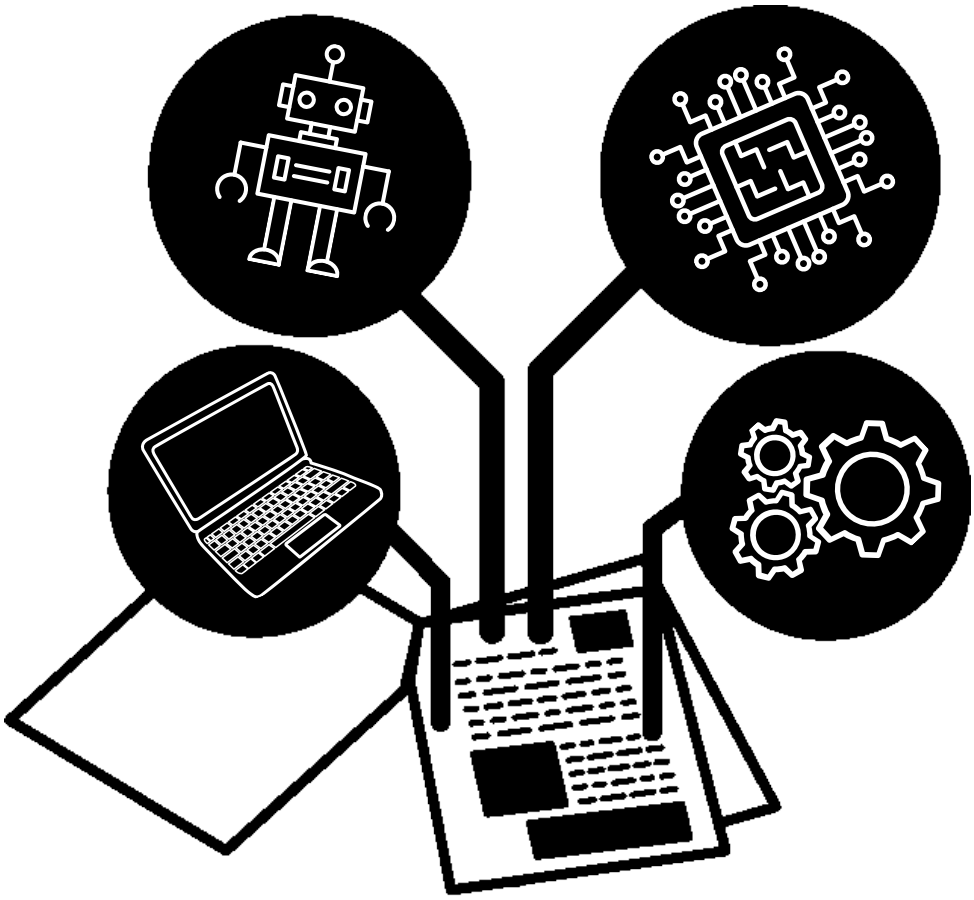
STEM Mobile Lab

Activity packs for K-8 kids



CREATED BY

STEM {Coding Lab}

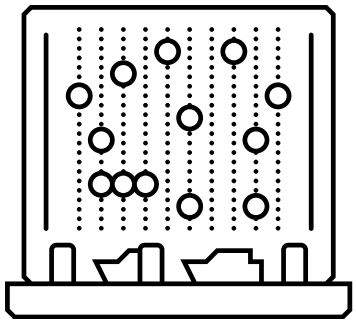
Driving Digital Literacy. For All Children.

SPONSORED BY

remake learning

Scratch Math: Battleship

Activity Guide



Activity Overview

The students will play this game in pairs similar to the regular Battleship board game. The gameplay is similar to the traditional Battleship game with the main difference being that instead of calling out a letter and number the students will guess the location by X and Y plot points.

Goals/Objectives

- Layout their boats on their grid with an understanding where it is on the X and Y
- Locate and sink the opposing teams boats
- Understand how the X and Y coordinate plane works

Materials

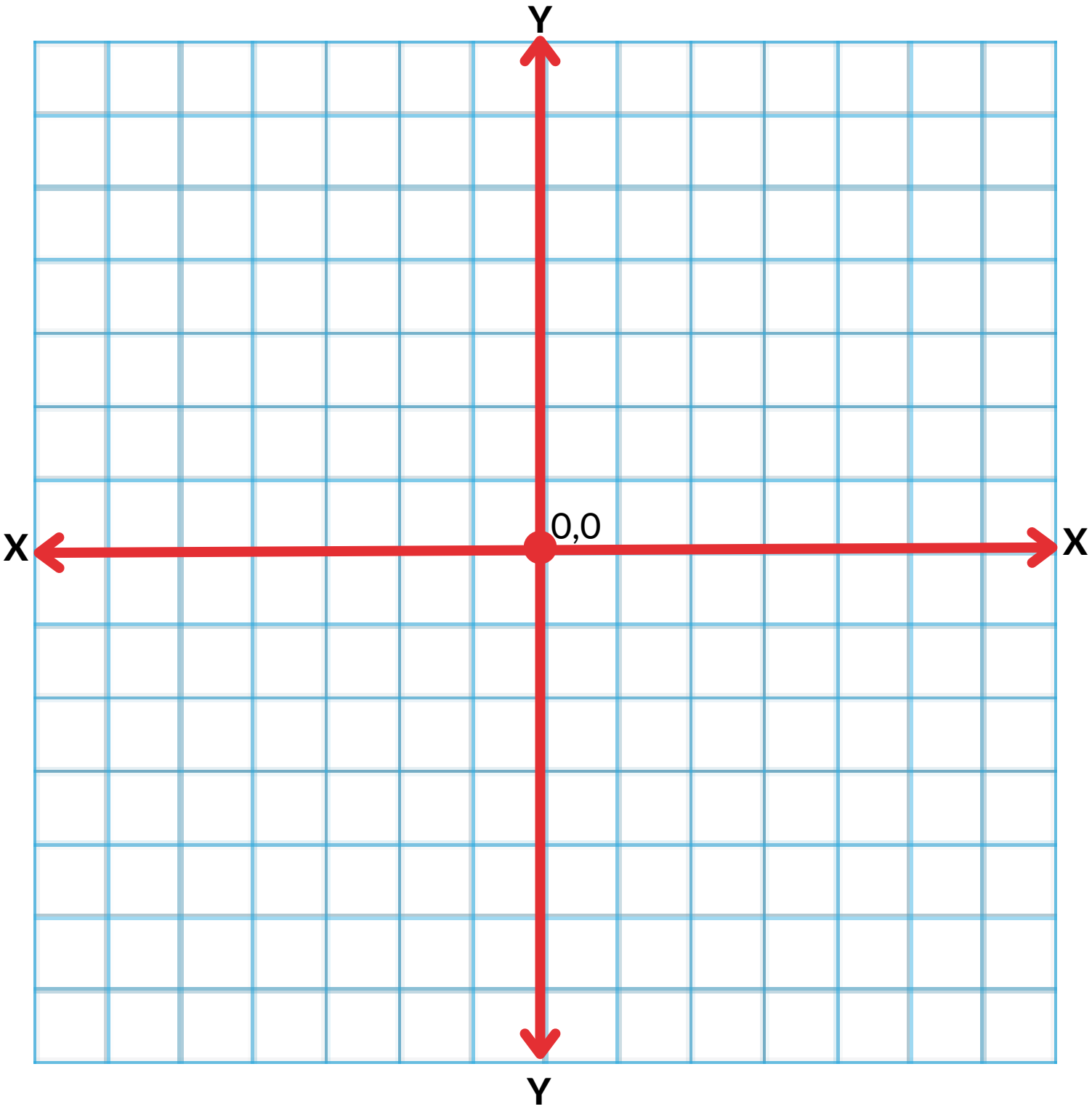
- 2 Grids per student
- Boat shapes
- Marker or Pen
- Piece of cardboard (1 per group)
- Presentation Device

Activity Instructions

1. Pass out 2 grids to each student. One for the boats and the other to track their guesses.
2. Have the students pair up. Put a piece of cardboard in between the students to block their vision.
3. Each player will take turns guessing the location of their opponents boats using the X and Y coordinates.
4. For each guess the students will mark an X for a miss and a 0 for a hit on one of their grids.
5. The player who is able to guess each of the coordinate points of all of the boats wins the game.
6. Depending on the time that is leftover you can have the students play again or switch partners and play a new game.

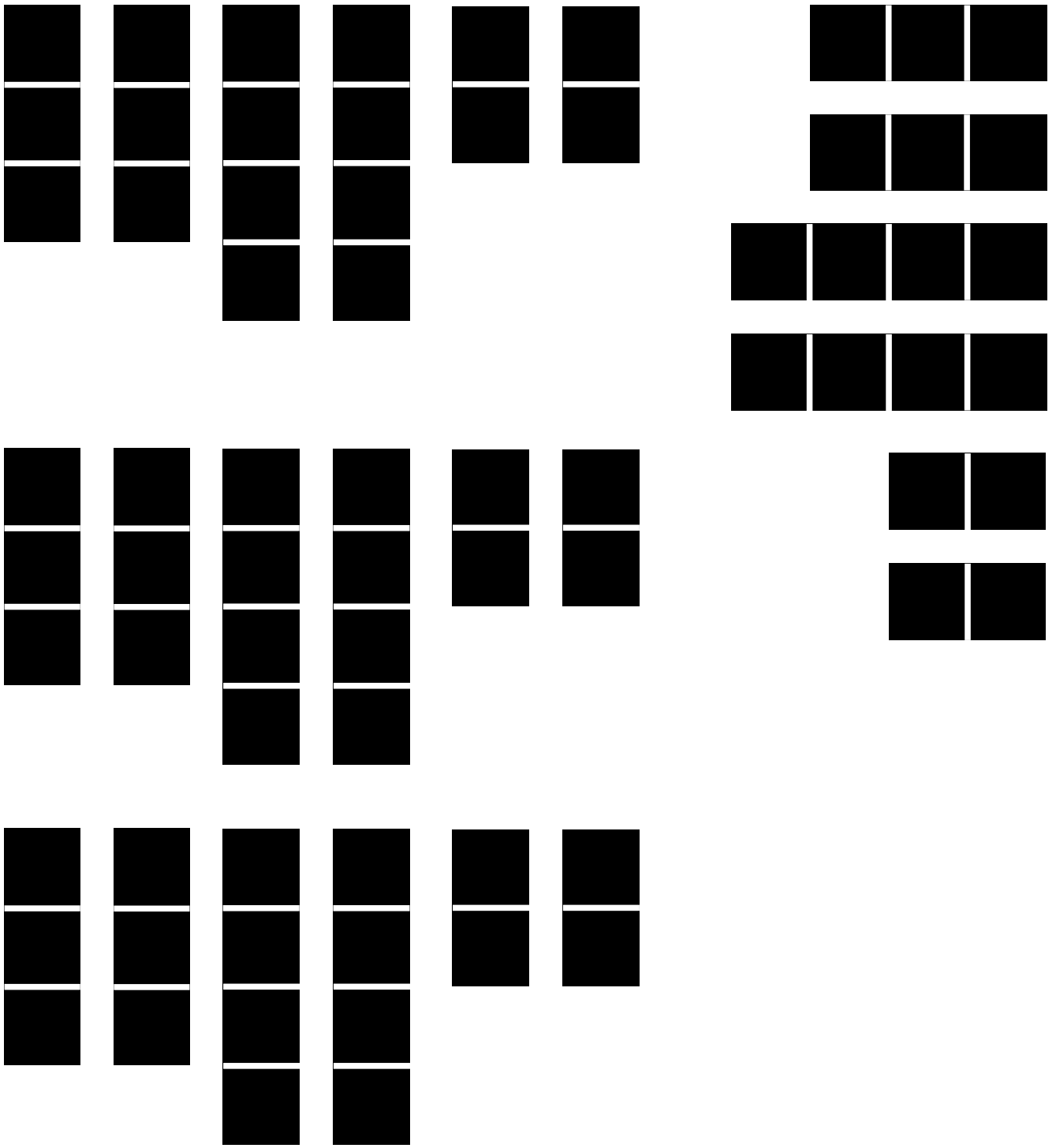
Scratch Math: Battleship

Activity Grid



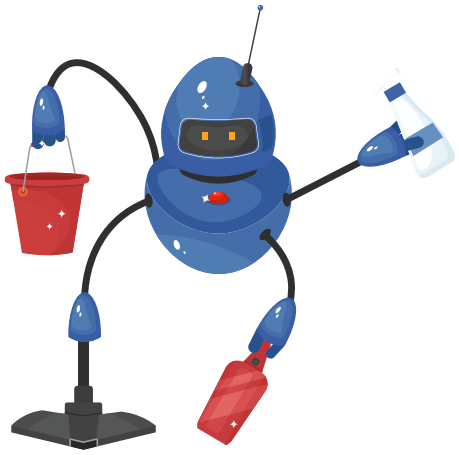
Scratch Math: Battleship

Boat Shapes



Design Your Robot Helper

Activity Guide



Activity Overview

In the future we may all have assistance robots just like the classic cartoon The Jetsons. This activity allows your student to design the robot of their dreams to assist them in the tasks that they need help the most.

As the instructor, you will share with the student what a robot is, what a prototype is, and the process engineers use to create the robots we use in our lives already.

Background Information

The main idea of this lesson is to teach the students the importance of **Technology** and **Robotics** in our daily lives. Follow the link below or scan the QR code to the right to help teach your student about those concepts.
www.bit.ly/more-on-robots

Another important concept for the students to understand is **Prototyping**. Think of prototyping as the rough draft of an idea that you might come up with. Often times prototyping will be done on paper or with basic materials. It won't be operational, but it is meant to bring to life a vision that is in your head.

Smaller concepts that you can discuss with the student include the **Functions** of a robot, as well as **Power Sources** for robotics. These topics will help the student understand how a robot works on a deeper level.

Activity Instructions

1. Use the above background information to teach your student about robotics.
2. Provide the student with the activity worksheet.
3. Work with your student to move through the worksheet and design their robot. There is a small drawing space if you would like to create the robot in another way please feel free.
4. Have the students label their robot with the different parts and their functions.
5. Have the students create a quick presentation about their robot focusing on its purpose and parts.

Maze Debugging

Activity Guide

Activity Overview

Every coder makes mistakes. Coders write thousands of lines of code to make an app work or a video game to play and “bugs” become just part of the process. Understanding how to recognize and fix those mistakes or “bugs” is called debugging.

In this activity the students will navigate a simple maze and then be given challenges in that maze that they have to identify and fix. Just like a coder finding and fixing computer bugs.

Background Information

Algorithms are a step by step process to solve a problem. In computer science algorithms are used to tell a computer, website, app, or piece of software what they want them to do. Follow the link below or QR code to the right to learn more about algorithms and how they are used in computer science.
https://bit.ly/more-on-algorithms

Debugging is when a coder identifies a mistake in their work and uses their skill and knowledge to come up with a solution on how to fix the mistake.

The term debugging has an origin that dates back to 1947 and a computer scientist at Harvard name **Grace Hopper.** Follow the link below or QR code to the right to watch a video about her story and how she coined the term Debugging.
https://bit.ly/more-on-debugging

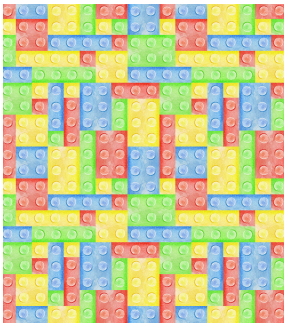
Activity Instructions

1. Get masking tape or painters tape and make a maze on the floor.
2. Explain to your student that they will navigate the maze without any problems or “bugs”. They will be able to see the easiest pathway.
3. Once they have gone through the maze the first time add some obstacle elements in the maze that would force them to try a different path. An alternate to this would be to put math problems or vocab words that they would have to complete to continue on.
4. While the students move through the maze they will need to debug their path to get to the end.

Intro to Pattern Recognition

Activity Guide

Activity Overview



At a very young age we learn about different patterns and how we can use them. This activity provides an introduction to pattern recognition for students in grades kindergarten through second grade. They will learn about different types of patterns like a/b, aa/b, and aa/bb.

Pattern recognition is an important skill in computer science. Designing loops requires the coder to identify repeating patterns in code. An important element of computational thinking is pattern recognition to help solve problems.

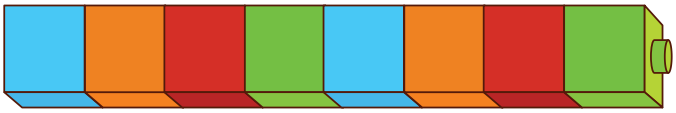
Background Information

The first focus area in this activity is all about finding patterns in **Art Decoration.** Patterns can be found in everything from paintings, sculptures, textiles, and many other art forms.

Another focus area of this lesson is how patterns can be used in the **Composition** of art. This can be used to draw attention to the viewers eye, create soothing psychological effects, creating buildings in architecture, and new designs in fashion.

Patterns are incredibly important in developing **Mathematical Sequences**. They allow a person to identify sequences of numbers and use multiplication and division to identify unknowns.

Another area of interest for this lesson are finding **Patterns in Nature** and how that helps scientists understand the world.



Activity Instructions

1. Find anything that you can use to sort (Lego, blocks, crayons, etc...)
2. Explain what an a/b, a/bb, and aa/bb pattern are.
3. Watch the video found at the link below or the QR code to the right to help the student understand patterns better. www.bit.ly/more-on-patterns
4. Have the students create patterns using the worksheet provided. The first few lines are guided and will help the students identify different types of patterns
5. The students can go beyond the activity by adding onto the created patterns or for you to ask them to do more complicated patterns.

Intro to Pattern Recognition

Activity Worksheet

A	B	A	B	A	B
A	B	B	A	B	B
A	A	B	B	A	A
A	B	C	A	B	C

Create Your Own Patterns

Conditionals with Cards

Activity Guide

Activity Overview

In this activity the student will use IF/THEN conditional statements to create rules to a card game. They can play with as many people as they want. When they draw a card they will reference their rules sheet (see next page) and either get that amount of points or do a designated action. This game doesn't need a winner or loser in the end, but if they would like there to be, using a point system will be a better fit.

Background Information

The main concept being taught in this activity is called a **Conditional Statement**. This is used by a computer, video game, or robot to read a situation and make a decision based on if it is true or false.

They will use **IF/THEN Conditionals** in this activity. When an IF/THEN conditional is used it is saying, "IF a statement is true THEN do this action." A good real-life example would be, "IF it is raining outside THEN you would get an umbrella."

Boolean Data is information that can either be true or false. This is important when using conditionals because depending on if it is true or false will determine what action is taken by the program.

Activity Instructions

1. Collect all of the necessary supplies for the activity. (Deck of Cards, Rules Sheet, Blank Paper)
2. Create the rules and outcome on the rule sheet.
3. Once the rules are decided upon one player will draw a card. Depending on what the card is and the chosen outcome the player will either be rewarded points or complete an action.
4. Each player will draw a card one at a time. If they are using points they can keep track on the blank paper.
5. Once the players have completed the whole deck of cards count up the score to determine the winner.

Conditionals with Cards

Rules and Outcomes Worksheet

Create a condition after “IF” and then an outcome after “THEN”. Example: IF the card is red THEN you get 10 points. You can score multiple times on one card depending on the rules you create.

IF _____ THEN _____

IF _____ THEN _____

IF _____ THEN _____

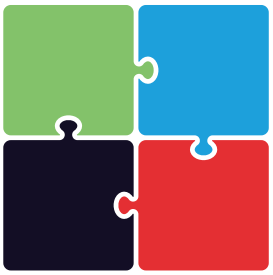
IF _____ THEN _____

IF _____ THEN _____

IF _____ THEN _____

Puzzling Problems

Activity Guide



Activity Overview

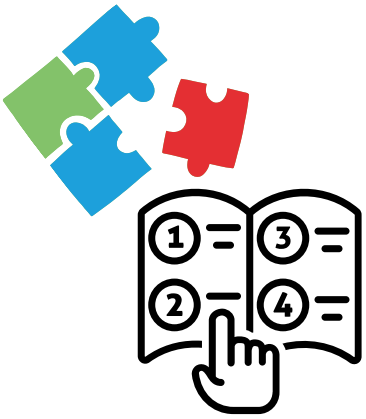
In this activity the students will learn all about the process of computational thinking. They will learn how to use the process to solve problems by moving through all of the elements that make computational thinking work. The child will pour an entire puzzle out on a table. The size of the puzzle will depend on the age and understanding of the student. They will then go step by step building the puzzle using the elements that they will note on the attached worksheet.

Background Information

Computational Thinking is a core skill that is necessary to computer science and problem solving in general. It is made up of four elements; Decomposition, Pattern Recognition, Abstraction, and Algorithm.

Decomposition is all about taking a big problem and breaking it down into smaller more manageable problems.

Pattern Recognition focuses on looking at patterns of success when you or someone you know tried to solve the problem before.



Abstraction is when you take all of the information you have collected and decide what is important and not needed.

Algorithm is when you take all of the information and make a plan on how you will solve the problem.

Activity Instructions

1. Collect all of the necessary supplies for the activity. (Puzzle, Computational Thinking Worksheet)
2. Dump the puzzle out on the area that you plan on building it. Do not start to put it together.
3. Use the worksheet attached to move through each step of the computational thinking process.
4. Once you have created the algorithm use it to solve the first problem you have identified.
5. Move on to another identified problem and repeat the process until the puzzle is built.

(Note: You do not need to complete the puzzle)

Puzzling Problems

Activity Worksheet

Follow the guide below to solve the problem of the puzzle.

Decomposition:

Identify the main problem then break it down into smaller more manageable problems to solve.

Pattern Recognition:

How have you solved that problem other times you tried it. What worked? What didn't work?

Abstraction:

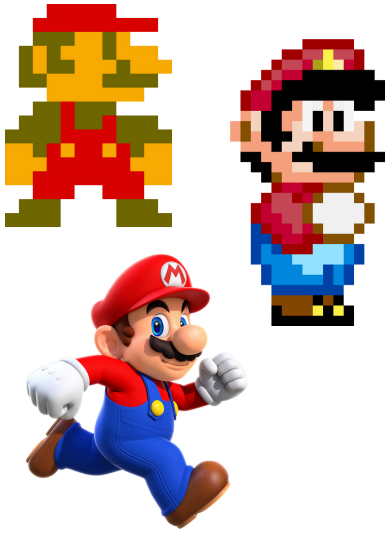
How have you solved that problem other times you tried it. What worked? What didn't work?

Algorithm:

Create step by step instructions on how to solve the problem you chose at the top of the page. It can be one or two steps or as many as it takes to solve the problem.

Pixel Art Projects

Activity Guide



Activity Overview

Every image shown on a screen is made up of **pixels**. These tiny dots of color can be found on your TV, computer, and phone screen. This activity will task students with creating a pixel image themselves. The website used for this activity will give them all the colors and resources necessary to create amazing images. Their imagination will allow them to make anything they want on this website. Use the project ideas on the next page to get them started.

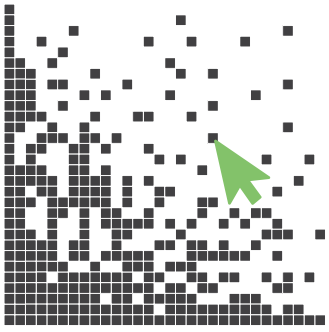
Background Information

Pixels are tiny dots of color that make up larger images on screens of technology.

Pixels use **RGB** to determine what colors will be used to create the image. RGB stands for Red, Green, and Blue. These are the primary colors of light. Just like the primary colors you learned about in art class, mixing them together makes it possible to create any color of light in existence.

How detailed an image is all depends on the picture's **resolution.** Think about what the old video games like Super Mario Brothers looked like versus how they look today. The pixels were much larger, so details couldn't be created as easily. Now we have high definition resolutions that have more pixels inside every inch of screen, allowing for very detailed images to be shown on your TV or computer.

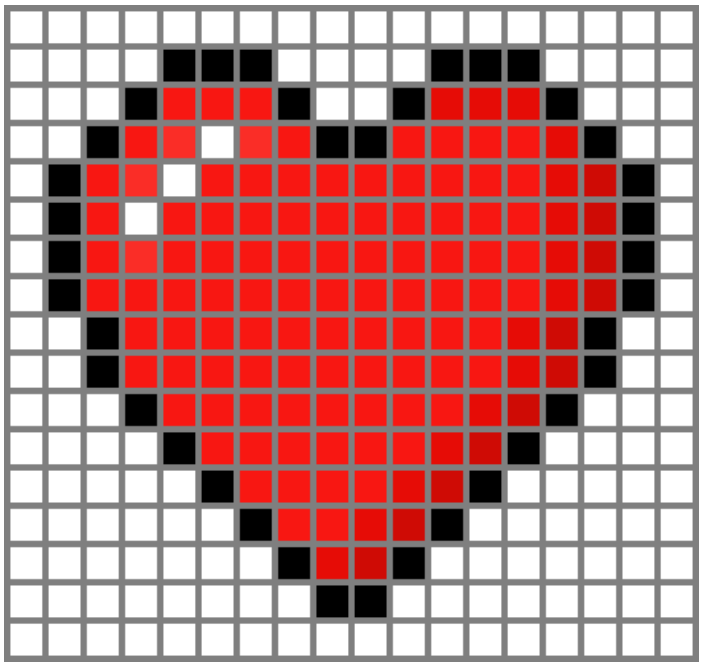
Activity Instructions

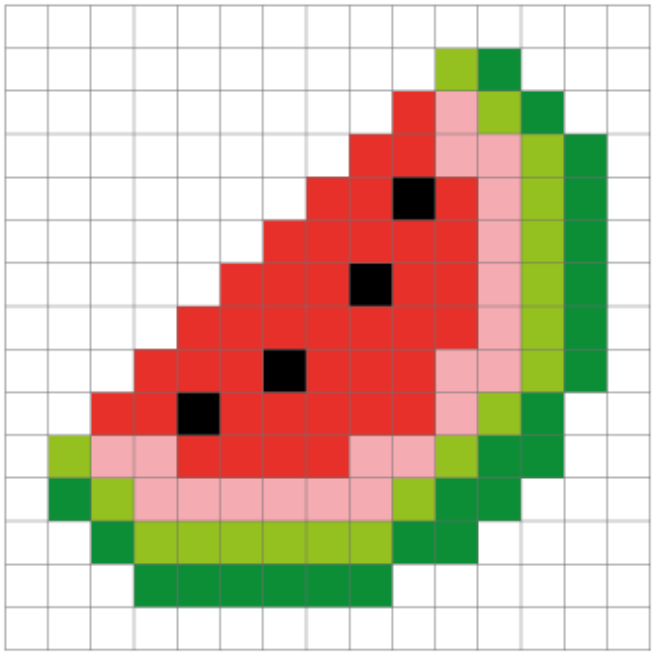


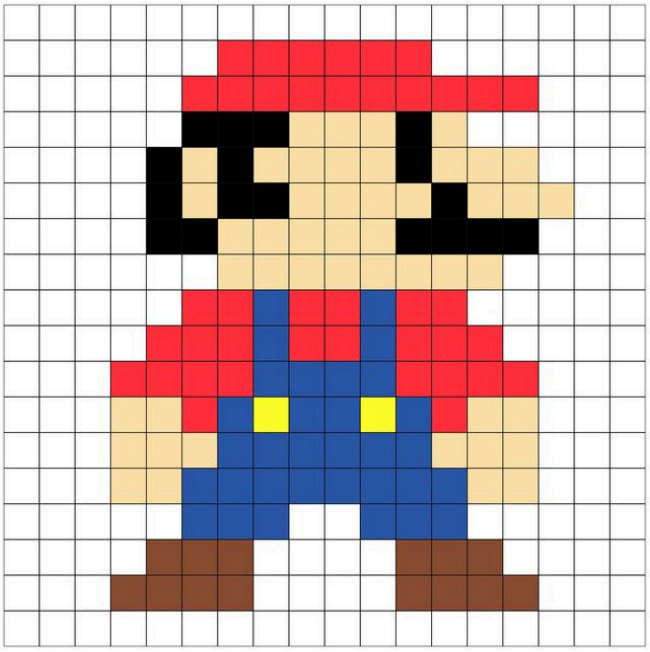
1. Pick a practice project from the next page to help you get started.
2. Utilizing the graph paper on page 4, practice copying the images cell by cell.
3. Next, go to the website www.pixilart.com
4. Click on the "Start Drawing" tab in the middle of the page, then click "New Drawing".
5. Use the tools available on the site to create your practice picture.
6. Once you have completed your practice picture you can either make another practice picture or a creation of your own.
7. Have Fun!!!

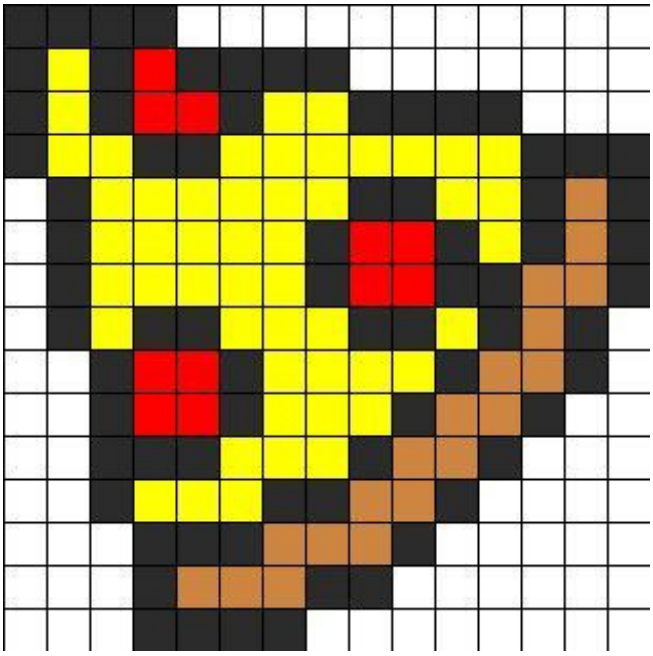
Pixel Art Projects

Practice Project Images



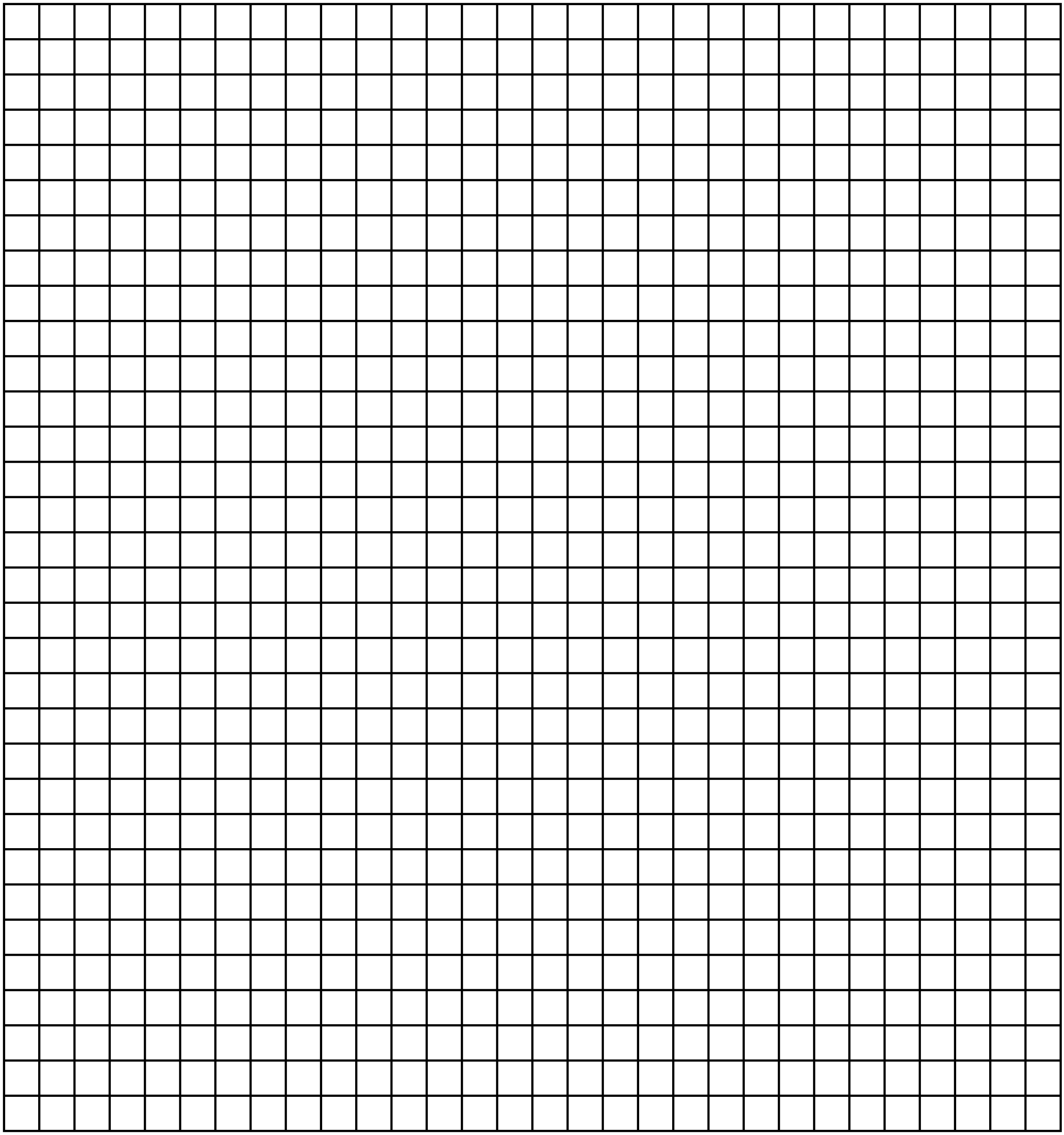






Pixel Art Projects

Practice Graph Paper



Abstraction Storytelling

Activity Guide

Activity Overview

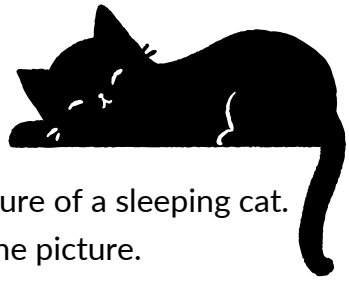
Computational thinking is a very important concept in the world of computer science. It allows someone to break down a problem into more manageable challenges. One of the elements of computational thinking is called Abstraction. This activity introduces your student to abstraction and why it is important to the computational thinking process.

Background Information

Computational Thinking is a core skill that is necessary to computer science and problem solving in general. It is made up of four elements; Decomposition, Pattern Recognition, Abstraction, and Algorithm.

Follow this link or scan the QR code to the right to learn more about computational thinking: www.bit.ly/more-on-comp-thinking

Abstraction is when you take all of the information you have collected and decide what is important and not necessary to solve the problem.



Activity Instructions

1. Find a picture that you can share with your student. An example would be a picture of a sleeping cat.
2. Explain to your student that we are going to make a silly story about the cat in the picture.
3. Identify any important information that you might need to create a story about the cat. Write it down as a reference when you are creating the story.
4. Create at least one funny story about the picture that you chose.
5. Depending on time have a few pictures available so that you can do it multiple times.
6. Discuss with your student how it help to create a story by first identifying important and not important information. This is abstraction.

WE NEED YOUR FEEDBACK

Use the QR code to the right or follow the link below to provide valuable feedback for this activity pack. Your feedback helps us to improve our current offerings and better understand which activities to make available in the future.

STEM Coding Lab thanks you for participating in this project. Try out our other activity packs to continue your students learning in the world of computer science and technology.

WWW.BIT.LY/SCL-MOBILE-LAB-FEEDBACK

CHECK OUT ALL OF OUR ACTIVITY PACKS

To view our full catalog of free activity packs, please follow the instructions via the link below or QR code to the right to create a login and gain access to the full portal.

WWW.BIT.LY/SCL-MOBILE-LAB-INSTRUCTIONS

FULL PORTAL INVITE LINK:

WWW.BIT.LY/SCL-MOBILE-LAB

STEM {Coding Lab}

Driving Digital Literacy. For All Children.

Created & Distributed by:
STEM Coding Lab
800 Vinial Street, Suite B307
Pittsburgh, PA 15212
www.stemcodinglab.org

For support, please contact:
info@stemcodinglab.org