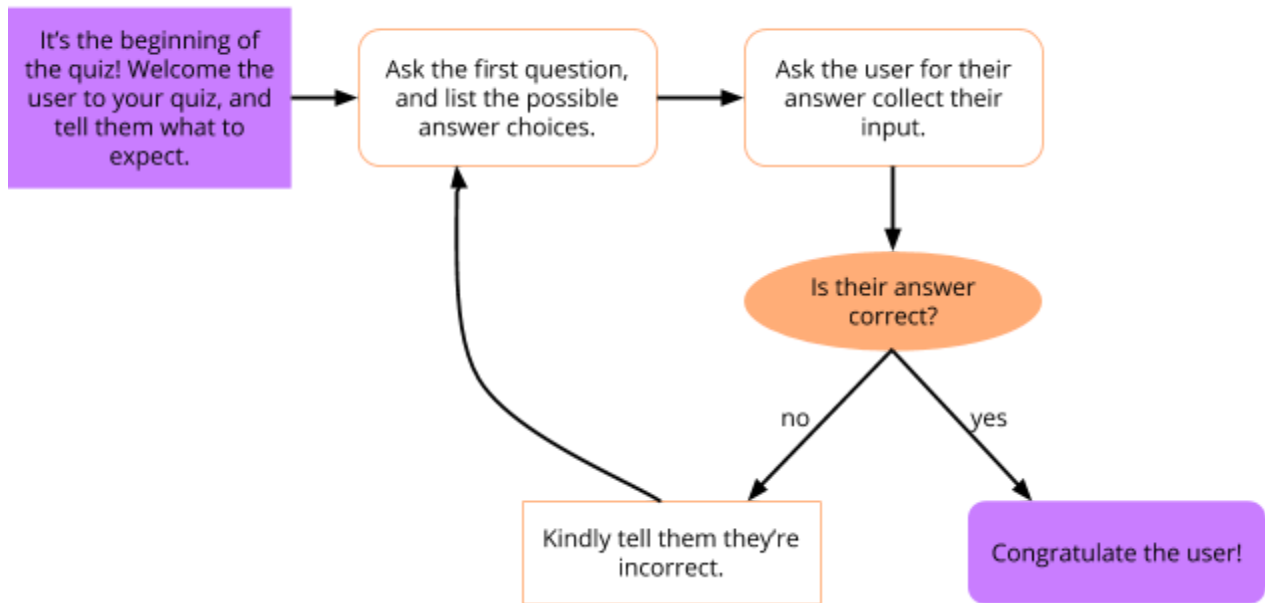
Read & Reflect

- List other tools or strategies that you have used in other classes to plan projects. How are they similar or different to an application flow?
- The book recommends coming up with a plan by drawing an application flow and pseudocoding before writing the code. Why does it recommend this strategy? Do you think it will help you? Why or why not?
- Look back at the example of an application flow on page 78. Find at least one example of a conditional and one example of a loop. How did you identify your examples?

GWC Challenge

- **Unplugged Activity:** Draw an application flow for your favorite activity or a piece of software you use. Label the places you used conditionals and loops in your flow.
 - **Materials:** Paper, pencils
- **Online Activity:** We’ve sketched an application flow for a simple quiz game. You can find it on the next page! Follow the application flow to build the game in Scratch. Add your own questions based on things you’re interested in! How might you use a loop to this flow so that your game would ask more than one question? If you completed the online activity about Dialing in on a Design from Chapter 4, you can use your code to help you here! That’s a strategy that computer scientists use all the time.

Start Here



- **Materials:** [Full Page Program Flow Diagram](#), [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

Passage 2: “The Secret Ingredient - Problem Solving” - Pg 84-89

Key Vocabulary

- **Binary:** A binary code translates words or computer process instructions into a series of 1's and 0's that tell computers what to do. In binary code, the word “hi” is 01101000 01101001.
- **Binary Number:** A binary number is a normal number that has been translated into a code of 1's and 0's. In the binary system, each digit of a number is called a **bit**.

Read & Reflect

- Who is Grace Hopper? What was her contribution to computer science?
- Think back to the passage on Binary numbers and how they relate to programming languages. Why are programming languages helpful?
- Have you tried any programming languages? Which are your favorite? Which are you curious to experiment with more?

GWC Challenge

- **Unplugged Activity:** Take on the Binary Math Challenge! The goal of the challenge is to answer 10 math problems correctly as a Club in under 5 minutes. But, the twist is that you have to give your answer as a binary number - and act it out!
 1. First, form groups of 4 or 5 students. Each student in the group will be one **bit**, meaning they can have one of two values: 0 or 1.
 - a. If a student is representing 0, they should sit down. If they represent a 1, they should stand. Practice representing a few of the numbers on the binary math worksheet to make sure everyone understands.
 2. Set a timer for 5 minutes.
 3. Then, one group at a time will try to answer a math problem that the teacher or another student posts on the board.
 4. The group will first calculate the answer, and then represent it as a binary number by acting as sitting or standing bits! The group can keep trying until they get the answer right, or pass if they are really stuck.
 5. Keep track of the number of problems you answer, and keep trying if you don't meet the goal the first time!
- **Materials:** [Binary Math Challenge Worksheet](#), Paper, pencils
- **Online Activity:** A friend has started programming a paddle ball game. So far, she's been able to make the balls move around the screen, but needs your help programming the paddle. Use pseudocode to plan out how the paddle should move in the game. Then, remix the game and turn your pseudocode into something that works!
 - **Materials:** [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

CHAPTER 6: DEBUGGING

Passage 1: “Debugging - Pg 96-100

Key Vocabulary

- **Debugging:** Code rarely works the first time. Debugging is finding out why your code is not working and fixing the problems. Debugging got its name when Grace Hopper found a moth in her computer (an actual bug!) that was making the computer malfunction.

Read & Reflect

- Look back “Whom and When to Ask for Help” on page 99. How does this compare to what you typically do when you feel stuck? Would this strategy work in other classes or situations too?
- Why is debugging an important part of the coding process? What do you learn from it?

GWC Challenge

- **Unplugged Activity:** Debugging code is a lot like looking at flaws in instructions. Read each set of instructions we’ve written for different puzzles below and identify the error. Finally, figure out how you would change the broken instructions to make them work correctly!
 - **Unplugged Materials:** [Debugging Instructions Worksheet](#), [Answer Key](#)
- **Online Activity:** We were trying to make a Tic-Tac-Toe game in Scratch, but we’ve gotten stuck! We know there is a bug somewhere in our code. Right now, when you press the spacebar, both letters are marked on the game board at once. Try to debug our code so that players can place one letter at a time on the gameboard. As you work, be sure to ask yourself:
 - What is supposed to be happening?
 - What is going wrong?
 - Where might I find that in the code?
- Don’t be afraid to change the code and tinker as you look for the error! You can always go back to the original game if you need to.
- **Online Materials:** [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

Having trouble finding the bug? Here’s a hint: To place one letter at a time, change the **key** that places the letter. For example, place the O when the “O” key is pressed, and place the X when the “X” key is pressed.

Passage 2: “Rubber Duck It” - Pg 101-105

Key Vocabulary

- **Debugging:** Code rarely works the first time. Debugging is finding out why your code is not working and fixing the problems. Debugging got its name when Grace Hopper found a moth in her computer (an actual bug!) that was making the computer malfunction.

Read & Reflect

- Compare and contrast the Rubber Duck and Error Detective strategies. Which one do you believe would be the most effective? Why?
- Taking a break and embracing imperfection aren't specific to computer science or programming. Can you think of other situations where these strategies might have helped you succeed?
- Describe what it might look, sound and feel like to embrace imperfection.
- Embracing imperfection can be scary and requires bravery. What's a time when you've decided to just try something new without worrying about if you'll get it right? How did it go? How did it feel? Would you do it again?

GWC Challenge

- **Unplugged or Online Activity:** One of the hardest things about creating programs is being brave and embracing imperfection! Create an inspirational poster, animation, or song that a fellow coder can read, watch or listen to to be encouraged when they are feeling stuck or afraid.
 - **Unplugged Materials:** Paper, pencils, markers
 - **Online Materials:** [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

CHAPTER 7: VIDEO GAMES

Passage 1: “Career Couture” - Pg 107-112

Key Vocabulary

- **Genre:** A video game genre is a group of games that have similar challenges. For example, educational games would be grouped together in one genre, while adventure games would be grouped in another.
- **Video Game Development:** Video game development is the process of coming up with and creating a video game! Girls Who Code students have made amazing games that address important topics, like endangered species and social issues.

Read & Reflect

- What genre of games do you enjoy most? The least? Why?
- Who are the creators of the Career Couture Game? What was their goal? Do you think the game may have met the goals? Why or why not?
- How did the creators collaborate as they worked on the project? Is this a good example of sisterhood? Why or why not?

GWC Challenge

- **Unplugged Activity:** Take on the perspective of the creators of Career Couture. Imagine that you are heading into a meeting with someone who you need to convince to help you continue to build your project and make it even better. What will you say to convince them that your project is important? How can you explain why your team is worth investing in?
 - Break into small groups, and assign roles. One person should be Glory, Zahraa, Maria and Nany. Use what you read to draft things you might want to say during the meeting. Then, bring the situation to life through a role play where someone from another group plays the potential investor.
 - **Materials:** Paper, pencils
- **Online Activity:** Use Scratch to create your own dress-up game! You can follow along with the Scratch Fashion tutorial (scratch.mit.edu/fashion) or remix the dress-up game in the GWC studio. If fashion isn't your thing, you could make a pong game, racing game, or catch game.
 - **Materials:** [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

Passage 2: “Tips from the Pros: Chelsea Howe” - Pg 113-117

Key Vocabulary

- **Video Game Development:** Video game development is the process of coming up with and creating a video game! Girls Who Code students have made amazing games that address important topics, like endangered species and social issues.

Read & Reflect

- What ideas do you have for a video game?
- Who is Chelsea Howe? What is the most interesting thing you learned about her?
- How are the games that Chelsea creates different from the games she saw growing up? Why does she feel like the games she creates are important?
- If you could ask Chelsea one question, what would you ask? Why?

GWC Challenge

- **Unplugged Activity:** You can create a video game too! Sketch out the storyboard for a video game you might want to build. Be sure to share the genre of game it will be, note key features and highlight any story that your game might follow. Use the comic strip on page 114 as inspiration! Also, if you forgot what a storyboard is, refer back to Chapter 4.
 - **Materials:** Paper, pencils
- **Online Activity:** Create an online animation or game to introduce Chelsea Howe to the world. The goal of your creation will be to share information about Chelsea Howe and her accomplishments with others. You might build a quiz game, a maze game, or anything you dream up that meets that goal!
 - **Materials:** [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

CHAPTER 8: DIGITAL ART AND DESIGN

Passage 1: “LED It Glow” - Pg 120-123

Key Vocabulary

- **Digital Art and Design:** Digital art and design bring technology into the process of creating art and designs, from editing photos to using code to lighting a scene in an animated movie.
- **Generative Art:** Generative art is art that has been made, at least partly, using computers. If you wanted to code a character’s hair in an animation, for example, you could either code every single hair or use code to duplicate the hairs realistically and save yourself some time. The animators who created Princess Merida in the Pixar movie Brave used generative art to give her a full head of hair that moves and behaves the way curly hair does in real life without having to animate every individual strand.
- **LED:** An LED, or light emitting diode, is a small light that can be included in an electrical circuit.

Read & Reflect

- On page 120, the book compares coding to other tools for creation, like paint or clay. Do you agree with this comparison? Why or why not?
- Who were the creators of the LED It Glow project? What motivated them to create this project?
- How did the creators show sisterhood? Did this give each person a chance to be brave? Why or why not?

GWC Challenge

- **Unplugged Activity:** In this chapter, you learned how code can be used to create art. Now, create some type of art - like a painting, a song, a dance, or a theatrical rendition - that highlights the connection between computer science and art to a viewer or listener.
 - **Materials:** Paper, pencils
- **Online Activity:** Create your own generative art with the stamp block in Scratch! Remix the project in the GWC Clubs Scratch Studio and add your own sprites and effects. When finished, you can share your creations in your own studio!
 - **Materials:** [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

Passage 2: “Fashion” - Pg 124-129

Key Vocabulary

- **Algorithmic Composition:** Algorithmic composition means using algorithms, or step-by-step lists of instructions, to create music with computers. Imagine a symphony written entirely by robots!
- **Digital Art and Design:** Digital art and design bring technology into the process of creating art and designs, from editing photos to using code to lighting a scene in an animated movie.

Read & Reflect

- In this passage, the book gives examples about how coding is used in visual art, fashion, and in music. Share your favorite example and why you liked it best.
- Who is Danielle Feinberg? How does she use computer science in her day-to-day job?
- In the passage about Danielle, the book talks about “happy accidents.” What was Danielle’s example of a happy accident? Have you ever had a happy accident while trying something?

GWC Challenge

- **Unplugged Activity:** As you read in this chapter, people are designing technology that you can wear as a part of your day to day life. What kind of smart clothing or accessory would you want to design? Follow the steps below to create a wearable prototype of a piece of wearable tech that you’d like to make.
 1. First, sketch your design. In your design, add notes that explain how your clothing or accessory would use technology. For example:
 - a. A bracelet that senses your heart-rate, and if it detects that you might be stressed, it lights up in soothing colors and emits calming scents
 - b. Sneakers that have magnetic soles that you can activate with your phone to help you ride the subway without losing your balance.
 2. A prototype is a usable, life-sized example of an invention that people use to demonstrate new concepts before actually building them. Use the materials available to you to make a prototype of your wearable invention. Make it come to life by adding colors, designs or other features to help others see your idea come to life.
 3. Share your prototype with other girls and point out the features that would use technology to make your project unique.
- **Materials:** Construction paper, cardboard boxes, cardboard tubes, scrap fabric, paper, pencils, or any other materials you can find for prototyping.

- **Online Activity:** Technology has given artists new ways to develop their ideas. For example, there are tools that fashion designers use to create new and innovative clothes before they send them to production! Create your own simple tool to help people unlock their creativity as they design their own t-shirt.
 - To complete this project, you'll have to learn a little bit about broadcast messages in Scratch. Start by exploring the sample code and the video below.
 - Then, expand the project so the user can select any of the colors they choose.
 - Finally, use the tool you created to design your own t-shirt!
 - **Materials:** [How to Use Broadcast Animation](#), [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

CHAPTER 9: ROBOTS

Passage 1: “Seeing Eye Bot” - Pg 132-135

Key Vocabulary

- **Robotics:** Robotics is a branch of computer science that deals with building machines that use code to complete tasks. Robots are being built every day to do amazing things, from assisting doctors to exploring the bottom of the ocean.

Read & Reflect

- In this passage, there are many different uses for robots. Which of these uses stood out to you? Why?
- Did your idea of what a robot is and what it is used for change as you read this passage? If so, how did it change? If not, why not?
- Who were the creators of the Seeing Eye Bot? What was their goal in creating this game? Do you think they met their goal?
- Give an example of where the creators of the Seeing Eye Bot were brave.

GWC Challenge

- **Unplugged Activity:** We use our 5 senses to help us move around the world: sight, touch, hearing, taste, and smell. On page 131, the book says that robots can “sense, think and respond” - but usually just have one or two senses to help them. In this activity, you’re going to try to navigate the world like a robot by using just one of your senses.
 - First, set-up a simple obstacle course. Don’t include anything that might cause people to fall or get hurt. It can be as simple as following a path from one corner of your room to another corner.
 - Then, break into small groups. As a group choose the one sense you think will be most helpful if you were a robot trying to navigate the course.
 - Finally, nominate a person to be the robot. That person will follow instructions that your team gives as they are in the obstacle course.
 - One at a time, send your “robot” through the course. As they navigate the obstacles, give instructions that tell them how to use their sense. For example:
 - Move to the right until you see a desk.
 - Go backwards until you smell Jamie’s gym bag.
 - While you are not touching a chair, move forward.
 - Afterwards, discuss how using just one of your senses felt. Use these questions to get started:
 - What was challenging? What was easy?

- How well did you work as a team?
 - Is there a combination of senses that you think would be best for a robot to use to navigate this course? Why that combination?
- **Materials:** Space for an obstacle course
- **Online Activity:** Animate a robot with Scratch! Create your own robot sprite and experiment with different costumes to make your robot come to life on screen. Remix the project in the GWC Scratch Studio to get started, and remember to share your creations to your own studio.
 - **Materials:** [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

Passage 2: “Ayanna Howard” - Pg 136-139

Key Vocabulary

- **Robotics:** Robotics is a branch of computer science that deals with building machines that use code to complete tasks. Robots are being built every day to do amazing things, from assisting doctors to exploring the bottom of the ocean.

Read & Reflect

- On pages 135-136, the girls are designing a homework helper robot. What are some of the features they want their robot to have? Are there any features you might add?
- Who is Ayanna Howard? What does she use computer science to do?
- What about Ayanna’s job seems the most interesting to you? Why?
- If you could ask Ayanna one question about her work, what would it be? Why are you curious about that topic?

GWC Challenge

- **Unplugged Activity:** Imagine you could build a robot that could do anything you wanted! Create a sketch of that robot. Be sure to label any sensors or mechanical pieces it would need. Also, write what your robot would do and the person or group of people who would benefit most from it.
 - **Materials:** Paper, pencils
- **Online Activity:** A product pitch is a short story, video, or presentation that inventors share to try to get other people excited about their ideas. Create an animated product pitch for a robot you would love to design and create. Be sure to tell the user why it would be amazing and how it might help their lives. If you can, include a drawing or sketch of what your robot would look like to really bring it to life!
 - If you’re not sure what type of robot you’d like to create, make a product pitch for the homework helper robot on page 135.
 - **Materials:** [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

CHAPTER 10: WEBSITES, MOBILE APPS, AND ONLINE SECURITY

Passage 1: “Websites and Mobile Apps” - Pg 142-146

Key Vocabulary

- **Application:** An application is a software program that runs on your computer, on the web, or on smaller devices like a smartphone or tablet. There are applications for everything, from word processing and games to editing photos and connecting with friends on social media.
- **Website:** A website is a place on the web that presents information to the public but does not require interaction from people. Websites are a lot like school assemblies, where a speaker comes and talks to you about something, but you don’t really talk back. You can make an awesome website with just a little HTML and CSS knowledge!

Read & Reflect

- This passage recommends that you think about “user experience” when designing a website. What is user experience? Why might it be important?
- What is the difference between a mobile web app and a native app? How might knowing this different help you build an app one day?
- Describe what cybersecurity is in your own words. Name 2-3 reasons why cybersecurity is an important field.

GWC Challenge

- **Unplugged Activity:** Design your own app. User experience designers often use “wireframes” — sketches of the different pages of their websites or apps — to create roadmaps before they design. Create your own app wireframe to design an app of your choice!
 - **Materials:** Paper, pencils
- **Online Activity:** Contribute to the Scratch online community! Scratchers work hard to keep the community respectful, safe, and honest. Check out the Scratch Community Guidelines to see how Scratch thinks about making people from all backgrounds and interests feel welcome. Then, find a project that stands out to you and respond to it in a comment using what you learned in the Community Guidelines.
 - **Materials:** [Scratch Community Guidelines](#), [Tips for Completing Online Activities](#)

Passage 2: “Smart, Not Scared” - Pg 147-153

Key Vocabulary

- **Cyber Security:** Cyber security means protecting the data on your computer, phone, or other devices from being stolen or damaged.

Read & Reflect

- What are some ways that you can keep yourself safe online?
- Who designed the Guardian Angel app? What were their goal? Do you think they met their goal? Why or why not?
- Who is Kaya Thomas? What does she use computer science to do?
- Kaya talked about her experience in college. How did Kaya show bravery as she was learning computer science? Who did she look to for help?

GWC Challenge

- **Unplugged Activity:** As you learned, cybersecurity is a field of computer science dedicated to protecting a user’s data. Encryption is one way that cybersecurity engineers keep data secret. They use the power of computers develop ways to encode messages that are very challenging to decode. Before we had computers, we still had ways to pass secret messages by encrypting them by hand. In this activity, you will try using a pigpen cypher to decode and encode secret messages, just like cryptographers might have before computers.
 - **Materials:** [Encryption Challenge Worksheet / Answer Key](#), pencils, scrap paper
- **Online Activity:** Organize your own Scratch account by creating your own studio. Then, add descriptions and instructions to the projects you’re most proud of. Finally, complete or add features to any projects that you really loved but didn’t get to finish! This is important for two reasons:
 1. By curating your account, you’re creating a portfolio of projects that you’re proud of and that showcases your skills. You should continue to grow your portfolio as you learn more about coding. This will help you tell your own story about how you became a coder, and maybe even help you get a job one day!
 2. Computer scientists love to build upon the solutions of others. By sharing your creations, you might inspire another coder to create something that is even better than they could have done alone!
 - **Materials:** [How to Create a Scratch Studio](#), [Scratch Community Guidelines](#), [Tips for Completing Online Activities](#)

CONCLUSION

Passage: "So What Now?" - Pg 154-157

Read & Reflect

- Which of the women featured in the book did you relate with most? Why?
- Throughout the book, you learned about many different things you can do and build with code. Which topic did you find the most interesting? Why?
- What is one reason why it is important for you to learn to code?
- What questions do you have after finishing the book? Where can you seek out some answers?

GWC Challenge

- **Unplugged or Online Activity:** Throughout the book, different women in tech are featured. Imagine what you might create with technology in the future. Then, create your own spotlight that we could feature in a one of our books in the future! Use any of the examples in chapters 7-10 to help you.
 - **Unplugged Materials:** Paper, pencils, coloring tools
 - **Online Materials:** [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)
- **Unplugged or Online Activity:** Design a poster or animation you can use to encourage more girls to try coding or to start a Girls Who Code Club in your community. In your creation, share some of the exciting, interesting, or important things that you learned about computer science from this book!
 - **Unplugged Materials:** Paper, pencils, coloring tools
 - **Online Materials:** [GWC Clubs Scratch Studio](#), [Tips for Completing Online Activities](#)

LOGISTICS

GIRLS WHO CODE HQ & YOUR CLUB

Girls Who Code HQ - or HQ, as we like to call it - is your one-stop-shop for all of the curriculum materials and resources you need to run your Club. You can gain access to HQ by heading to hq.girlswhocode.com,

signing up for a free account, and entering your Club Code. **We recommend that you access the curriculum through HQ to ensure that you are using the most up-to-date materials.**

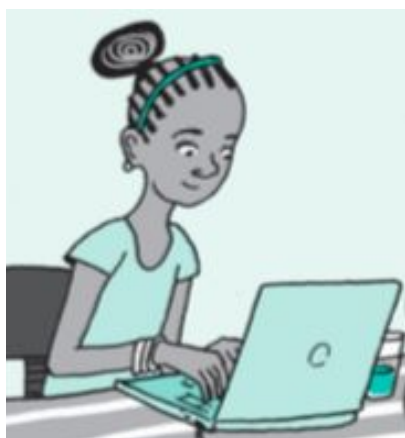


Currently, most of the materials on HQ are intended for you, the Facilitator. However, your students can also join HQ to gain access to all of the materials we have available and to stay up to date as we add more student facing materials. To add students to your Club, they must register for a free account and enter your Club Code to join.

Students below the age of 13 must have parental permission to access the website. **Please ask families to register students at home or use a permission slip to get written parental permission.**

COMPLETING ONLINE ACTIVITIES

At Girls Who Code, we know that coding is a collaborative field that requires teamwork, good listening skills, and patience with your peers. For that reason, we recommend that girls work on all of the activities - but especially the online challenges - in pairs. This helps girls build sisterhood and communication skills. It also helps you as the teacher, because girls will have a buddy to help them if they get stuck.



If your Club is tackling the Online GWC Challenges, you'll be using **Scratch**. Scratch is a free, online coding language and community developed by MIT. It is designed to help beginners of all ages unlock their creative powers through computing. While you can code on Scratch without an account, we recommend registering at <https://scratch.mit.edu> to get access to all of the awesome tools Scratch offers - including the ability to save and share your work!

If you are new to Scratch, you're in luck! Scratch has a rich community of users and great resources to help you get started. For more information about Scratch, remixing projects, and other useful information, check-out the [Getting Started page](#) on Scratch.

All of the online activities we suggest have projects with sample code to help you and your Club get started! You can access all of the projects through the GWC Scratch Studio at <https://scratch.mit.edu/studios/4843299/>.

The best way to complete these challenges is to remix our starter code and adding new features to create your own projects. Remind the girls to share their projects in your own studio after each activity, and don't forget to share your creations with GWC!

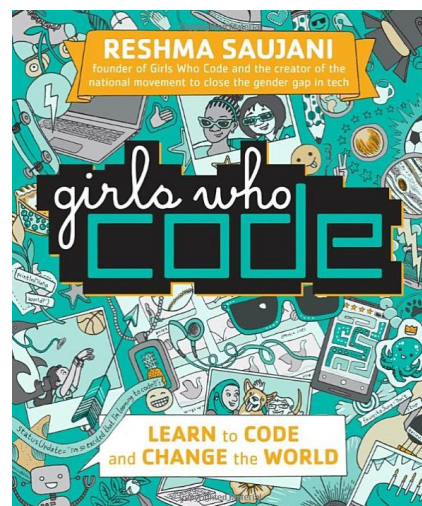
One last note: If your Club plans to try the online activities, we recommend that you set up computers before your Club to save time.

STAYING IN TOUCH WITH GIRLS WHO CODE

If you need help running your Club: Reach out to us at clubs@girlswhocode. Our customer care team will get you the answers you need!

If you want to share the awesome work of your Club: Reach out to us on social media. We love to amplify the stories of our Clubs on [Twitter](#), [Instagram](#), and [Facebook](#)!

If you want to connect with other Facilitators: Check back on HQ for updates about how to engage with our vast Facilitator Community.



SISTERHOOD ACTIVITIES

Sisterhood is the community of people who want to see more women in computer science! These activities can help you spark friendships and create a safe space in your Club, which is the first step to creating building sisterhood.

NAME GAMES: Help girls get to know each other.

- **What's My Name?**

- **Description:** This is a memory game that encourages girls to share something about themselves and to pay attention to the names of others.
- **Instructions:** Instruct your Club to form a circle. Each person should pick an adjective that resonates with them and begins with the same letter as their first name (e.g, Daring Diana). Once everyone has had a chance to think, choose a girl to share her combination. The next girl in the circle should repeat the names that came before her, and end by introducing herself!



- **Reverse!**

- **Description:** This is a silly game that breaks the ice, and engages each girls in trying to decode the names of others.
- **Instructions:** One by one, each member of the group will introduce themselves by trying to say their name backwards. Everyone else in the Club should try to guess their name. Before moving on to the next person, be sure that each girl gets a chance to say their name correctly and have everyone greet her by saying hello in unison!

FOCUS ACTIVITIES: Grab the attention of your Club.



- **The Magic Wand**

- **Description:** This encourages everyone to reflect and listen to the other girls in the Club.
- **Instructions:** Ask girls, "If you had a magic wand, what would you change in the world?" Have each girl share what they would want to change and a brief explanation as to why.

- **Fizz Buzz**

- **Description:** This game challenges girls to think ahead and practice their listening skills.
- **Instructions:** The goal of this game is to count to the highest number possible, while applying the rules you share for replacing numbers. Begin by having your Club sit in a circle. Then, share a rule for replacing a number with the word "fizz" and a second rule for replacing a number with the word "buzz." For example:
 - If a number is a multiple of 4, you should replace it with fizz. (e.g., 8, 12, 20 = fizz) If a number has a 6 in the ones place, you should replace it with buzz. (e.g., 6, 26 = buzz) If a number fits both criteria, it should replace it with fizz-buzz. (e.g., 16, 36 = fizz-buzz).
- The player designated to go first says the number "1", and each player counts one number in turn. However, any number that fits the given criteria should be replaced with fizz, buzz, or fizzbuzz. If the team makes a mistake, the game restarts at one.

- **Mind Meld**

- **Description:** This is an opportunity for students to focus on active listening skills and patience.
- **Instructions:** Challenge students to work together to count to 40 with their eyes closed. To do this, students can take a risk by saying the next number aloud whenever they want. However, if multiple students say a number simultaneously, the game starts over at 1!

ACTIVE ENERGIZERS: Get everyone up and moving!

• Body Part Twister

- **Description:** This game is great for getting people working together and energized. It is a physical activity and needs participants to be comfortable being physically close to one another or leaning on each other.
- **Instructions:** Call out different body parts. Each body part you call out is are the only parts of the body the whole group can have touching the floor. Encourage everyone to work together to find a solution and balance on each other if they need to.
 - For example, to a group of nine people you could call out four bums, two feet, one head, two hands, four knees.
- Call out the next set of instructions as soon as everyone is in position. Just remember to think before you call out combinations or you could call out something that is physically or numerically impossible!

• Shakedown

- **Description:** This activity is an opportunity to shake out jitters and help focus energy.
- **Instructions:** Have girls stand in a circle. Then, tell them to follow your lead.
 1. Hold out your right hand. Quickly shake it and count down from 6 on each shake. Repeat this with your left hand.
 2. Hold out your right leg. Quickly shake it and count down from 6 on each shake. Repeat this with your left leg.
 3. Continue to shake and count, decreasing by one count each round until you get down to one.
- Check out this video by Rock The Room Training for a demonstration: [Game #1: The Shakedown](#).



APPENDIX

UNPLUGGED ACTIVITY WORKSHEETS

Chapter 5 - Passage 1 - “Go With the Flow”

[PROGRAM FLOW DIAGRAM](#)

Chapter 5 - Passage 2 - “The Secret Ingredient: Problem Solving”

[BINARY MATH CHALLENGE](#)

- [STUDENT WORKSHEET](#)
- [TEACHER WORKSHEET](#)

Chapter 6 - Passage 1 - “Debugging”

[DEBUGGING INSTRUCTIONS CHALLENGE](#)

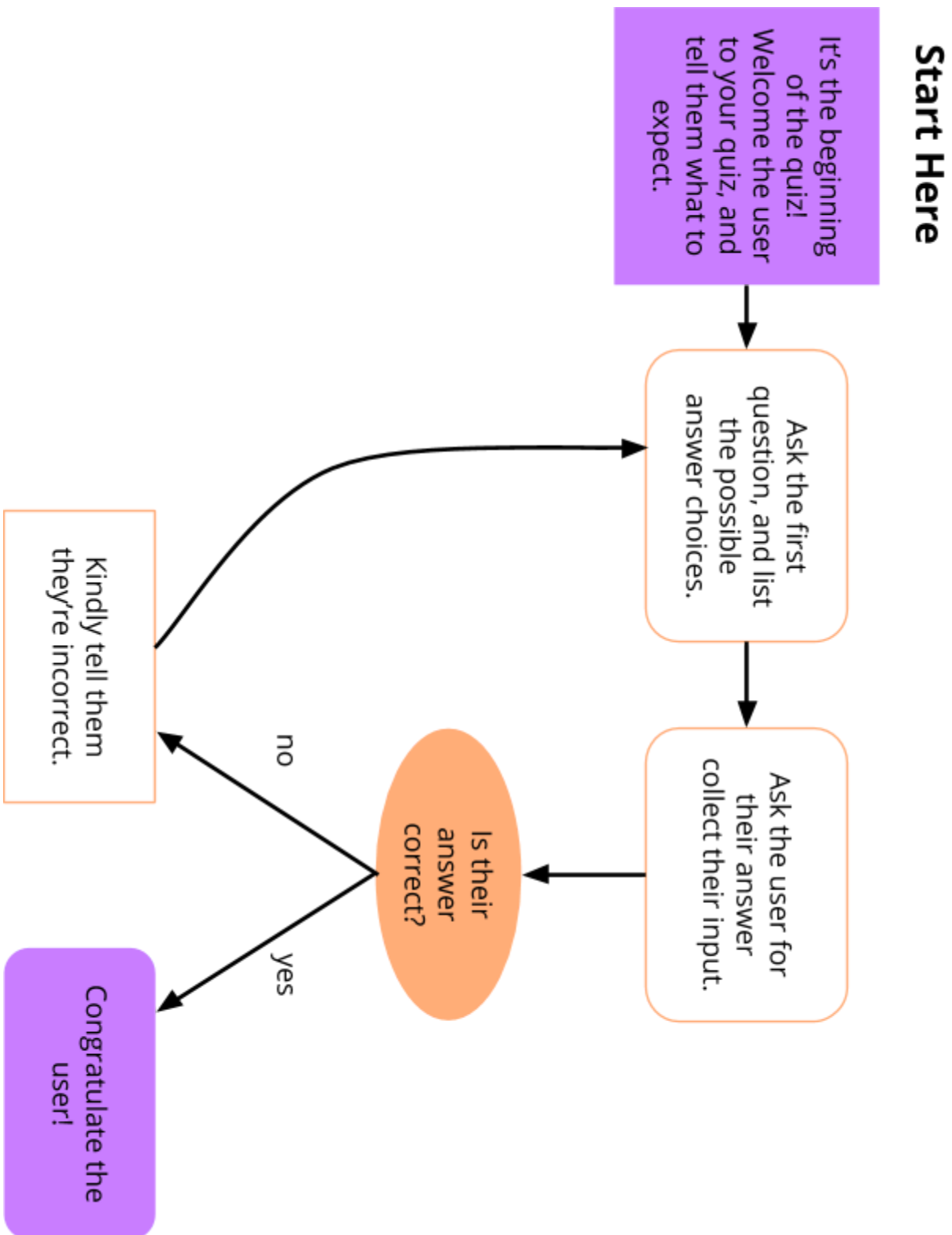
- [STUDENT WORKSHEET](#)
- [ANSWER KEY](#)

Chapter 10 - Passage 2 - “Safe, Not Scared”

[ENCRYPTION CHALLENGE](#)

- [STUDENT WORKSHEET](#)
- [ANSWER KEY](#)

PROGRAM FLOW DIAGRAM



BINARY MATH CHALLENGE

STUDENT WORKSHEET

Base 10-digits to Binary Converter

Base 10 Digit	Binary Number	<p>Do you notice any patterns in how the binary numbers change as they get larger? Describe the patterns you see!</p> <p>Are there any numbers you can't represent if you only have 4 bits in your group? Why?</p> <p>If the word "hi" is 01101000 01101001 in binary, how many bits do you think a computer would use to store your name? What about an entire book?</p>
1	0001	
2	0010	
3	0011	
4	0100	
5	0101	
6	0110	
7	0111	
8	1000	
9	1001	
10	1010	
11	1011	
12	1100	
13	1101	
14	1110	
15	1111	
16	10000	
17	10001	
18	10010	
19	10011	
20	10100	

BINARY MATH CHALLENGE

TEACHER WORKSHEET

Here are some math problems to get you started. Feel free to add more or tweak what is here on what your kids are learning - just make sure the solutions fall between 1 and 15!

Math Problem	Solution
$2 + 2$	0100 (4)
3×4	1100 (12)
$20 - 18$	0010 (2)
$30 / 6$	0101 (5)
$7 + 2$	1001 (9)
$(6 + 8) - 1$	1101 (13)
$20 \times \frac{1}{2}$	1010 (10)
$8 + 3$	1011 (11)
$4 + 4 + 4 + 3$	1111 (15)
$(10 - 3) - (4 + 2)$	0001 (1)

DEBUGGING INSTRUCTIONS CHALLENGE

STUDENT WORKSHEET

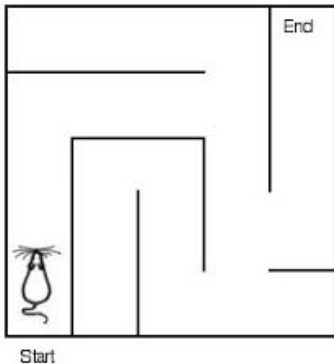
Find the errors in each set of instructions below. Then, correct the error so that the instructions will work correctly! You might want to act out the activity or puzzle to help you find the bug.

As you work, ask yourself the following questions:

- What is supposed to happen?
- What is going wrong?
- How can it be fixed?

Round 1: Escape the Maze

Goal: Help the mouse navigate from the start to the end of the maze.



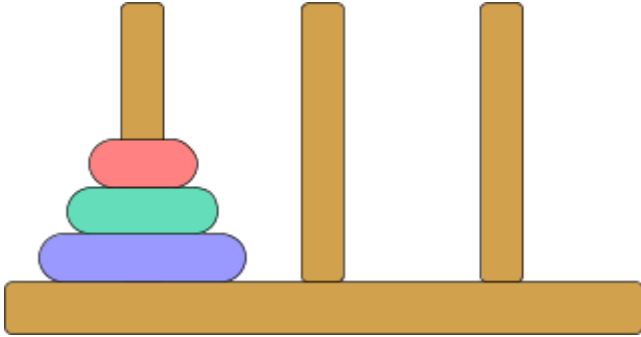
Buggy Instructions:

1. Move forward until you hit a wall.
2. Turn right 90 degrees.
3. Move forward until you hit a wall.
4. Turn right 90 degrees.
5. Move forward until you hit a wall.
6. Turn left 90 degrees.
7. Move forward until you hit a wall.
8. Turn left 90 degrees.
9. Move forward until you reach the end.

Correct Instructions

Round 2: Towers of Hanoi

Goal: Move the stack of disks to the 3rd pole without placing a larger disk onto a smaller disk.



Buggy Instructions:

1. Move the small pink disk to the second pole.
2. Move the medium green disk to the third pole.
3. Move the large purple disk to the second pole.
4. Move the medium green disk to the first pole.
5. Move the large purple disk to the third pole.
6. Move the medium green disk to the third pole.
7. Move the small pink disk to the third pole.
8. Done!

Correct Instructions

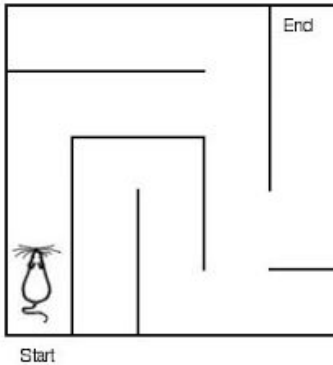
What strategies worked best when debugging these instructions? How might you apply these strategies to other subjects?

DEBUGGING INSTRUCTIONS CHALLENGE

ANSWER KEY

Round 1: Escape the Maze

Goal: Help the mouse navigate from the start to the end of the maze.



Buggy Instructions:

1. Move forward until you hit a wall.
2. Turn right 90 degrees.
3. Move forward until you hit a wall.
4. Turn right 90 degrees.
5. Move forward until you hit a wall. ← **ERROR**
6. Turn left 90 degrees.
7. Move forward until you hit a wall.
8. Turn left 90 degrees.
9. Move forward until you reach the end.

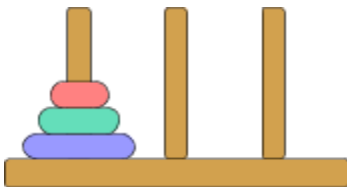
Correct Instructions

There are multiple possible ways to explain this, but one answer is below.

1. Move forward until you hit a wall.
2. Turn right 90 degrees.
3. Move forward until you hit a wall.
4. Turn right 90 degrees.
5. Move forward until there is an opening in the wall to your left.
6. Turn left 90 degrees.
7. Move forward until you hit a wall.
8. Turn left 90 degrees.
9. Move forward until you reach the end.

Round 2: Towers of Hanoi

Goal: Move the stack of disks to the 3rd pole without placing a larger disk onto a smaller disk.



Buggy Instructions:

1. Move the small pink disk to the second pole.
2. Move the medium green disk to the third pole.
3. Move the large purple disk to the second pole. ← **ERROR**
4. Move the medium green disk to the first pole.
5. Move the large purple disk to the third pole.
6. Move the medium green disk to the third pole.
7. Move the small pink disk to the third pole.
8. Done!

Correct Instructions

There are multiple possible ways to explain this, but one answer is below.

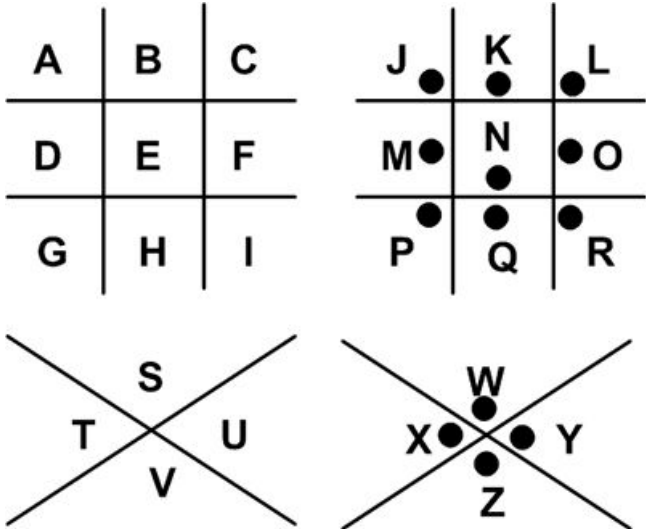
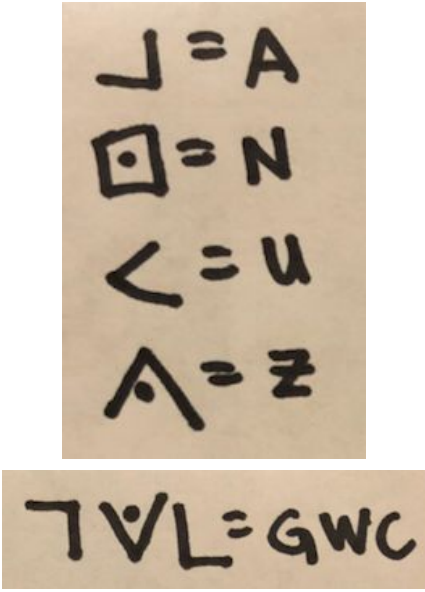
1. Move the small pink disk to the second pole.
2. Move the medium green disk to the third pole.
3. Move the small pink disk to the first pole.
4. Move the medium green disk to the second pole.
5. Move the small pink disk to the second pole.
6. Move the large purple disk to the third pole.
7. Move the small pink disk to the first pole.
8. Move the medium green disk to the third pole.
9. Move the small pink disk to the third pole.
10. Done!

ENCRYPTION CHALLENGE

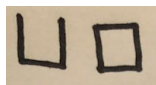
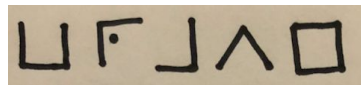
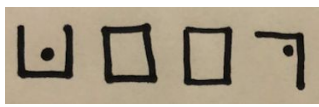
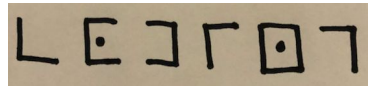
STUDENT WORKSHEET

Use the key below to decode the messages by replacing symbols with letters. Then, write a message of your own and encode it.

How might computers make keeping messages secret easier?

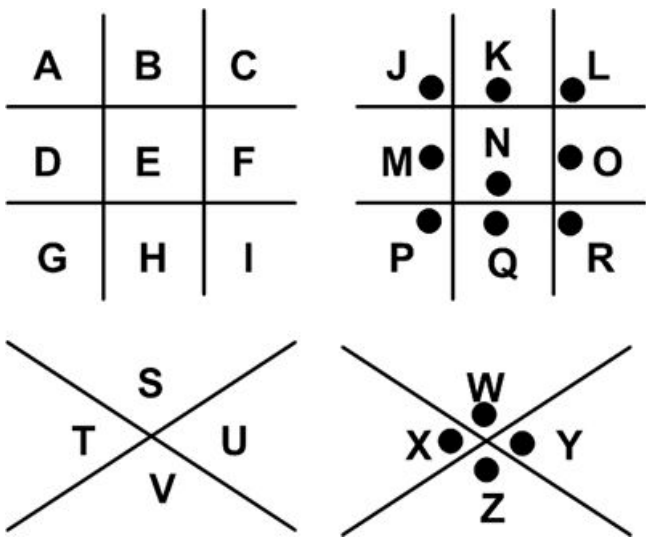
Key	Examples
	

Part 1: Decode the message below.

Code	Answer
	
	
	
	

Part 2: Encode Your Own Message

1. Find a partner.
2. Write a short message to this partner using normal letters on a scrap piece of paper.
3. Then, encode it using the key.
4. Finally, swap papers with your partner and decode their secret message.

Key	Message
	

Part 3: Decode Your Partner's Message

Use the key to decode your partner's message that is written above. As you work, ask yourself: how might computers make encryption faster or easier?

Decoded Message

ENCRYPTION CHALLENGE

ANSWER KEY

NOTES FOR TEACHERS:

- **Using the Key:** You encode letters using the pigpen cypher by replacing letters with the shape that surrounds the letter in the key. For example, the letter "E" is in the center of the hash, so it is represented by a box.
- **Fort Parts 2 and 3 of the activity,** encourage students to write 5-6 word messages for their first try. If time allows, let them encode more complicated messages.

Key	Examples

Part 1: Decode the message below.

Code	Answer
	BE
	BRAVE
	KEEP
	CODING