Creative Computing

The Kano Curriculum

KANO
anyone can make

Contents

Introduction to the Kano Curriculum

Every day, Kano Educators all over the globe empower young people to build technology and create with code. Kano is being used to teach computer science and coding in classrooms, in Learnerspaces to develop a DIY mindset, in libraries to enhance digital literacy, and more! In those
learning spaces, educators and facilitators are helping young people demystify the hardware and software that makes computers work and we've seen some amazing creations.

With help from our champion educator community, we've put together the Kano Curriculum to help you integrate computing and coding in your learning space. The lesson plans in this book are
a mixture of teacher-led structure and student-led learning, designed to enable your learners to progress in their understanding of technology, while inspiring them to create with it. You don't have to be a computer science teacher, or have any background in computer science, to teach with Kano. These lessons are designed to help you get started with creative computing, no matter your level of experience.

Each lesson comes with an accompanying worksheet to help check what learners understand and to celebrate their successes with them, their peers, and their family.

Why Kano?

Kano is focused on bringing a creative approach to computer and coding education. We are creating a world where anyone, anywhere, can learn make and play with technology, not just consume it. From kids in Sierra Leone who have never had a computer to young learners in the UK and US - all are part of the new creative generation.

Who Uses Kano?

Over 1,000 classrooms, clubs, camps, and community programs are using Kano to engage learners in understanding and participating in the digital world. With Kano, you're truly part of a global community; 150,000 Kano Kits have been shipped to young people in over 86 countries. Our aim with Kano for classrooms is to make computing education accessible not only to learners but also to teachers.

Why Is Kano Valuable for Learners?

Kano is designed to build a generation of creators, not just consumers. Our education programs are part of this movement, to empower the innovators and designers that will address some of the grand challenges we face as a global society. Kano is the best tool for programs at the intersection of STEM education, 21st century skill development, and differentiated learning.

STEM, STEAM, STEAMED...! Education

In recent years, there has been a push to promote STEM (Science, Technology, Engineering, and Mathematics) Education. You may have also seen the acronym with the "A" included for "Arts," and even with an "'ED" at the end to include Entrepreneurship and Design! The objective in any case is clear: we know that developing learners able to solve problems with technology is critical for the jobs of the future. Kano believes that developing STEM skills is not limited to these subjects, but as a cross-curricular movement.

Kano's projects and challenges push learners to develop STEM skills in a fun and engaging environment. Kano develops challenges that are available online for free, so learners can select projects they find fun and relevant.

21st-Century Skills

How we teach must reflect how our learners learn. It must also reflect the world they will emerge into and shape–a world that is rapidly changing and is increasingly connected. Kano's style and approach to teaching must emphasize acquiring basic digital literacy necessary for succeeding in the 21st century, with both teachers and learners at the core. Kano's hardware and software weave creativity, technology, and coding across subject areas, to promote deeper learning in an engaging and hands-on way.

Kano's technology, along with our guided lesson plans, ensure that we weave the 4Cs into teaching and learning:

Creativity and Innovation
Critical Thinking and Problem-Solving
Communication
Collaboration

Our lesson plans and student-led approach help to build life and career skills, including:

Flexibility and Adaptability
Initiative and Self-Direction
Social and Cross-Cultural Skills
Productivity and Accountability
Leadership and Responsibility

Differentiated Learning

Kano offers immediate differentiated learning in its operating system. When you log into Kano, you can access all of the apps and go through walkthrough tutorials to learn about different coding languages. All of the apps have challenges that range from basic, to medium, to advance. Each app also includes “playground mode,” where anyone can explore coding and make creations all their own! Some of our most advanced coders like to explore what others have created and remix the code to make their own piece of art, game, or song; the possibilities are endless!

Lesson Plan Pedagogy

All lesson plans in this packet are designed with structure in mind. Below is a guide to help you understand the structure and adapt it to your learning environment.

We use scaffolding to help learners acquire new knowledge. As with other subjects, with computer science, the scaffold provides a temporary framework that is put up for support and access to meaning and is then taken away as needed, when the learner secures control of success with a task.

In this framework, learners are explicitly taught and instructed in the following way:

1. Linking to prior knowledge
2. Teacher Connection ("I Do"): Modeling a new concept or topic either through lecture or examples on the board. This is the explain time where teachers talk 80% and learners talk 20% (more listening).
3. Engage ("We Do"): This is the point where the educator works with the learners to learn a new concept. The teacher talks 40% of time and learners talk 60%.
4. Practice/Exploration time ("You Do"): The learners run free. They are actively exploring a new concept or building things on their own. The majority of class time should be spent with the learners actively engaged in the material. 90% of talking is from learners, 10% from teachers.
5. Evaluate ("What can you do?"): How can we check for understanding? Is this in the form of remodeling what was explored by rethinking in new ways? Is it with some type of formal evaluation?
6. Closing: Wrap up the day in some type of closure. Is it giving a homework assignment? Is it reflecting in their engineering logs?

These 6 steps can help organize lesson plans and projects for Kano. The key areas are:

1. Linking
2. Engage
3. Exploration: Challenges
4. Sharing
5. Evaluation
6. Closing

Within each section, there are guiding questions that can be incorporated:

1. **Linking**
    a. What is the objective of your lesson, and how can you get learners interested in it? Activate their prior knowledge!
    b. Get learners involved and thinking by presenting a problem, brainstorming, playing a game. Energize the learners.
2. **Engage**
    a. What is the specific knowledge you are trying to get across? Is it the goal for the day– for example Exploring Make Art? Is it designing a logo?
        i. Name the logo, explain what it is and how it is used.
    b. Get feedback from learners and play off of each other's ideas
3. **Exploration: Challenges**
    a. This is the time where learners explore, and it should be the bulk of activity time. When you are making lessons, make sure that the activity in some way:
        i. Links to your greater objective
        ii. Helps learners focus and work toward the objective
        iii. Helps learners think of new and creative ways to explore and create
    b. There are multiple challenges in each lesson. If a learner finishes one challenge, allow them to move on to the next challenge in the lesson.
4. **Sharing**
    a. Always give your learners the opportunity to share their thoughts with the community, be it with their partners or the larger Kano community on Kano World.
5. **Evaluation**
    a. What questions, processes, or steps can you use to help learners evaluate themselves?
    b. What can you do to push learners to rethink what they created?
6. **Closing**
    a. This is the last remark you make for the day. What is the closing thought you want to get across?
    b. This section will also connect to homework examples.

How to Use Worksheets with Kano

All lesson plans in this packet will have a worksheet that can be used during or after the Kano session. Each lesson is divided into three parts: **Explorer**, **Programmer**, and **Creator**.

Explorer:
This section can be done **during** the Kano session or **after**. It is typically an activity where learners have to find or remember key elements of the lesson. For example, the "Explorer" section in "Intro to Kano Code" would be to identify what blocks live under which category in Kano Code.

Programmer:
This section should be done **after** the Kano session and be used as a formative assessment on the learner's use of Kano for the day. Typically, the Programmer Section is 1-2 exercises that ask probing questions on what the learners learned. For example, in the "Intro to Scratch" lesson, the learner may be given a code block sequence, and they have to explain what the code would do.

Creator:
This section can be **after** the Kano session. In the "Creator" section, learners are asked to be creative and think of new ideas for a design or code. For example, learners may be asked from the "Make Art Pattern Perfection" lesson to design a new pattern and explain how they think they could code this new pattern in Make Art!

Worksheets can be found at the end of each lesson with an answer key for the lesson in the appendix.

Learning Objectives

While your learners use Kano they will be having fun exploring and learning at the same time! Although each lesson has its own set of learning objectives that connects cross curricularly, the packet has core concepts and objectives embedded throughout. These concepts include:

- Hardware
- Software
- Program Development
- Control
- Algorithms
- Variables

The curriculum objectives include:

- Learners will develop skills to engage in creative coding.
- Learners will be able to articulate the difference between hardware and software.
- Learners will be able to identify programming languages and how they are used on Kano.
- Learners will be able to navigate the Kano computer and understand the components of Kano Apps.
- Learners will be able to work collaboratively on projects.
- Learners will be able to communicate ideas articulately to their peers.
- Learners will be able to identify community needs and think of innovative solutions to address them.
- Learners will be able to use Kano to create innovative projects.

What Is in This Lesson Plan Packet?

In this curriculum packet, you will find each lesson plan along with a student worksheet. All answer keys for the worksheets can be found in the appendix.

The lessons include the following:

1. **Building Kano Lesson Plan (2 lesson plans)**
    a. Build a Computer
    b. Explore Kano
2. **Make Art Challenges (3 lessons)**
    a. Intro to Make Art
    b. Pixel Hack Scavenger Hunt
    c. Pattern Perfection
3. **Intro to Scratch (2 lessons)**
    a. Intro Scratch
    b. Programmed to Dance
4. **Kano Code Challenges (3 lessons)**
    a. Intro to Kano Code Pt. 1
    b. Intro to Kano Code Pt. 2
    c. Kano Code Challenge
5. **Intro to Terminal Quest (1 lesson)**
6. **Hack Minecraft Challenges (3 lessons)**
    a. Intro Lesson
    b. Terraform with Minecraft
    c. Minecraft Challenge
7. **Community Challenge (2 lessons)**
    a. Design Thinking
    b. Create a Better World
8. **Celebration Lesson (1 lesson)**
9. **Engineering Log Template/Handout**
10. **Sample Survey for Teacher + Learners**

LESSON 1

Build a Computer!

Beginner **1 hr 10 min**

Learners will discuss ahead of time what the components of a computer are and then use that knowledge to BUILD one.

OBJECTIVES

- Learners can describe the components of a computer system, including hardware, operating systems, and applications.
- Learners can give examples of how computers are used in the real world.
- Learners build computers and write lines of code.

STANDARDS

- **K12 CS:** Computing Systems.Devices, Computing Systems.Hardware and Software
- **CSTA:** K - 2: 1A-CS-01, 1A-CS-02,
  3 - 5: 1B-CS-01, 1B-CS-02
- **Common Core:** CCSS.MATH.PRACTICE.MP1

MATERIALS NEEDED

Print out a diagram of the Raspberry Pi and talk through each component.

Introduction

10 mins

Linking

Today, learners will build a computer! Before they do, challenge them. Ask them to write down as many parts of a computer (mouse, speaker, etc) as they can in 2 minutes. After the time is up have them compare with their partner. As a group, share out your answers and the leader should write them down so the class can see the parts. Discuss the difference between hardware and software.

Engage

We were able to name a lot of parts for a computer, and today we will focus on these hardware pieces. Some we always knew, some we just learned. Today, we are going to see how all these parts interact and make a computer. We will have our own components, and by the end of the day we will build, and have a computer that works!

Exploration Activities

Challenge 1: What Can Computers Do?

5 mins

Ask learners what they think computers can do. As they discuss write their responses down.

- What are they used for?
- What is code?
- What is a Raspberry Pi?

Challenge 2: Build a Computer!

30 mins

Pass out the Kano kits. Ask learners whether any of them have built their own computers before to get them excited.

Build! Learners build their Kanos. Clap and cheer as learners get powered up and type “cd rabbithole.”

Challenge 3: Explore Kano

10 mins

If you have a little time, let the learners play around and move into different apps on Kano. Direct them to Make Art so they can start coding art! If you have a lot of time left to explore then move on to the Explore Kano lesson.

Closing

Evaluation

5 mins

Once the computers are picked up, ask learners to fill out their engineering log. Also, in the in class reflection section answer these questions:

- What was your favorite part about today's session?
- What was your least favorite part about today's session?
- What are three things you learned today?
- Why is it important to create, not just consume, technology?

Call on four people to answer 1 of the 4 questions above.

Extension

5 mins

Before everyone leaves, ask the learners to go home tonight and draw or write what it was like to build a Kano Computer. Did they enjoy it? Were they excited? What was the computer like?

Also, pass out the "Build Worksheet" to be completed at home. You can find the worksheet in the appendix section of this packet.

Kano Clean-up

10 mins

As you start using Kano in class, how you clean up will become important. Take a substantial amount of time (10 - 15 minutes) to practice your clean-up routine with your learners.

Name: _____ Date: _____

Explorer Questions

Directions: Under each image, write the name and what each part is used for on the Kano!

_____

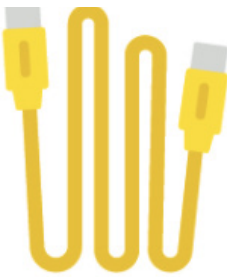
_____

_____

_____

_____

_____



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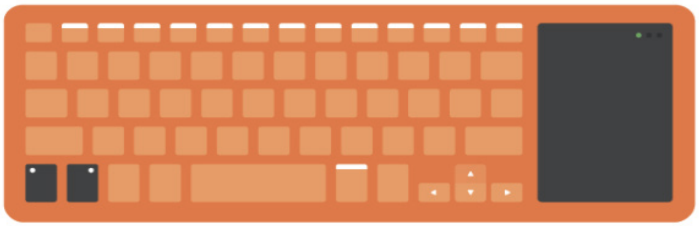

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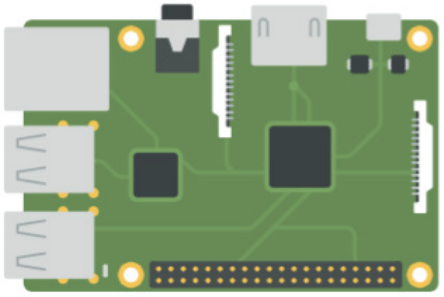
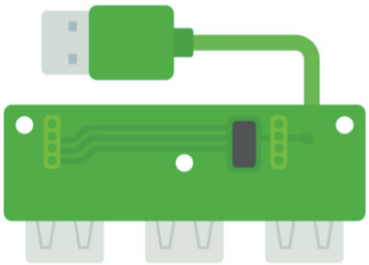
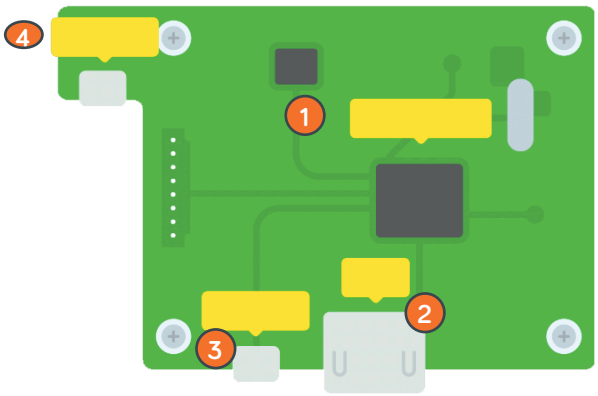




Below is an image of the Raspberry Pi. Can you label each part correctly?



1

2

3

3

Programmer Questions

In the sections below answer the questions to the best of your ability. If needed, draw examples to support your statements!

1. Today you built and coded your Kano Computer! Can you name the components that were **hardware** of the Kano? Can you name the components that were **software** on the Kano?

Hardware	Software

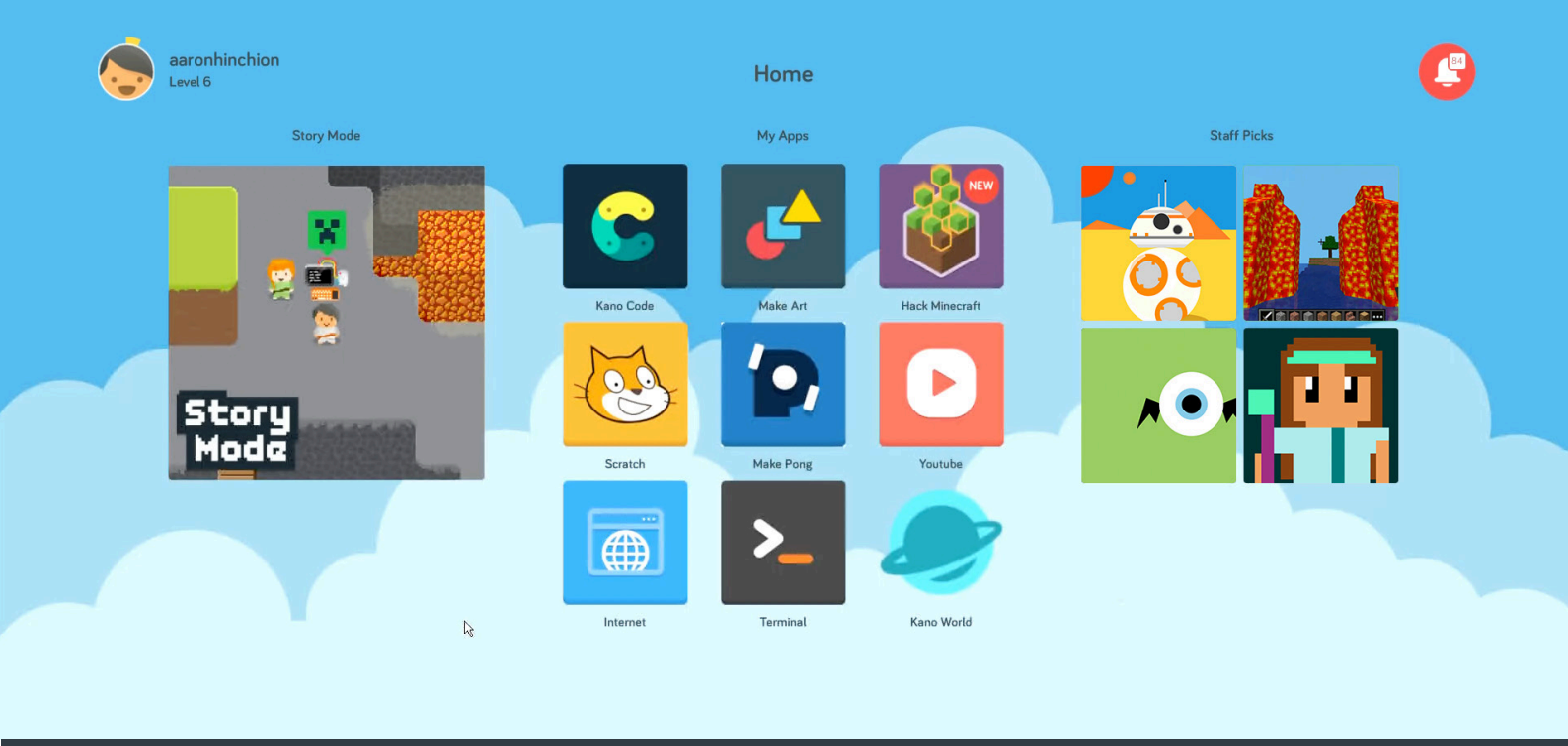
2. While you were using the Kano there were components you used that were **inputs** (you putting information into the Kano) and there were things that were **outputs** (the Kano showed you something). What do you think was an **input** device of the Kano hardware? What do you think was an **output** device?

Creator Question

You just built your own computer! Now how about you design your own computer? Below, draw the perfect computer! What components would it need to turn on? What would make it unique? Be creative!

Impact Question

How has technology changed in your life? What was it like when you were 5? What was it like 3 months ago? What new technologies have you heard about or seen?



LESSON 2

Explore Kano

Beginner **1 hr**

Learners, after building their Kanos, will take time to understand the software inside the Kano operating system and explore some of the features to get to know it!

OBJECTIVES

- Learners will grasp the difference between hardware and software
- Learners will understand how Kano's Operating System (OS) works
- Learners will gain an understanding of the different uses of code
- Learners will be able to use code to make basic creations

STANDARDS

- **K12 CS:** Computing Systems.Devices, Computing Systems.Hardware and Software
- **CSTA: K-2:** 1A-AP-09, 1A-CS-01, 1A-CS-02, 1A-CS-03
- **Common Core:** CCSS.MATH.PRACTICE.MP1

Introduction

10 mins

Linking

Remember building our computers and learning about hardware and software?
Remind learners that a way to help you remember the difference is to think of hardware as a physical device. Something you can touch and put in your hands. With software, you can't do the same thing. It lives inside your computer or in another device.

Today, we're going to dive into software and start coding. Ask learners what they have heard about code - what is it? What are some coding languages they've heard of? List a few on the board - including:

- Scratch
- CoffeeScript (Make Art)
- Python (Make Snake)
- Kano Blocks (Make Minecraft, Make Pong)
- HTML
- JavaScript
- CSS

You can use these resources to help you discuss code with your learners. When they powered up the Kano, they saw something called "binary code." Computers think in 1s and 0s. Humans don't! In order to speak to computers, we need code!

Engage

Get excited! We want to use code to be creative - you can do all sorts of things with code!
Watch this video on coding at Pixar.

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

Challenge 1: Become a Creative Remix Master!

5 mins

We have built a Kano, but now we want to think about how we can be CREATIVE with Kano. For all of our sessions we will be learning how to code in a lot of different environments. We will be given a lot of step-by-step instructions on how to create magnificent creations in art, games, and sound! What we want to do when we finish these challenges is to think creatively!

Once you finish a challenge, don't just click next and move on! After each challenge try to change the code. Maybe you can change the numbers for a code block or you can change the color. Try it out and see what you can do and what you can uniquely create! Become a Remix Master!

When you code something super cool try sharing in on Kano World or recording in your engineering log what you did so you can tell the whole group how awesome your code is!

Even though you told them to become remix masters, it is helpful to show them at least how to remix or "hack" each challenge.

Challenge 2: Explore Make Art!

15 mins

Once Kanos are powered on have the learners go to Make Art. For Make Art, work with them through the first Basic challenge (Sunny Day) and show them how they can be the remix master. The easiest remix you can make for Sunny Day is to change the background color or radius of the circle!

Have them work on at least 3 challenges in Make Art and remix each challenge. Again, encourage learners to share their work via Kano World or record their remix in their engineering logs!

Challenge 3: Explore Make Snake!

10 mins

There are a lot of different apps on the Kano computer. But can you hack a game? Yes! Now, let's exit out of Make Art and go to Make Snake. If your group is young, tell them that snake was a wildly popular game on phones where you were a snake moving around the board eating apples or little dots. It was very basic, but now they get to hack it and make it challenging with code!

In Make Snake, learners should remember to try and remix the challenges after learning how to modify the game. Don't forget to share your game with Kano World!

Challenge 3: Explore Make Pong!

10 mins

How about one more game? This time let's hack Pong! Again, this was a very popular game (the first video game) and we can hack it to be AWESOME now! This platform is a little different than Make Snake. Instead of just using lines of code we can use block code similar to Scratch to customize the game! Remember to remix each challenge and don't forget to share your game with Kano World!

Closing

Evaluation

5 mins

Tell the learners to get into pairs and talk about which of the three games they liked the best. If they haven't already, ask them to share what they've created via Kano World! Each pair can share what they liked best and what was most difficult.

Come up with a class definition for "code," and list a few things that you can create using code. Have learners write down this definition in their engineering log.

Extension

Before leaving, pass out the "Explore Kano Worksheet" to be completed at home. You can find the worksheet in the appendix section of this packet.

Kano Clean-up

5 mins

Power down and put away Kanos

anyone can make™

Name: _____ Date: _____

Explorer Questions

Directions: Under each image write the **name** of the Kano App, **how you code** (blocks or text), and a brief **description** of the app.

_____

_____

_____

_____

_____

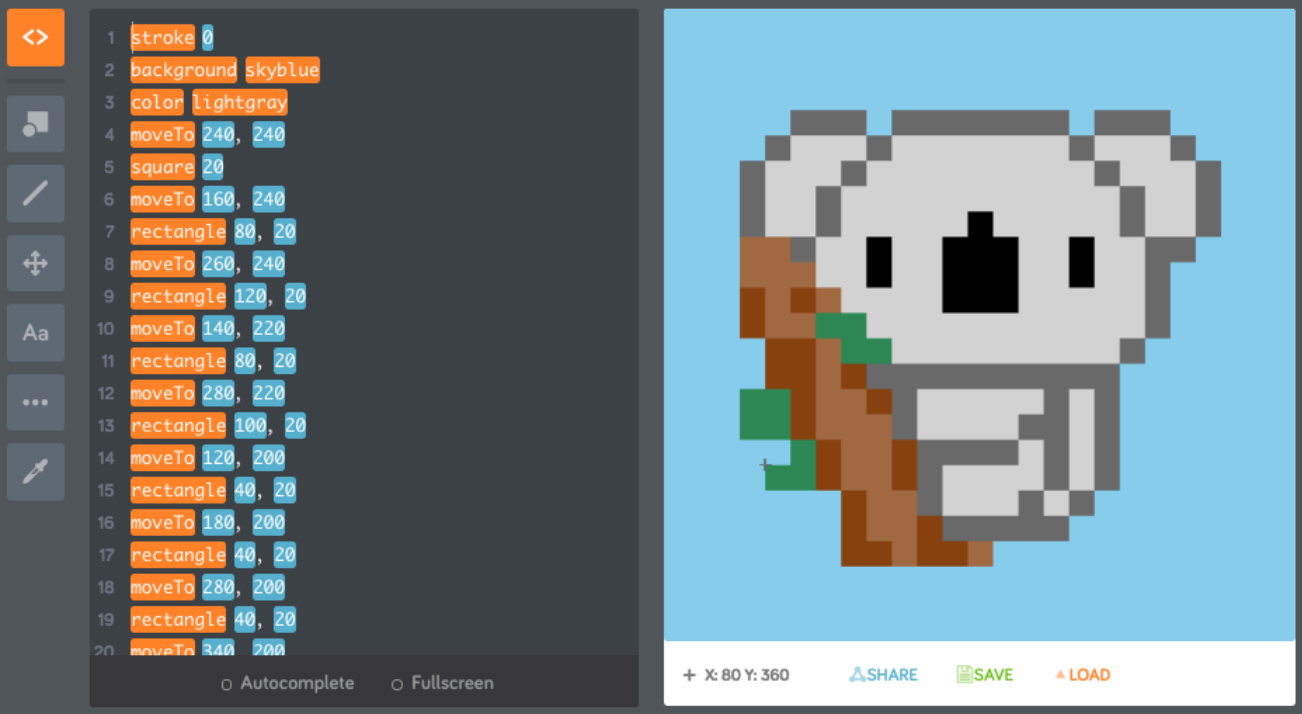
_____

Programmer Question

Where there any other apps that you discovered? Is so write their name, provide a description of the app, and draw what the app's logo looks like below!

Creator Question

If you could design an app for the Kano what would it be? What would its features be? What would the logo be? Draw the app below!



LESSON 3

Intro to Make Art

Beginner **1 hr**

Have your creators gets used to Make Art and begin creating unique creations to share!

OBJECTIVES

- Learners will understand how to access Make Art
- Learners will be able to identify the features of Mark Art and use them to create their own pieces of art

STANDARDS

- **K12 CS:**
  Computing Systems.Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-AP-10, 1A-AP-11, 1A-AP-12 , 1A-AP-15
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-16, 1B-AP-17
  6-8: 2-AP-12, 2-AP-13, 2-AP-16
  9-10: 3A-AP-18

MATERIALS NEEDED

Visit http://art.kano.me/challenges to find all our Make Art challenges

Introduction

10 mins

Linking

Ask your learners to draw anything, using a pen and paper. It can be as simple or as complex as they want but they only have 5 minutes. Put a countdown up to get them energized to go!

Engage

Tell your learners to turn and talk to each other for 1 minute each. What is your favorite program you have used to edit images (Paint, Photoshop, Code)? Do they think they can transfer their drawings to the computer with one of those softwares? If you can how? After they are finished with the 2-minute turn and talk discuss how computers are becoming used more often in artwork, from Disney films, to 3D printed jewelery, to laser cut wood prints, to art made from code! Art is changing and using technology to create this change. Today, they will learn one platform to use code to create art and share it with the world!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

35-45 mins

Challenge 1: Get to know Make Art!

Briefly go over the features of Make Art and how you access the app.

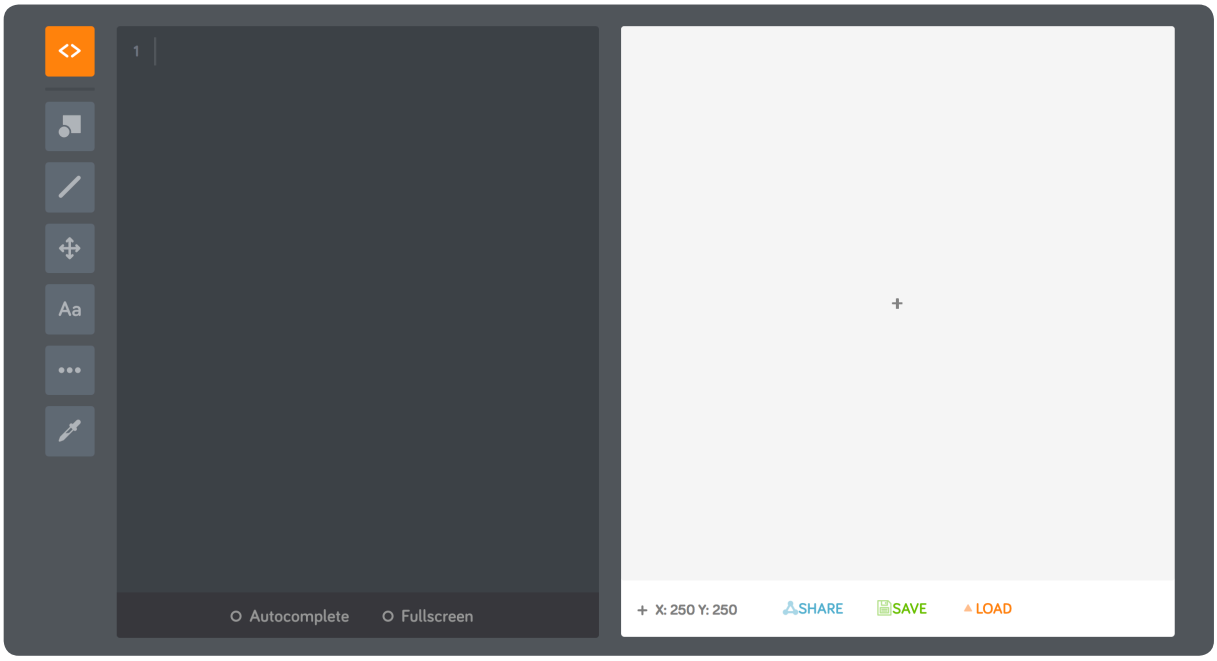
Click this icon to launch Make Art!

Once the app is open, they will have the option to work on ”challenges” or hang out in the “playground.” Challenges are exactly that, challenges, that the Kano team creates to help creators get used to the environment and start learning code. They are walkthroughs that provide specific instructions to move forward and you can customize your creations afterward!

The playground is a little different. There are no walkthroughs, it is a playground for your imagination! Take the skills you learned in the walkthroughs or tinker around to see what you can create!

When you open up Make Art in “challenges” or “playground” you will see a screen like the one

below. The left side is where you will code, and the right side is where you will see your creations start to grow and be built!



Try hitting enter a few times in the dark left side. You will notice numbers appear. This is a number system to help you create individual lines of code.

Now on the right side move your cursor around. You should notice that in the bottom left corner of the white screen you will see the “x” and the “y” move positions. In Make Art you are creating masterpieces on a grid that corresponds to a coordinate plane. You can use your cursor to help you identify where on the grid you need to draw!

On the left side you will notice seven gray boxes. These are buttons to different windows that give you information on Make Art!

Code: This will be where you will usually have your left screen working on. Here you type in the code that will help build your creations on the right side.

Shapes: Do you want to create objects? You can create shapes: circle, ellipse, square, rectangle, and polygon in this section with the example code shown.

Lines: With this button you can draw lines! These include drawing a line of a certain size, and drawing a line to a certain point.

Position: We want to create in different spaces on our digital canvas. To do this we need to learn how to move around on the board. You can see example to move the cursor a certain distance away and move the cursor to a particular position.

Text: Maybe you want to say something in words. Use the text box to learn examples to: write a message, set size and/or font, sets bold text on (true) or off (false), sets italic text on (true) or off (false).

General: This button explains a few things that don't fit in the other categories. Such as: repeat code or get a random number in a range.

Colors: What is a piece of art without color? In the color button you will see examples to: set the background color, change the color in use, change the width and color of the stroke (border, set a color's brightness, set a color's saturation, rotate a color's hue angle by a given amount, set how see through a color is.

Challenge 2

Get used to Make Art! Have your learners click on Make Art and explore the beginner challenges. Remind them to remix each challenge and don't forget to tell them to share their art pieces on Kano World!

Challenge 3

Are your learners ready for a challenge? Have them open up the playground and attempt the following scenarios:

> **Scenario 1:** Can you draw an example of a drink you would have in the current weather? For example, if it is cold you may drink hot chocolate! If it is hot you may drink iced tea.
>
> **Scenario 2:** Let's make something more extensive. Can you draw your name in different colors? Stylize it and make it your own!

**Note: it may be helpful to let each learner have a piece of paper and pencil to draw out their picture. Encourage learners to draw simple shapes that make up a larger picture!

Challenge 4

Challenge a classmate! Pair up your learners. Have each student write a challenge on a piece of paper. Tell them to make it reasonable and something that can be created in Make Art only. Make sure their partner doesn't see! Once they have their challenge thought out they will exchange with their partner. Can each person finish the challenge before they run out of time?

Challenge 5

Wow, your creators have gotten far super fast! Now, can they take their drawing from the start of class and do the impossible? Can they turn their paper drawing into CODE?

Save your work and share to Kano World!

Closing

Sharing and Evaluation

15 mins

Your learners should have finished Challenge 3. Ask the challenger to critique the challenge -y's artwork. Did it make the grade? Ask the challenger to grade them! If they did, give them a 3, if it was okay a 2, if not that much a 1. Ask the challenger to give two lines of feedback, one helpful comment to make it better and one positive comment!

Educator Note: It is recommended you model this to the learners to make sure they fully understand the task.

Tell the learners you hope they enjoyed this introduction lesson and that they will be doing more exciting work with Make Art. While learners leave, tell them to turn in their post-it notes with their grade for their challenge partner's work. Also, have learners complete their daily engineering log!

Extension

Before leaving, pass out the "Intro to Make Art Worksheet" to be completed at home. You can find the worksheet in the appendix section of this packet.

Kano Clean-up

5 mins

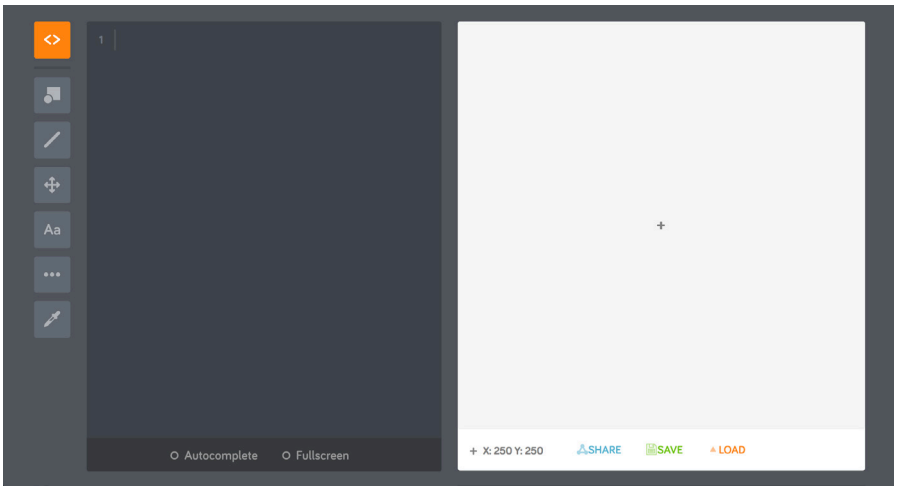
Power down and put away Kanos

Intro to MakeArt

Name: _____ Date: _____

Explorer Questions

Directions: Under each image ,write a brief description about each MakeArt feature. Think about what you can code with each feature.



_____

_____

_____

_____

_____

_____

_____

_____

Programmer Questions

What does Syntax error mean? How do you fix it?

In the challenge “Sunny Day” you have the completed code below. In the below code, explain which words can be changed to modify the outcome and which things have to stay the same.

Creator Question

You created on Make Art today, but challenge yourself now! Draw a simple drawing using only three shapes (rectangles, circles, and/or triangles). Try to code this drawing tonight or in class later!

LESSON 4

Pixel Hack Scavenger Hunt!

Beginner **1 hr 15 min**

Learners will complete the Pixel Hack challenges and identify geometric shapes and properties in a scavenger hunt!

OBJECTIVES

- Learners will be able to code complex images with CoffeeScript code
- Learners will be able to identify and define geometric shapes and properties appropriate to their age level.

STANDARDS

- **K12 CS:**
  Computing Systems. Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development

- **CSTA:**
  K-2: 1A-AP-10, 1A-AP-11, 1A-AP-12 , 1A-AP-15
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-12, 1B-AP-16, 1B-AP-17
  6-8: 2-AP-12, 2-AP-13, 2-AP-16
  9-10: 3A-AP-18

MATERIALS NEEDED

Download the Educator's Guide to Pixel Hack

Introduction

3 mins

Engage

Quick! You have 3 minutes to identify as many shapes in the room as possible! Write down the item and what type of shape it is!
Can we have a few volunteers to tell us what types of shapes they have?

Connecting

We just had to find as many shapes as possible when we were looking around the room. Today, we will be drawing different shapes with code, but we have to figure out what those shapes are!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

35-45 mins

Challenge 1: What are Shapes!

Before starting go over the following shapes and their names with the learners. Make sure each student can give one example of each shape so they will be prepared to find them in the scavenger hunt:

All Learners:

- Circle
- Oval
- Square
- Rectangle
- Triangle
- Line
- Perpendicular lines
- Parallel lines

Older Learners:

- Acute angle
- Obtuse angle
- Lines of symmetry
- Regular polygons
- Irregular polygons angle measurements (45, 90, 180, 360)

Challenge 2: Pixel Hack Scavenger Hunt!

Turn on your Kano and open up Make Art. In the challenges you should see where it says Pixel Hack. There are a lot of challenges in Pixel Hack. Your mission is to code AS MANY challenges as you can in the next 30 minutes and find AS MANY shapes as possible in 45 minutes. Work with your partner to find the following shapes:

- Circle
- Oval
- Square
- Rectangle
- Triangle
- Line
- Acute angle
- Obtuse angle
- Perpendicular lines
- Parallel lines
- Lines of symmetry
- Regular polygons
- Irregular polygons
- Angle measurements (45, 90, 180, 360)

Make sure that you and your partner identify how many of each shape you find in each challenge. The team that finds the most shapes wins!

Remind learners to remix each challenge and share to Kano World!

Sharing

15 mins

Evaluation

Each team will come up and share the number of shapes they found in each challenge. The lead teacher should have each challenge up so the class as a group can discuss how many shapes they see and if there may be more or less.

Closing

Shapes are everywhere! If you haven't finished the Pixel Hack try to finish the rest of the challenges at home tonight! Let's see how many more shapes we can find!

Also, record in your engineering log the most common shape you found. Why do you think this was the most common shape?

Extension

Before leaving, pass out the "Pixel Hack Worksheet" to be completed at home. You can find the worksheet in the appendix section of this packet.

Kano Clean-up

5 mins

Power down and put away Kanos

KANO
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Pixel Hack

Name: _____ Date: _____

Explorer Questions

Directions: In this Pixel Hack Scavenger Hunt you want to record how many shapes you find! In each challenge write down as many shapes, lines, angles, or other geometric items you can find!

Challenge Name	Shapes, Lines, Angles
Pong	
Asteroids Ship	
Tetris	
Loot Chest	
Variables	
Diamond Sword	
Steve	
RPG Mage	
For Loop	
8-bit Sunset	
Color Frenzy	
8-bit Grass Block	
8-bit Diamond Block	

Programmer Question

In this activity you found a lot of different shapes. Can you match the shape or angle with the correct vocabulary word?

Creator Question

Make Art uses simple shapes and lines to create magnificent art work with code! Why not try to create an art piece yourself? Use simple shapes to create a unique art piece. Afterward, write out how many of each simple shape or angle measurement (acute, obtuse, 90) that you used to make it!

LESSON 5

Pattern Perfection!

Mixed **2 hr**

Learners will use Make Art to learn more about patterns, how math can help with pattern creation, and learn how patterns can help create a secret code!

OBJECTIVES

- Learners will use mathematical concepts to create visual patterns
- Learners will learn about the history of ciphers and how they were used
- Learners will create a unique cipher using technology

STANDARDS

- **K12 CS:**
  Computing Systems. Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-AP-10, 1A-AP-11, 1A-AP-12 , 1A-AP-15, 1A-DA-07
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-12, 1B-AP-16, 1B-AP-17
  6-8: 2-AP-12, 2-AP-13, 2-AP-16
  9-10: 3A-AP-18
- **Common Core:** CCSS.MATH.PRACTICE.MP1 **CCSS.MATH.CONTENT.4.OA.C.5**

Introduction

15 mins

Linking

- Get into pairs.
- Individually, each student is to draw a pattern. It can be a picture, it can be a number pattern, it can even be a secret code!
- Switch papers with your partner and see if you can figure out each other's pattern.
- Select a student to come up and draw a pattern on the board

Engage

Discuss as a class:
Today, we are learning about patterns and how we can create and better understand them with computer code! Patterns are everywhere from fashion to music. What is a pattern? What are some important patterns we've learned about from history or math?

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

Challenge 1: Code + Patterns!

30 mins

Log into Make Art.
Go to **Ozwald Boateng × Kano** challenges. Ozwald Boateng is an English fashion designer of Ghanaian descent. We've created these challenges along with him to reflect fashion in the digital world!

Explore how to make different patterns using exponents, shapes, polygons, and designs and share them in Kano World! Get through at least:

- Color
- Material
- Cut
- Pattern

Remix the "**Pattern**" challenge by changing the color and size of some of the shapes. Add your own flair. We will continue these challenges at another time if you haven't yet!

Challenge 2: Create your Pattern with Kano

30 mins

You've use Make Art to make some really cool art that you can use in fashion or for complex math representations. Now try to design your own pattern. You can create this pattern in any app–including in Make Art, Make Minecraft, or Scratch. You can even continue to code the challenges in Make Art but add your own flair.

Share your patterns in pairs or groups of four.

Challenge 3: Patterns and Ciphers!

30 mins

Patterns are used a lot in the real world. We analyze data, make scientific discoveries, create products, and make political decisions using patterns. Another way you can use patterns is through code. Not computer code, but something similar. These codes are called ciphers. In your groups of four, research ciphers on your Kanos. Learn more about: Morse Code, Cipher Wheels, and Pigpen.

Note*** If you have Kano Magazine you can use the cipher on the back!

Challenge 4: Create Your Own Cipher

30 mins

Building on the pattern you started in Challenge 2, create your own secret message as a group!

Sharing and Recap

10 mins

Each team will come up and share the number of shapes they found in each challenge. The lead teacher should have each challenge up so the class as a group can discuss how many shapes they see and if there may be more or less.

Pattern Perfection

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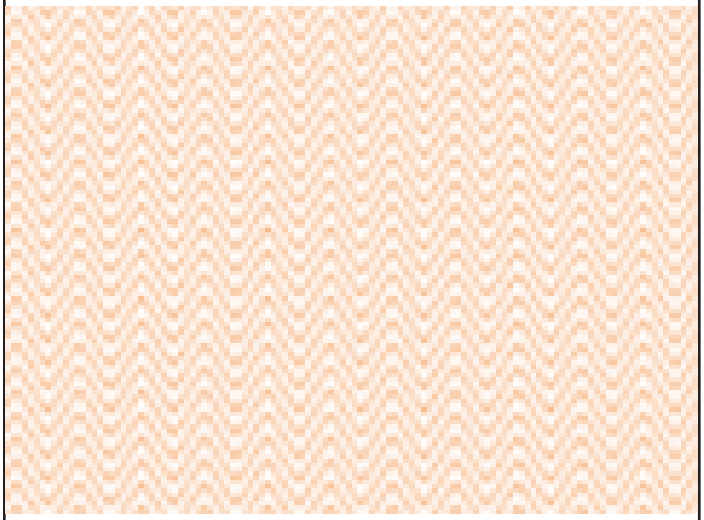
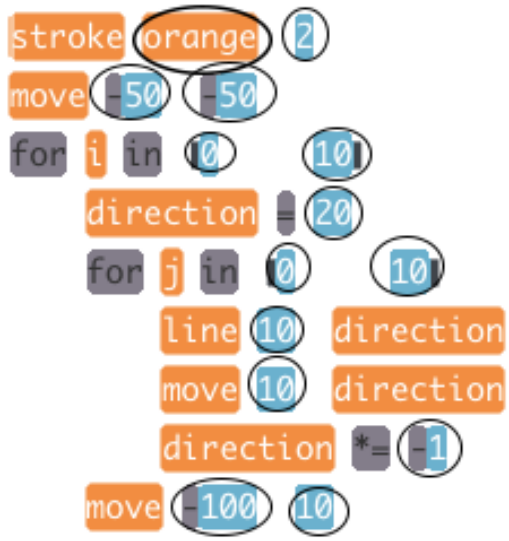
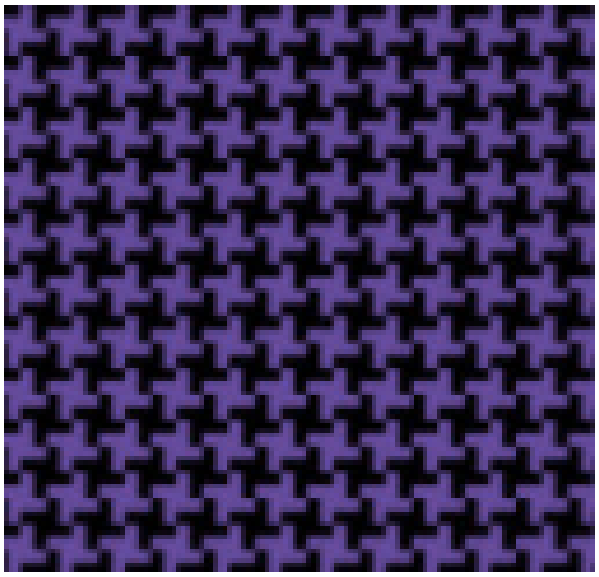
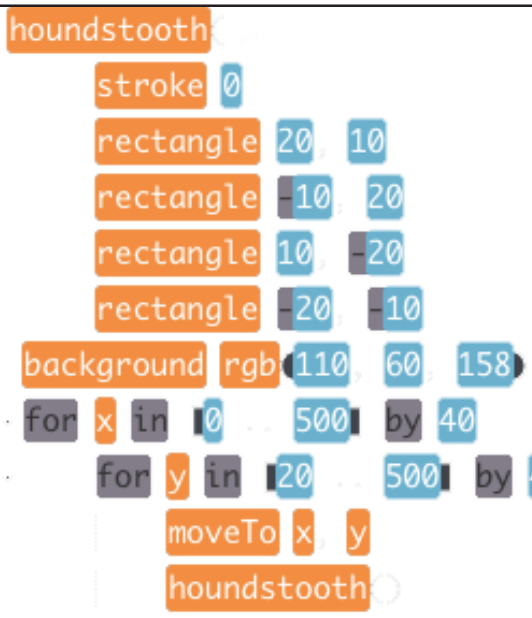
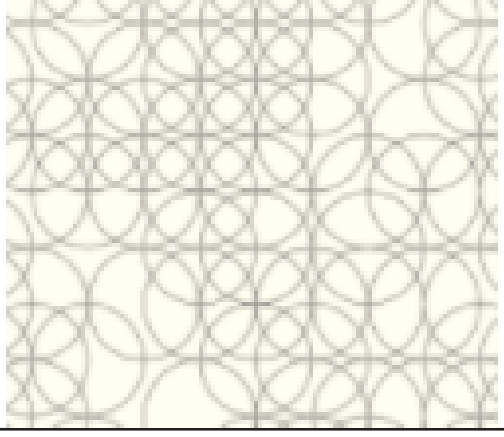
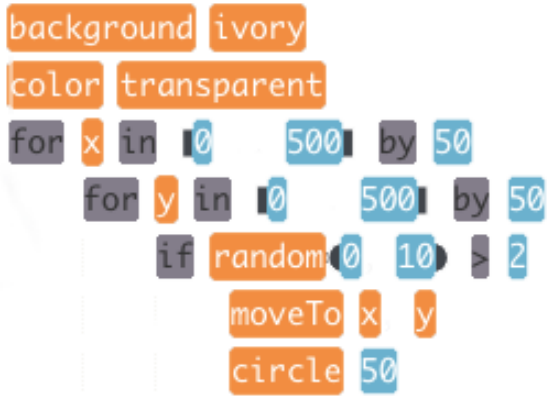
Name: _____ **Date:** _____

Explorer Questions

Directions: In Pattern Perfection you created patterns with code! What if you want to modify the pattern though? Below you have images of a pattern and the code used to create it. In the code section, circle all portions of the code you could change to modify the code. The first one is an example

Challenge	Source Code
	
	
	

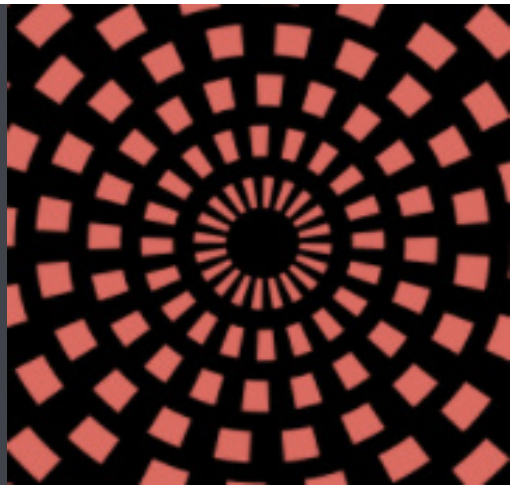
Pattern Perfection

anyone can make™

Programmer Questions

Patterns are created with a specific repetition. In the Make Art challenge called “Pattern” you had the code below create the image next to it:

```
background black
stroke 30, red
color transparent
for r in [0 .. 350] by 50
    for i in [0 ... 2] by .1
        arc r, i, i - .05
```



In your own words, can you explain each line of code and why it created the image you see on the right?

Creator Question

If you had to make a pattern in Make Art again what would it look like? How do you think you would code it? Draw the pattern out below and label how you would code it!

Reflection Questions in Engineering Log:

- What was one thing you learned when you coded patterns in Make Art today?
- What was your favorite part of the challenges?
- What was your least favorite part of the challenges?

Extension :

Tell learners to fill out one of the student engineering logs to share how they created their challenges. Also, fill out the “Pattern Perfection” worksheet. Refer to the appendix section for the worksheets!

Kano Clean-up

5 mins

Power down and put away Kanos.

LESSON 6

Intro to Scratch!

Mixed **1 hr**

Learners will Learn the basics of Scratch to begin creating new games and designs!

OBJECTIVES

- Learners to understand that Scratch is a commonly used programming language
- Learners to be able to imagine possibilities for their own Scratch-based creation

STANDARDS

- **K12 CS:**
  Computing Systems. Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-AP-10, 1A-AP-11, 1A-AP-12 , 1A-AP-14 , 1A-AP-15
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-12, 1B-AP-15 , 1B-AP-16, 1B-AP-17
  6-8: 2-AP-12, 2-AP-13, 2-AP-16, 2-CS-03
  9-10: 3A-AP-18
- **Common Core:** CCSS.MATH.PRACTICE.MP1 **CCSS.MATH.CONTENT.4.OA.C.5**

Introduction

5 mins

Linking

Ask learners about their experiences with computers. Ask them to draw one thing they'd want to use technology for/what they would want technology to do.

Engage

5 mins

Introduce learners to creating with Scratch and the range of projects they will be able to create by showing the Scratch overview video and some sample projects.

Explain that over the next few sessions they will be creating their own interactive computational media with Scratch. (Show some videos from the resource links provided)
Explain that Scratch/blocks is just another form of a coding language.

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

Challenge 1: Get to Know Scratch!

30 mins

Learners explore in Scratch and complete the introduction activity found on:
https://www.raspberrypi.org/learning/getting-started-with-scratch/worksheet/

If you need to walkthrough specifics with the learners reference the "Getting to Know Scratch" PowerPoint found at kano.me/educators/lesson-plans

Closing

10 mins

Sharing

What did you create in Scratch? Turn and talk to a partner and share your Scratch creations. In your engineering log, write what you would like to learn or do for your next Scratch lesson.

Closing

What did you create in Scratch? Turn and talk to a partner and share your Scratch creations. In your engineering log, write what you would like to learn or do for your next Scratch lesson.

Extension

If your learners have extra time pass out the “Intro to Scratch” worksheet!

Kano Clean-up

5 mins

Power down and put away Kanos

Name: _____ Date: _____

Explorer Questions

Directions: Match each Scratch block to the category the block lives under!

Motion

Control

Looks

Sound

Pen

Events

Sensing

Programmer Questions

Below are some examples of Scratch blocks. In your own words, describe what each block would do in Scratch.

1.

2.

3.

Below is a sample of code from Scratch. What do you think the program will do when it runs?

Debug It!

Something is wrong with the code below. Can you figure out what is wrong? How would you fix it? Record your answer next to the Scratch blocks.

Creator Question

In Scratch you can create games, animations, and much more! What if you had to program your own video game? Draw below the game you want to code! Label your drawing to explain how you would code it with the Scratch Code Blocks!

LESSON 7

Code a Dance Party

Mixed 2 hr

Learners will use Scratch to explore code and how to issue commands to make their character dance!

OBJECTIVES

- Learners will understand that computers can perform a variety of tasks
- Learners will understand that code can be used to communicate and create a computer program
- Learners will create a sequence of program commands
- Learners will work together on designing a creative piece of work, a dance program that others can follow

STANDARDS

- **K12 CS:**
  Computing Systems. Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-AP-10, 1A-AP-11, 1A-AP-12 , 1A-AP-15
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-12, 1B-AP-16, 1B-AP-17
  6-8: 2-AP-12, 2-AP-13, 2-AP-16
  9-10: 3A-AP-18
- **Common Core:** CCSS.MATH.PRACTICE.MP1 CCSS.MATH.CONTENT.4.OA.C.5

Introduction

20 mins

Linking

Ask for six volunteers – three people who don't mind being the leading partner and three people who don't mind being led. Make the leading partner pair up with someone who doesn't mind being led.

For each pair:

1. Have one partner facing away from the teacher and the leading partner (and the rest of the group) facing the teacher.

2. Show a simple 3 step dance move to the leading partner and the group, but NOT to the other partner.

3. Ask the leading partner to describe to their partner (using only words!) how to perform the sequence of dance moves shown in the video.

Engage

5 mins

Have all the learners sit down. Was that hard or easy? Why do you think it was hard (you couldn't see the teacher)? How do you think you could help the dancer next time (provide very detailed steps)?

The dancers are a lot like computers, they are given very specific steps and then they execute them as they understand them. We have to provide details and specific steps to make sure they perform the way we want them too!

Today ,we will be programming in Scratch! This is a platform you can use to create interactive games and projects using coding blocks. Our mission today is to program a dance!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

Challenge 1: Plan Your Dance

30 mins

The main activity today is to program our Kanos to dance, specifically tango! But what does this dance look like and what are the sequences?

- Move to a space where you will have enough room to move around.
- Separate learners into pairs or groups of three
- Now, create 6-10 moves that connect together to make a tango routine.
- Make sure you record the moves on paper using a stick figure, to practice and change if necessary
- Practice a few times and make sure you have very detailed and specific steps. Remember computers are stupid!

Challenge 2: Review Scratch

20 mins

Your learners should have completed the introductory course in Scratch. However, it is important to go over the blocks and what they mean. Issue the learners a challenge:

- How can you move in Scratch?
- How can you make a character spin in Scratch?
- Can you change the background in Scratch?
- Can you add music?
- Do you think you can have two characters dancing together? How?

Give the learners 3 minutes for each question and see if they can show this code portion. These moves will be helpful for them to work out.

Challenge 2: Code Your Dance!

40 mins

Now that you have the moves and you have reviewed, have learners code their dance! Remind learners to be as creative with the characters they use, the music, and backgrounds they design! Also tell learners that if they are online they can access the Scratch database and look at other projects!

Closing

10 mins

Sharing

What did you create in Scratch? Turn and talk to a partner and share your Scratch creations. In your engineering log write what would you like to learn or do for your next Scratch lesson.

Closing

10 mins

Have learners share their dances to the group.

Extension

If your learners have extra time, pass out the “Programmed to Dance” worksheet!

Kano Clean-up

5 mins

Power down and put away Kanos

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Programmed to Dance

Name: _____ **Date:** _____

Explorer Questions

Directions: For Programmed to Dance, you had to be creative and create your own program! Below, draw a picture and write at least five sentences explaining what your program did in Scratch.

Programmed to Dance

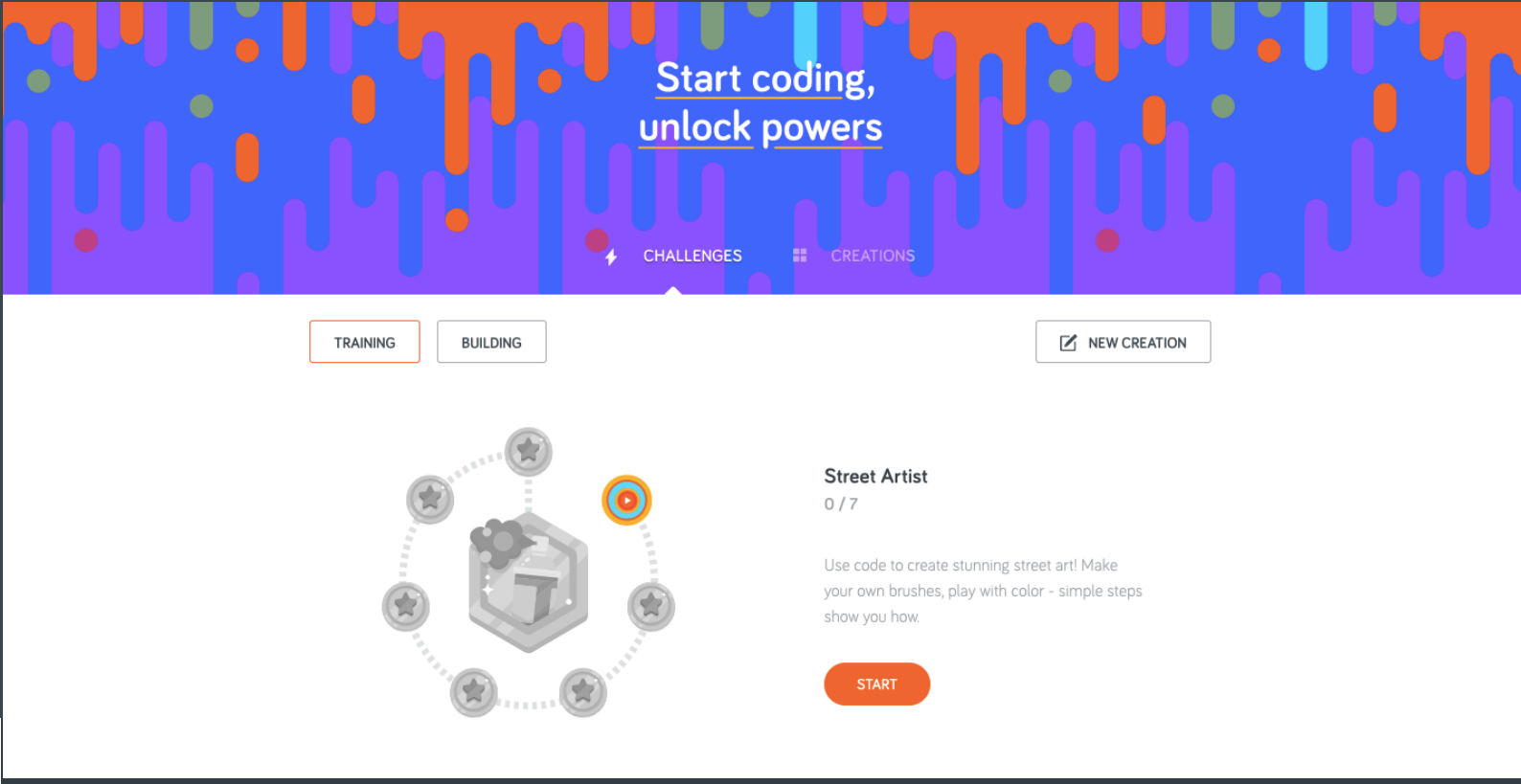
Programmer Question

In Scratch there are a lot of blocks you can use for dance. Think of three blocks you used to create a dance for your character. Why did you pick those blocks? Why were they useful for a dance?

Block Chosen	Why Did You Use this Block?
Block 1	
Block 2	
Block 3	

Creator Question

If you had to do this challenge again what dance would you want to code? What would be different than what you coded? Draw out the dance below and label the drawing with the new coding improvements you would use!



LESSON 8

Intro to Kano Code Pt. 1

Beginner **1 hr 30 min**

Have your creators get used to Kano Code and begin creating unique creations to share!

OBJECTIVES

- Learners will understand how to access Kano Code
- Learners will be able to identify the features of Kano Code and use them to create their own creations

STANDARD ALIGNMENT

- **K12 CS:**
  Computing Systems. Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-AP-10, 1A-AP-11, 1A-AP-12 , 1A-AP-15
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-12, 1B-AP-16, 1B-AP-17
  6-8: 2-AP-12, 2-AP-13, 2-AP-16
  9-10: 3A-AP-18

MATERIALS NEEDED

world.kano.me

Introduction

10 mins

Linking

Take 5 minutes to draw a picture of your favorite app and write 5 sentences explaining why it is your favorite app. If you need a refresher on what an app is check out this BBC Website article.

Engage

Have a few learners share out their favorite apps and why. Let learners who have similar app love raise their hands or show their support for their app.
Apps are pretty awesome. From Angry Birds to Messenger, apps can do a lot of things. We are going to learn today about another feature of Kano called Kano Code . In this app we will learn how to use block codes to create apps and drawings that are fun, unique, and our own creations!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

Challenge 1: A Walkthrough of Kano Code

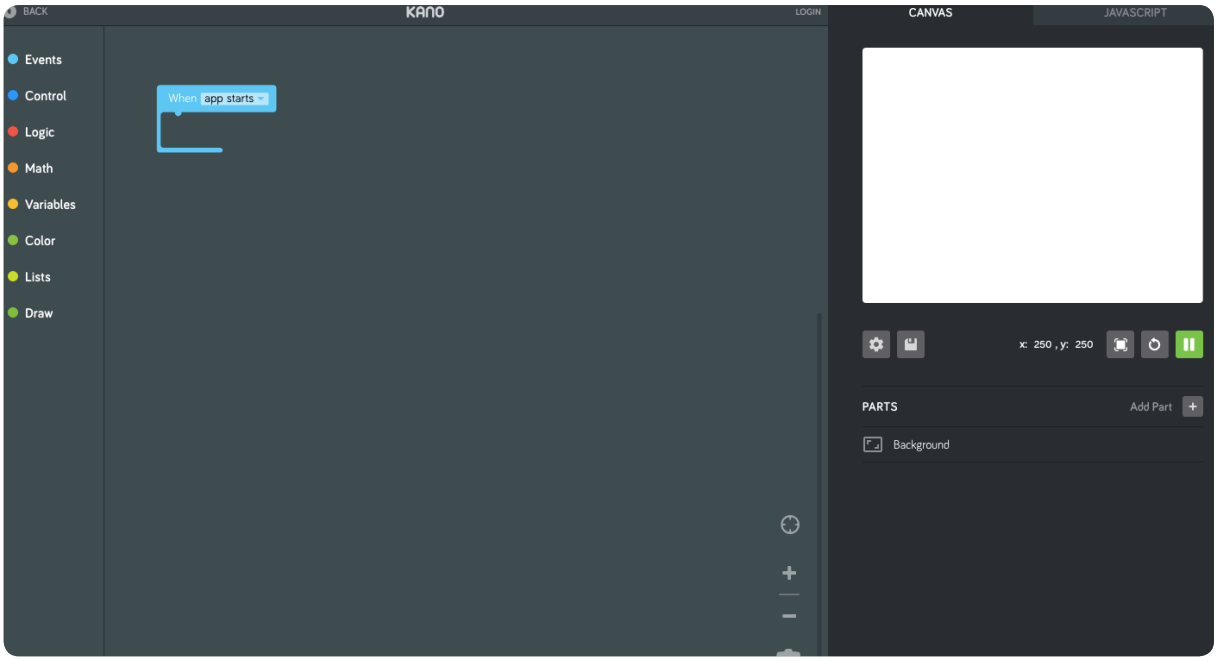
30 mins

Click this icon to launch Kano Code!

You will be directed to the Kano Code page. At the top, you will see a few options: Challenges, and Creations.

- "**Challenges**" is where you can learn HOW to code in Kano Code. It is separated into three categories
  1. Training: Get step-by-step instructions to code and receive badges
  2. Building: More step-by-step instructions you can use to learn to code
  3. New Creation: This is more of a playground mode where you can create from a blank slate
- "**Creations**" is where you can look for users, user-created creations, or check on the competition in Kano World.

Just to explore Kano Code, let's open Kano Code from the "New Creation" link. When you open Kano Code you should see a screen like the one below.



Like in MakeArt,in Kano Code you have a side that is where you code and a side that is your canvas. In Kano Code, our canvas is on the left and our coding area is on the right.

A few things about the display. On the right, you have a blank canvas. Like in MakeArt, in Kano Code you can move your cursor around and, on the bottom left, you will notice an x and y number changing. This is to help you identify coordinates on the canvas and place objects as needed. You will also see "**Add Part**." The "Add Part" portion will let you add parts to the canvas that can make your app more interactive. You can add stickers, buttons, text, or other parts that interact with players.

The left side is our coding area. Kano Code uses block coding to make awesome creations. Below is a brief explanation of what blocks live in each button. For a more detailed explanation of each block refer, to this document.

The next page highlights each type of block and what it is used for.

- **Events**

  This is where you'll see blocks that tell your app how to respond. When _____ happens then you run the code that will connect in the blocks.

- **Control**

  This is where you'll see blocks that tell your app how to act. Most of these blocks include loops or timed/controlled processes.

- **Logic**

  Here you'll see logic blocks. These are: if, else if, else statements, comparison blocks, and Boolean (true/false) blocks.

  You can think of how you act in a scenario. If the store is open you go inside, else you leave. You do not break into the store if it is closed! Boolean blocks are the true false statements that help us determine what we should do in the scenario above.

  If the store is true (open), then go inside. If it is false (closed) then leave.

- **Math**

  This is where you'll see blocks that relate to math. These blocks include: operations, random selection, and comparison with numbers.

- **Variables**

  Here you'll see blocks that work with variables. A variable is a place holder for something, like how x and y are place holders for a number in an algebra problem. However, variables in code can hold data, numbers, text, and other things.

- **Color**

  Here you can find blocks that allow you to work with color in Kano Code. You can change the hue of a color, change a color, or select a random color.

- **Lists**

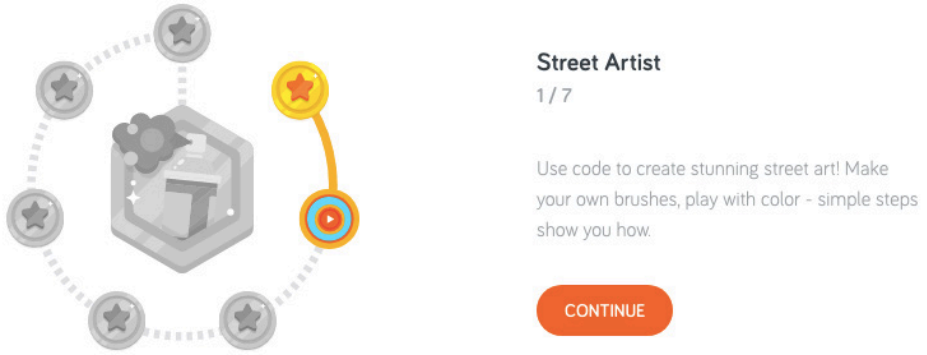
  This is where you'll see blocks that work with lists. A list is known as an array in programming and it is atoll you can use to help store a lot of information at once (like a box holding a lot of objects).

- **Draw**

  Here you can play with blocks that will let you draw a creation similar to MakeArt. You can draw different shapes, line strokes, and move about the canvas using coordinates to draw.

Challenge 2: Street Artist

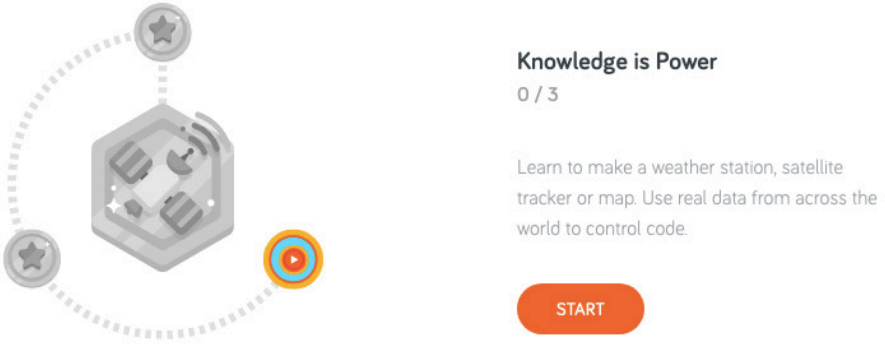
30 mins



We created our Kanos earlier and we just learned what all the blocks mean in Kano Code. Now, let's actually make some AWESOME creations! When you first log into Kano World you will notice a picture like the one above. Click "**Start**" and go through the Street Artist challenges in Kano Code!

Challenge 3: Learn to Use Data and Code!

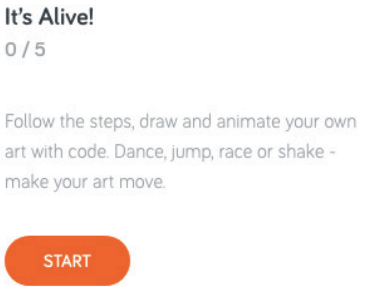
30 mins



Now that you have learned how to make creative code, let's learn to use date to code! Go through the "**Knowledge is Power"** challenges in Kano Code!

Challenge 4: Harness the Power of Movement!

30 mins



Now that you have learned how to use creativity and data to code, let's learn to make objects move! Go through the "**It's Alive"** on challenges in Kano Code!

Save your work and share to Kano World!

Closing

15 mins

Sharing

Use the remaining time in class to share what the learners remixed or created on their own. Remind learners to share their creations on Kano World!

Evaluation

Ask learners to find one partner and turn and talk to answer the following questions. What did everyone like about the creations? What was difficult? What is a new skill you learned that will help next time you use Kano Code.

In their engineering logs, have the learners write one idea they have for next time to use Kano Code.

Extension

Have learners fill out the "Intro to Kano Code" worksheet that can be found in the appendix.

Kano Clean-up

5 mins

Power down and put away Kanos

Intro to Kano Code

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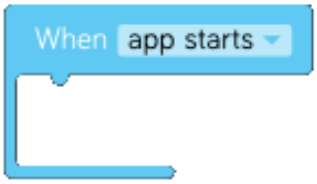
Name: _____ **Date:** _____

Explorer Questions

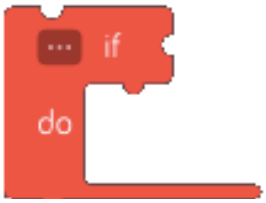
Directions: Kano Code uses different coding blocks to create unique creations. In the app, there are multiple trays with different blocks living under each tray.

Below match the Kano Code block with the tray it would live under:



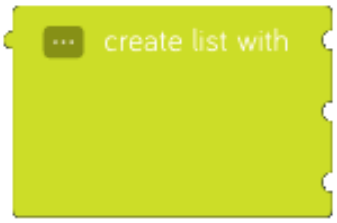
Variable

Events

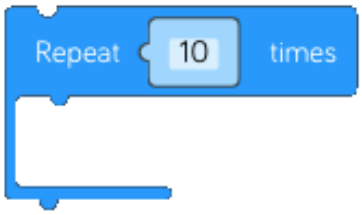


Math

Logic

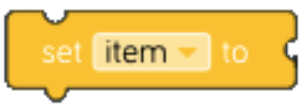


Color



Lists

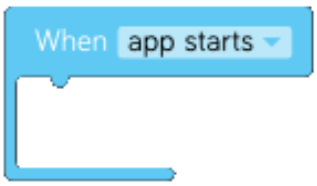
Draw

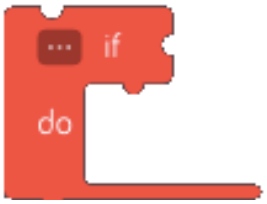


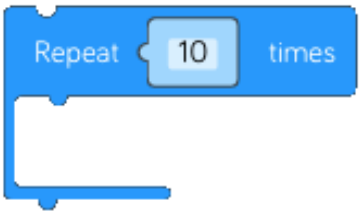
Control

Programmer Questions

Directions: Below are two examples of Kano Code blocks. In your own words, describe what each block would do in a Kano Code application. Could you also explain which tray they belong to?

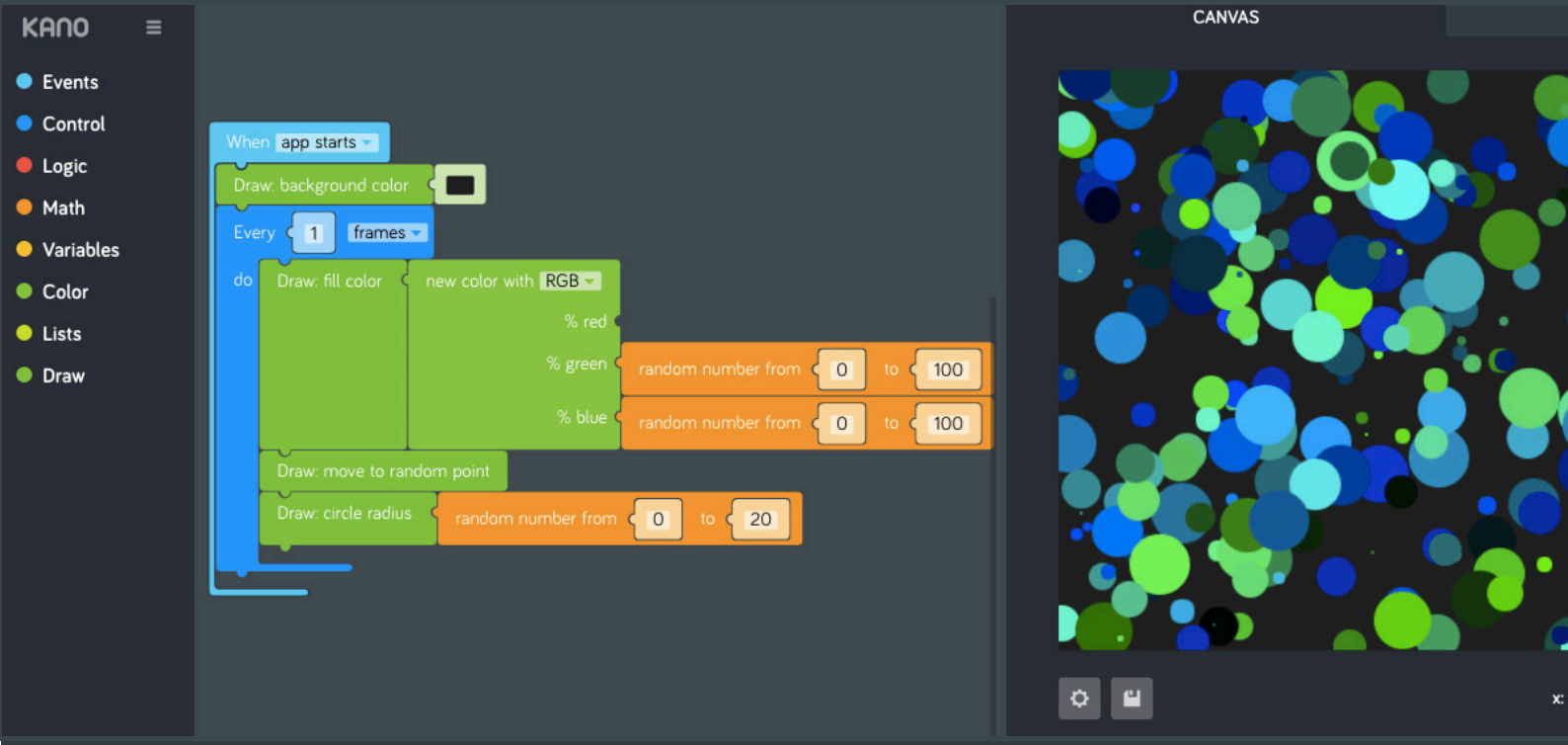






Creator Question

Directions: In Kano Code you can create interactive and animated code. What do you think you will create next time on Kano Code? Draw an image of what you want like to create below and label it with the code blocks you will use!



LESSON 9

Intro to Kano Code Pt. 2

Beginner **1 hr 30 min**

Have your creators get used to Kano Code and begin creating unique creations to share!

OBJECTIVES

- Learners will understand how to access Kano Code
- Learners will be able to identify the features of Kano Code and use them to create their own creations

STANDARDS

- **K12 CS:**
  Computing Systems. Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-AP-10, 1A-AP-11, 1A-AP-12 , 1A-AP-15
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-12, 1B-AP-16, 1B-AP-17
  6-8: 2-AP-12, 2-AP-13, 2-AP-16
  9-10: 3A-AP-18

MATERIALS NEEDED

world.kano.me

Introduction

10 mins

Linking

Do you know what remixing is? Have you ever remixed something? Turn to a partner and discuss what remixing is and give a few examples. Be prepared to share with the class!

Engage

Like music, art, and so many other things, we take old ideas and add something to them to make them cooler and better. Today we will be doing the same thing but on a digital platform. We have used Kano Code and we have seen some different activities that are there. Now, we are going to take some of those pre-made challenges and make them our own by giving them a unique flare!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

Challenge 0

30 mins

If your learners need a refresher on Kano Code and the specifics for each button help them out! If not, go ahead and jump into Challenge 1.

Challenge 1

30 mins

Explore Kano Code! Open up Kano Code and explore the projects that are available. Finish at least two of the walkthroughs to get used to it.

Challenge 2

30 mins

Are your learners ready for a challenge? Have them open up the playground and attempt the following scenarios:

Scenario 1: Open up the tab "**Building**" and open the project "**Parade.**" Complete the directions shown. Now let's remix it! Can you change the stickers that show? Can you change the placement of the sticker on the canvas?

Scenario 2: Open up the tab "**Building**" and open the project "**Sticker Randomiser.**" Complete the directions shown. Can you remix this project to make something different than cheese? Can you make the stickers change every second when the button is clicked? Can you add sound?

Challenge 3

30 mins

Create Your Own! Your learners have played with Kano Code and remixed a few of the projects to create their own unique creations. Now let's see what they can do with less guidance! Give learners two options to choose from:

Option 1: Pick another project from Kano Code and remix it to be something COMPLETELY different!

Option 2: Go into the playground and design your own project and build it from scratch!

When the learners are done, they will share their creations with the class.
Save your work and share to Kano World!

Closing

15 mins

Sharing

Use the remaining time in class to share what the learners hacked or created on their own. Remind learners to share their creations on Kano World!

Evaluation

Ask learners to find one partner and turn and talk to answer the following questions. What did everyone like about the creations? What was difficult? What is a new skill you learned that will help next time you use Kano Code?

In their engineering logs have the learners write one idea they have for next time to use Kano Code.

Extension

Have learners fill out the “Intro to Kano Code Pt 2” worksheet that can be found in the appendix.

Kano Clean-up

5 mins

Power down and put away Kanos

Kano Code Pt 2

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Name: _____ **Date:** _____

Explorer Questions

Directions: Fill out each section by reflecting on your Kano Challenge you completed today!

What were the two challenges you worked on today? What did you do in each challenge? How did you remix them?

_____

_____

_____

_____

What did you remix in the challenge “Parade”? What could you remix for next time?

_____

_____

_____

_____

What did you remix in the challenge “Sticker Randomiser”? What could you remix for next time?

_____

_____

_____

_____

Kano Code Pt 2

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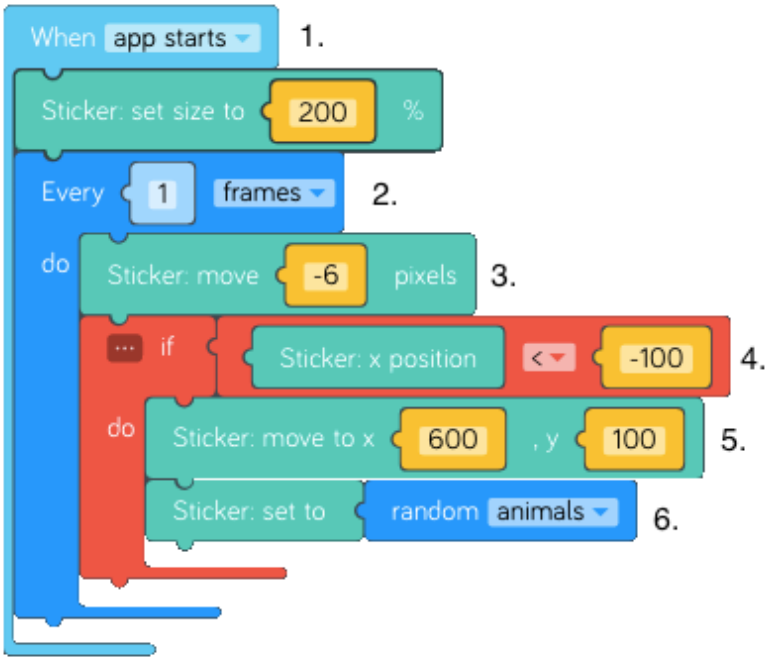
Programmer Questions

Directions: In Parade, you used different Kano Code blocks to create an animation. Can you identify what is happening in each portion of the code? In the spaces below, write down what you think is happening in each numbered block.



1. _____

2. _____

3. _____

4. _____

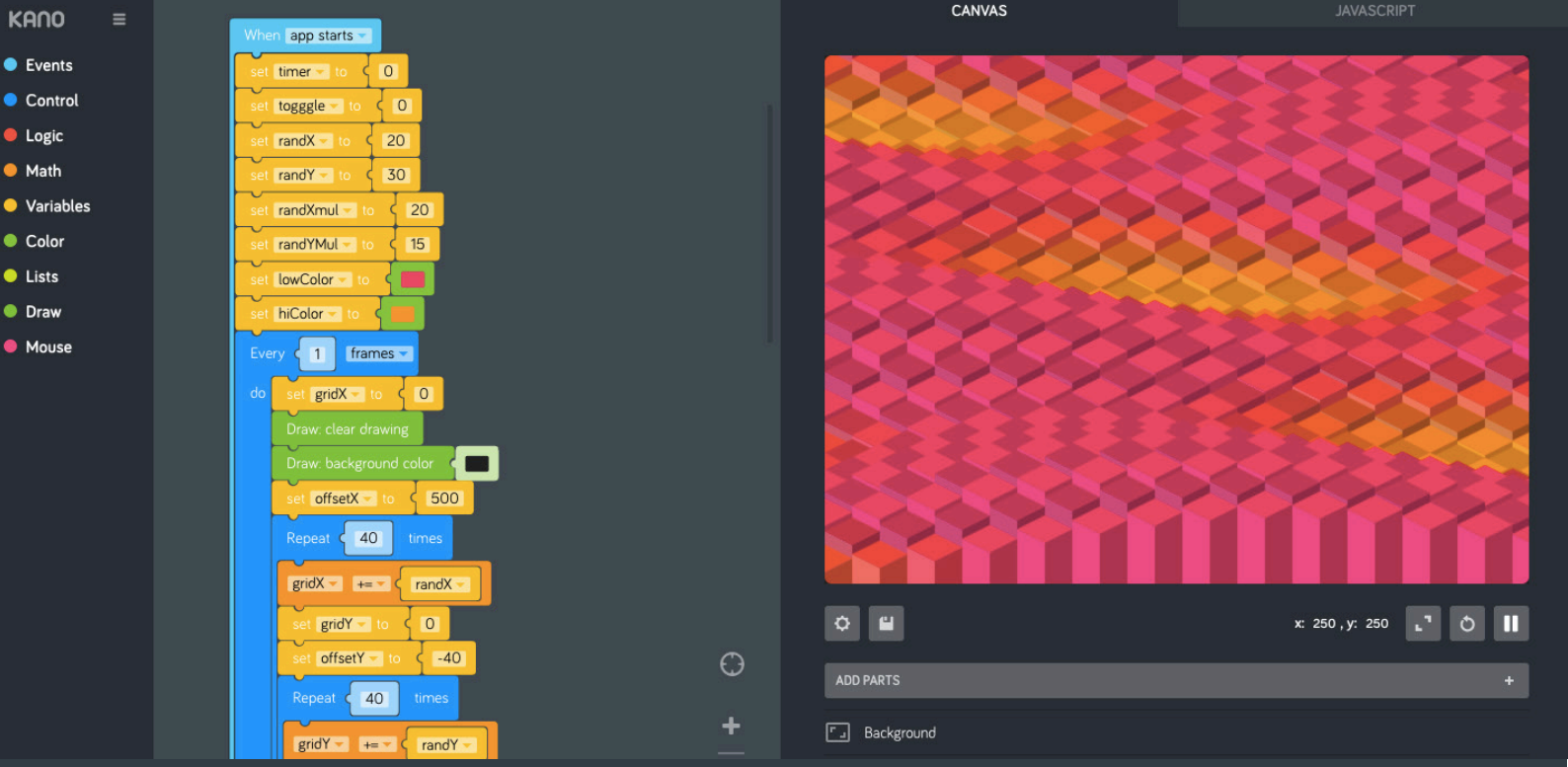
5. _____

6. _____

7. _____

Creator Question

Directions: If you had to design a new feature or block to use on Kano Code, what would it do? Below, draw what the code block would do and how Kano Code would use it!



LESSON 10

Kano Code Challenge

Beginner **1 hr 30 min**

Learners will take what they have learned from Kano Code and create a new app that must contain specific parts. The most creative app wins!

OBJECTIVES

- Learners will understand how to access Kano Code
- Learners will be able to identify the features of Kano Code and use them to create their own creations

STANDARDS

- **K12 CS:**
  Computing Systems. Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-AP-10, 1A-AP-11, 1A-AP-12 , 1A-AP-15
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-12, 1B-AP-16, 1B-AP-17
  6-8: 2-AP-12, 2-AP-13, 2-AP-16
  9-10: 3A-AP-18

MATERIALS NEEDED

world.kano.me

Introduction

10 mins

Linking

We have played a lot with Kano Code and we are basically experts now, right? Now how about a final challenge? In their engineering logs, plan out an app using Kano Code only. What would it do and how would you use it?

Engage

We all wrote down something we wanted to build in Kano Code. Now LET'S DO IT. Find a partner and decide together which project you want to make. Before you start though, I will be giving you some more challenges to make it harder. Be prepared!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In.

Exploration Activities

Challenge of the Day:

30 mins

Sit with your partner and decide which project you want to try and work on. You will have the whole class period so try to think of one you can do in that time frame.

Before you start going I will give you a few specifications that your final project MUST include. These are:

- At least one variable
- At least one control block
- At least one thing that is randomized

This means I will be looking specifically for these three types of blocks!

If you need help with anything see if you and your partner can figure it out. If you can't then see if someone at another group can help you. If you all can't then raise your hand and I'll come by!

When learners are done, they will share their creations with the class.

Save your work and share to Kano World!

Closing

15 mins

Sharing

Use the remaining time in class to share what the learners remixed or created on their own. Remind learners to share their creations on Kano World!

Evaluation

Ask learners to find one partner and turn and talk to answer the following questions. What did everyone like about the creations? What was difficult? What is a new skill you learned that will help next time you use Kano Code.

In their engineering logs, have the learners write one idea they have for next time to use Kano Code

Extension

Have learners fill out the “Kano Code Challenge.” worksheet that can be found in the appendix.

Kano Clean-up

5 mins

Power down and put away Kanos

Kano Code Challenge

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Name: _____ **Date:** _____

Explorer Questions

Directions: For this Kano Code Challenge you had to be creative and create your own program! Below, draw a picture and write at least five sentences explaining what your program did in Kano Code.

Programmer Questions

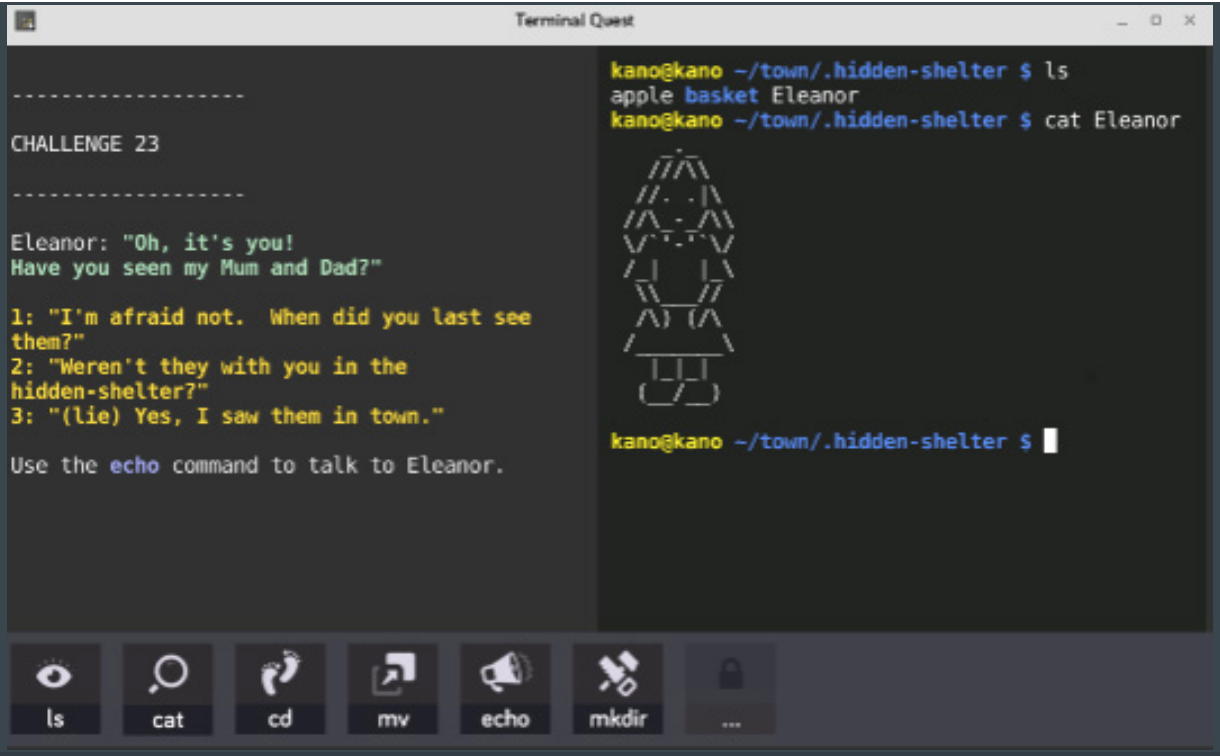
Directions: In the Kano Code Challenge you had to use the following blocks:

- At least one variable
- At least one control block
- At least one thing that is randomized

In the space below, can you explain in your own words how you used each block and what that block did when used.

Creator Question

Directions: Part of coding is thinking about ways to improve your projects. Below, draw a design on how you could improve your Kano Code Challenge for next time! Label the drawing explaining how you would improve it.



LESSON 11

Intro to Terminal Quest

Beginner 1 hr 30 min

Learners will understand how file directories work and get introduced to Terminal Quest and terminal commands.

OBJECTIVES

- Learners will understand what a terminal window is
- Learners will understand that before the GUI, developers used terminal to complete commands, even play video games!
- Learners will understand that we use terminal commands to navigate in terminal like we would in a GUI (graphics user interface)
- Learners will be introduced to Terminal Quest and understand how to complete challenges in the app

STANDARDS

- **K12 CS:**
  Computing Systems. Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-AP-10, 1A-AP-11, 1A-AP-12 , 1A-AP-15
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-12, 1B-AP-16, 1B-AP-17
  6-8: 2-AP-12, 2-AP-13, 2-AP-16
  9-10: 3A-AP-18

Introduction

20 mins

Linking

Pass out the Terminal Neighbourhood worksheet. Explain to learners that on the worksheet is an image of a neighbourhood with three houses. We are looking for a few missing items in the neighbourhood and we need to find them! We are looking for the:

Red, Blue, Yellow, Orange, and Green circles

Can they identify what part of the neighbourhood, house, and room the items are located?

For example: The red ball is located in Middle Neighbourhood/Room1/RedCircle

Once the learners have found all the items, how can they get to the items? What directions would they need to give to find the items?

Engage

Files and items we use every day to create, build, and play with on our computers and Kanos have a specific location. The process of files living in specific locations is known as file directories. Each item (file) lives in a specific directory. We can modify, create, and even delete files whenever we want (as long as they don't prevent our computers from running!).

Back in the olden days of programming, if you wanted to play games and create files you would do it in a small black box known as terminal. There you would use commands to move around the directories, sort of like you were doing when you were looking for the colored circles.

Over time, we have developed many easier systems and interfaces to use computers. We don't use commands, rather, we use folder icons to manage our files. The interface we see when we move files around is known as a GUI (Graphic User Interface). Instead of lines of text, we use graphics or images!

However, as programmers and innovators, we still use terminal and terminal commands to run programs and develop code. GUIs are fine, but terminal is where it all started!

Today, we will be learning more about how when we click on images and move pictured items around our Kanos we are actually doing the same thing as a line of text command in terminal!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

Challenge 1: What is the GUI?

10 mins

If I said open a picture that was called “Surprise” that was in the folder called “Images” how would you open it? Get a few responses from learners. Final answer should be double click on the folder called “Images” then select the file called “Surprise.”

When we move our mouse around on the Kano and click on images we are interacting with the GUI (Graphic User Interface) of the computer. This is the easier way of modifying and creating files on our computers!

What else can you double click on the computer? Write down in your engineering logs at least five things you can double click on the computer! Give learners 2 minutes to write down thoughts and 3 minutes to share their responses. Answers can include (files, programs like Microsoft, Google Chrome, Internet Explorer, Minecraft)

Every time we click on something on the Kano, we are interacting with the GUI! Pretty cool right? But why is it happening? What is going on behind the images?

Challenge 2: What is Terminal?

10 mins

Before we had the GUI, we had terminal. The terminal window is a black box of endless possibilities. Before computers had easy to use graphics we could click on, we used text commands in terminal to do everything!

Check out this **video** of a terminal window in action!

As we can see from the video, with terminal we could do all the same things we do now! In our example where we said to open the file called “Surprise” in the folder “Images” we could have used terminal commands like the ones below to open it:

Cd images/
images/surprise

The commands do the same thing as clicking!

Challenge 3: What is Terminal Quest?

30 mins

Now that we know what the GUI is and terminal, let's start learning terminal commands! We want to open the application called Terminal Quest. This Kano app helps you learn what terminal commands are through a mystery story. While we are reading the story on the Kano we will learn new powers. We want to record these new powers as we learn them in our engineering logs so we can look back over them and remember them!

See how far you can get through Terminal Quest! Can you solve the mystery?
Save your work and share to Kano World!

Closing

5 mins

Sharing

Use the remaining time in class to share what the learners hacked or created on their own.

Extension

Have learners fill out the "Intro to Terminal Quest" worksheet that can be found in the appendix!

Kano Clean-up

5 mins

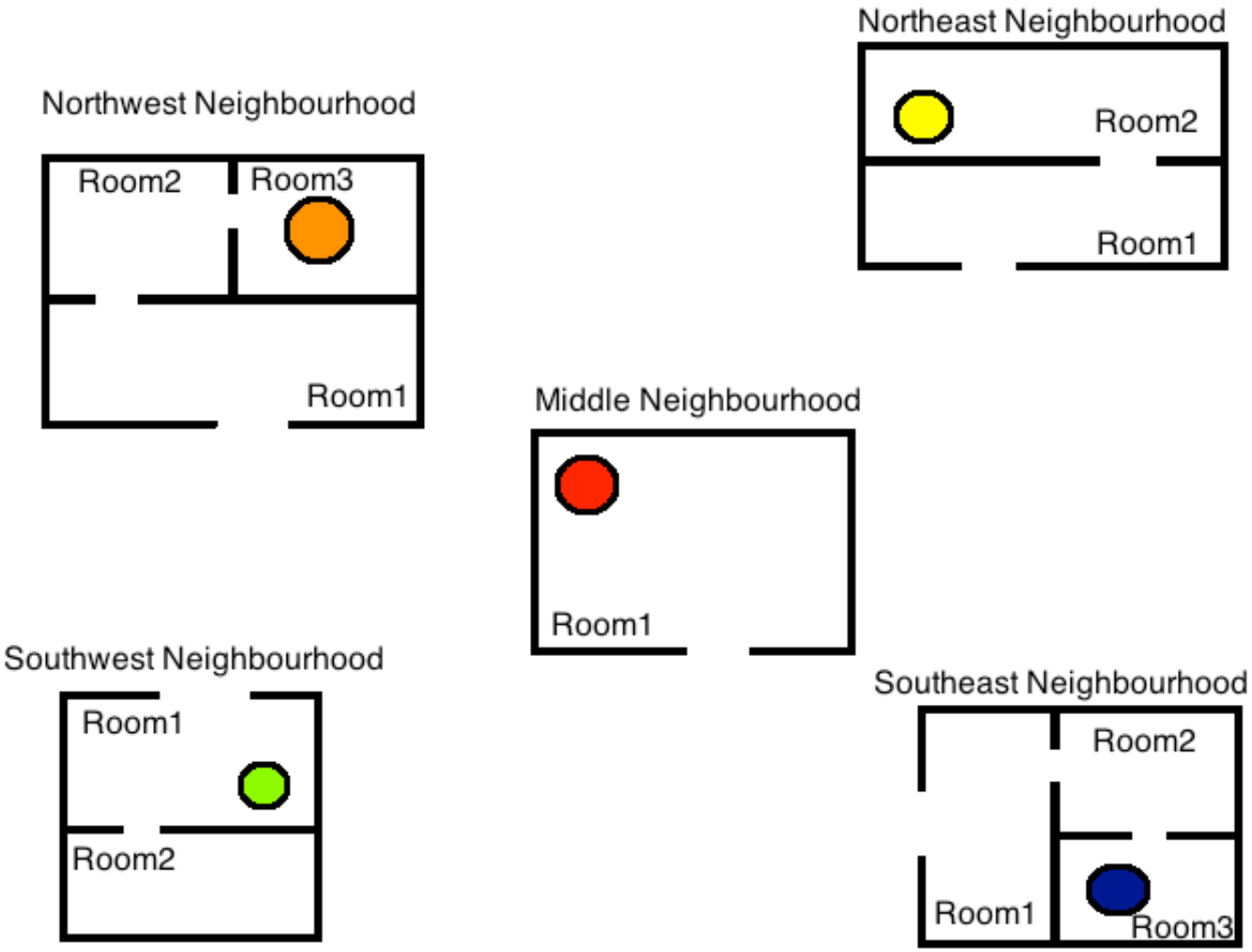
Power down and put away Kanos.

Terminal Quest Map

anyone can make™

Name: _____ **Date:** _____

Directions: Below is an image of a neighbourhood with a few items around. Can you help give detailed location information on where the colored circles live? Below is an example.



1. **Where is the red circle?** Middle Neighbourhood/Room1/Red Circle

2. **Where is the green circle?**

3. **Where is the blue circle?**

4. **Where is the orange circle?**

5. **Where is the yellow circle?**

Intro to Terminal Quest

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Name: _____ **Date:** _____

Explorer Questions

Directions: In Terminal Quest, you are learning about terminal commands through a story! Do you remember what each command means? Fill out the chart below with the new information you learned! It is okay if you haven't discovered all the commands just yet! Leave the box as "unknown."

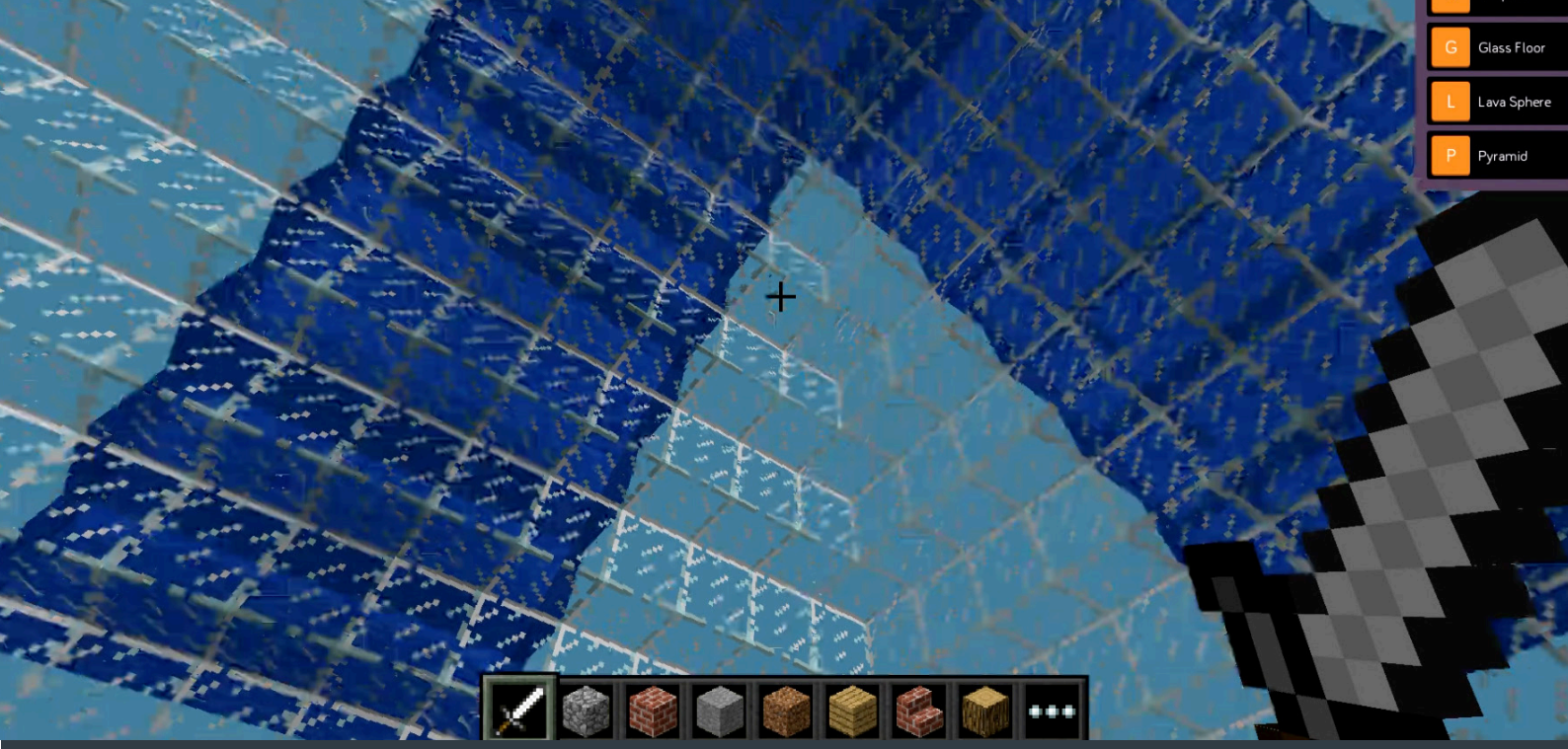
Terminal Command	What Will the Command Do?
ls	
cat	
cd	
-a	
mv	
echo	
mkdir	
nano	

Programmer Question

Directions: In Terminal Quest, you learned the command “ls” and “cat.” In your own words, explain what each command does when used.

Creator Question

Directions: Terminal Quest is a story that hasn’t been finished yet! If you had to predict what would happen, how do you think the story should end? Share your thoughts below!



LESSON 12

Intro to Hack Minecraft

Beginner **1 hr 10 min**

Get introduced to the controls, tools, and workspace to create virtual worlds!

OBJECTIVES

- Learners will be able to identify the controls in Minecraft and create simple creations

STANDARDS

- **K12 CS:**
  Computing Systems. Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-AP-10, 1A-AP-11, 1A-AP-12 , 1A-AP-15
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-12, 1B-AP-16, 1B-AP-17
  6-8: 2-AP-12, 2-AP-13, 2-AP-16
  9-10: 3A-AP-18

Introduction

10 mins

Warm up

Split learners up into pairs and ask them, “If you could live anywhere in the world where would it be? What would it be like? What would the weather be like?” Have learners turn and talk to each other for to discuss. After the time is up have learners share out where they would want to live and what it is like.

Today we are going to learn how to use Minecraft. Minecraft is like a giant sandbox. Like in a sandbox, in Minecraft you can create anything from castles to mermaids. Minecraft is a virtual world where you can use different materials to create landscapes, buildings, and communities.

Your imagination is limitless!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

35 mins

Challenge 1:

Before we start using Minecraft we need to learn about keyboard controls and navigating in Minecraft. As each key is explained, try it out on your Kano!

- w = forward
- s = backward
- a = left
- d = right
- e = inventory. Materials to build with
- numbers 1 - 0 are for choosing different materials
- Move mouse = turn around
- left click mouse = build (or destroy)
- Space bar = jump (repeated tapping will raise you into the air. Quick double tap will take you back down)

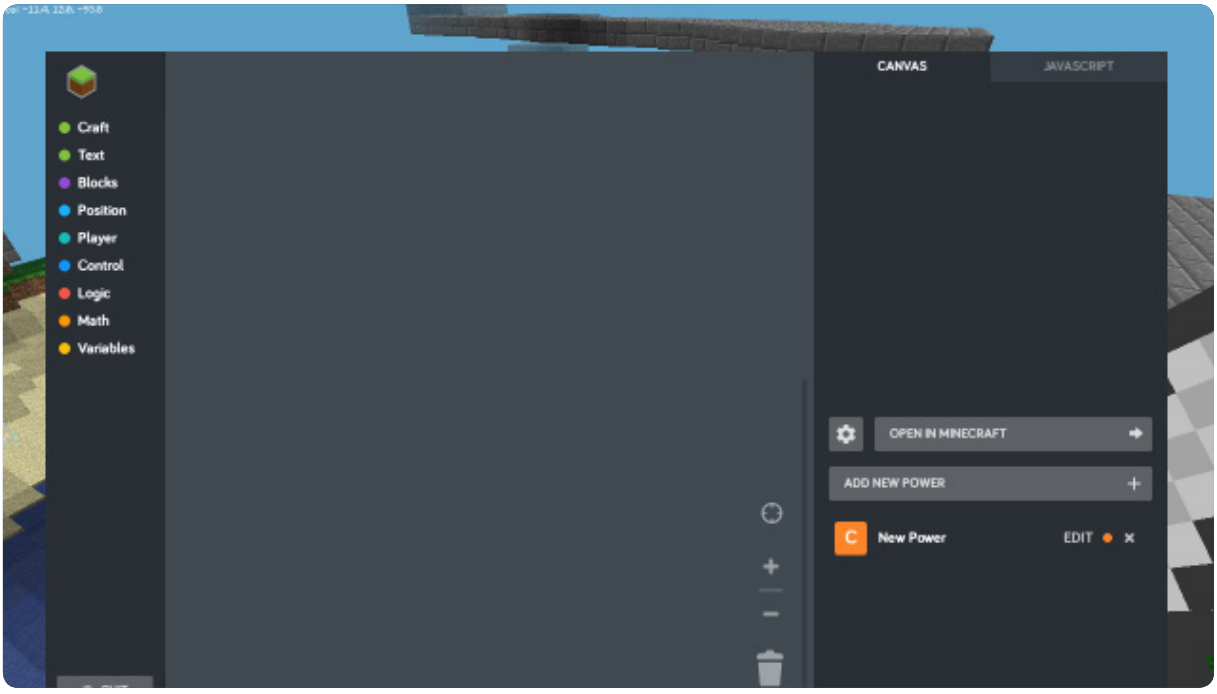
Let's walkthrough accessing a virtual world in Minecraft. First, access Minecraft through the dashboard. Then:

- Click on "**Start**"
- Click on "**Your Origin Story**" it will bring you to a page to select your own challenges)
- The first challenge is called **"T is for Tower."** Click on the challenge

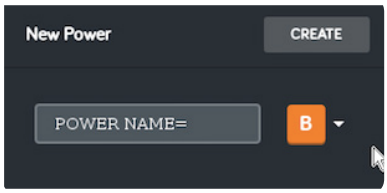
Take a bit of time to explore the environment around you, trying out the new controls you learned!

Challenge 2:

The workspace, tools, making floors.
Minecraft is pretty cool, but how do we get to the fun part of making things? In order to create things, we use the "**tab**" button. Click the "tab" button, and we should see the workspace and tools on the right-hand side:



In Hack Minecraft, you can code a key to create objects immediately. For example, I can code the letter “Q” to create a diamond floor when clicked.



- **Craft**
  When we click here, we can see blocks that allow us to create. We can create individual blocks, groups, floors, pyramids, even doors!
- **Text**
  Maybe you want to add some text to your screen. A set of instructions or action words!
- **Blocks**
  Maybe you want to be able to select a block or have a random block appear.
- **Position**
  You can use these blocks to designate the position (x, y, and z) of your blocks.
- **Player**
  You can also change the position of your player!
- **Control**
  Maybe you want to repeat the same code block sequence. Use control blocks to create loops.
- **Logic**
  Logic statements are “if this happens, do this” or maybe you are comparing something to make a new creation.
- **Math**
  Sometimes we need to use math operations in our code!
- **Variables**
  Variables are things we create that will hold specific information we want. It can be an item or it can a list of items. It can even be a sentence or word we type out!

Variables are things we create that will hold specific information we want. It can be an item or it can a list of items. It can even be a sentence or word we type out!

In the “T is for Tower” challenge, it asks you to change the glass to TNT. Can you go back into the code space and make 5 TNT towers appear at once? What about 10? 20? 100!?

Challenge 3:

Before we move on to the challenges in Hack Minecraft, let’s try creating things JUST with code. To do this we will stay in the “T is for Tower” challenge and modify the code blocks.

- Press “**tab**” to enter back into the workspace if not already there.
- Click on “**Change Key**” and pick a key to start the code
- Click on “**Craft**” and drag the “**Set Floor**” block
  - ◊ Note: This will create a floor and will go one block under the player, you can also select
- Click on the single number block and enter “**3**”
  - ◊ This means you will create a 3 x 3 square for a floor
- Click on “**Type**” and select “**flowers**”

Your block should look like this:

Click tab to go back into the Minecraft world. Once there, click the letter key you selected to see the floor of flowers appear!

Can you go back into the code space and change the floor size? What about the type of block the floor is made from?

- Have learners click the letter key assigned to creating the flower bed.
- Ask learners: What do you currently see?
- Now walk for a little and then press the same letter key again. Ask learners again: What do you see?
- Look for the first flower bed. Ask learners: Is it still there? What does this mean?
    - ◊ There is a correlation between the position of the user to the things you make and that whatever is on the workspace will be made if you click on the letter key.
- If time ask learners to find some more space and to change the "type" of block for water, grass, or ice. Make some more floors.

Congratulate your learners! You just wrote code to hack Minecraft!!

Challenge 4:

Using blocks and positions

- Now let's learn some new buttons.
- The small gear on the top right corner can clear the workspace of code blocks which will ensure previous code is not replicated. Press "**reset**".
- Now, let's place a few blocks of grass. We can go into "**Craf"**" and select the "**Set**" "**Blocks**" block that has position and size.
- For this we will want to change the numbers for position and size. Change the numbers to be something between 0 and 5
    - ◊ If you leave the position at 0,0,0, when you create your blocks you will be inside them and it will be dark!
    - ◊ If you leave the size at 0,0,0: it will only be 1 block! We want to create larger structures.
- Change the "**Type**" block to "**Grass"**

Your block should look something like this:

Challenge 5:

Try out some of the challenges in "**Your Origin Story.**" Remember to remix the code afterward to make the projects your own!

Closing

15 mins

Sharing

In their engineering logs have learners write down what they have learned. What were some of the key phrases or words we learned ('blocks, numbers, setters, getters, type, length, width, orientation, etc.')? What did you like? What did you not like? What was hard? What was easy?

Call learners up to the board and have them draw something they want to create next time!

Extension

Have learners fill out the "Intro to Hack Minecraft" worksheet that can be found in the appendix.

Kano Clean-up

5 mins

Power down and put away Kanos.

Intro to Hack Minecraft

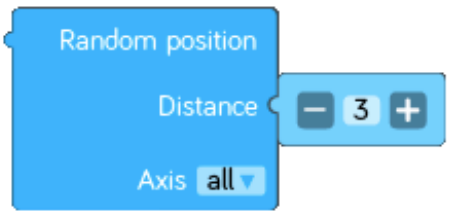
anyone can make™

Name: _____ Date: _____

Explorer Questions

Directions: Match the Hack Minecraft block with the category it would live under in Hack Minecraft! Some categories may be used more than once or not at all!

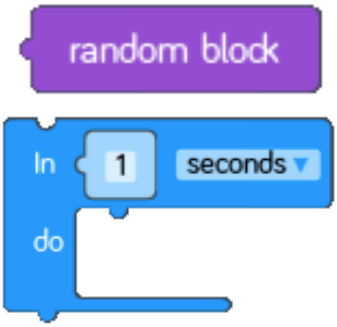
Craft



Blocks

Text

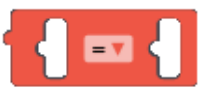
Position



Player

Control

Logic



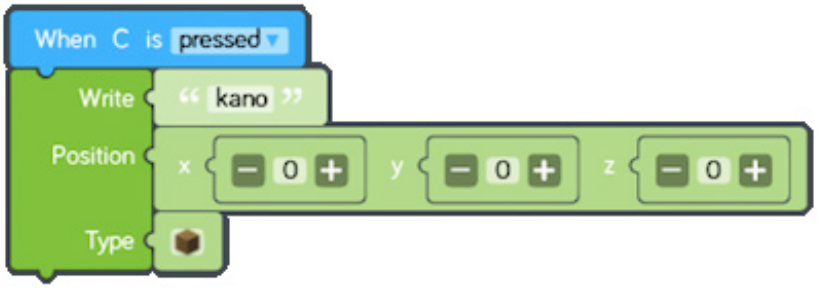
Math

Variables

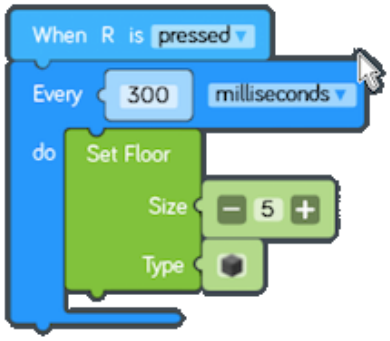
Programmer Question

Directions: Below are some examples of Hack Minecraft blocks. In your own words, describe what is happening in each image with regards to Hack Minecraft.

1.



2.



3.

Programmer Question

Directions: There are a lot of cool things you can create in Minecraft! Below, draw what you would like to build next time on Hack Minecraft and label the drawing explaining what code blocks you would use!

LESSON 13

Terraform with Minecraft

Beginner **1 hr 15 min**

Learners will build a landform they've learned about in class using code in Make Minecraft.

OBJECTIVES

- Learners will understand features of a landform, biome, or place (examples from schools: Terra del Fuego; Mt St. Helens; tundra).
- Learners will be able to create a plan for constructing a landscape and use digital tools, like Kano Code and Minecraft, to build according to the plan

STANDARDS

- **K12 CS:**
  Computing Systems. Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-AP-10, 1A-AP-11, 1A-AP-12 , 1A-AP-15
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-12, 1B-AP-16, 1B-AP-17
  6-8: 2-AP-12, 2-AP-13, 2-AP-16
  9-10: 3A-AP-18

Introduction

10 mins

Starter

Teacher to ask learners to get into pairs or groups and discuss:

- A historic or popular place they have been - why do many people go to this place?
- An unusual place they have heard about or seen on TV - what was unusual about this place?

Teacher to introduce the idea that computers can be programmed to create virtual and visual worlds - and with the ability to code, they will have the power to create virtual worlds!

Content refresher: Teacher to review an important landform or biome the class has learned about this year–examples include mountain ranges, lakes, beaches, or glaciers.

Ask learners: If you had to build or draw this landform, how would you do it?

Today, learners form a code team and use Minecraft to create a virtual environment!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

35 mins

Challenge 1 (Optional):

If paper and pencil are available, learners to spend 15 minutes drawing their planned landscape first with the Sample Worksheet Template.

Challenge 2:

In pairs, learners choose an aspect of their landscape and reflect at least three structures from that landscape in their Minecraft world.

Challenge 3:

In at least one case, learners describe another method for building their structure. For example, with Tierra del Fuego or another mountain-like structure, they can use:

- Smaller squares on bigger squares, OR
- Building in slices using large rectangles and/or using the air blocks or their sword to delete blocks
- Other methods...

Challenge 4:

Create at least one structure using Hack Minecraft blocks from the playground.

Save your work and share to Kano World!

Closing

15 mins

Sharing

Choose groups to describe their formations to the class. Groups to outline how they completed each challenge:

- What were the three formations?
- What is one structure that they could have created another way?
- How did they use the Kano Blocks? Why was using code better or worse?

Tell learners to fill out their daily engineering logs!

Optional: Hand in plan

Extension

Have learners fill out the “Terraform Minecraft” worksheet that can be found in the appendix

Kano Clean-up

5 mins

Power down and put away Kanos

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Terraform

Name: _____ Date: _____

Explorer Questions
Directions: What did your world look like? Draw it below. Make sure to label everything!

Reflection Questions:

What were the three formations?

What is one structure that you could have created another way?

How did you use the Kano Blocks? Why was using code better or worse?

Programmer Questions

Directions: If you wanted to create a mountain in 1 key, what coding blocks would you use and why? You can write out the name of the blocks or draw them below!

Creator Question:

In the space below draw the next Minecraft structure you want to terraform. Also, label how you will code each section of the structure. What type of blocks would you use to create it?

LESSON 14

Minecraft Challenge!

Beginner **1 hr 30 min**

Learners will take what they have learned from Hack Minecraft and create a new world that must contain specific parts. The most creative world wins!

OBJECTIVES

- Learners will understand how to access Hack Minecraft
- Learners will be able to identify the features of Hack Minecraft and use them to create their own creations

STANDARDS

- **K12 CS:**
  Computing Systems. Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-AP-10, 1A-AP-11, 1A-AP-12 , 1A-AP-15
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-12, 1B-AP-16, 1B-AP-17
  6-8: 2-AP-12, 2-AP-13, 2-AP-16
  9-10: 3A-AP-18

Introduction

10 mins

Linking

We have played a lot with Hack Minecraft and we are basically experts now right? Now how about a final challenge? In your engineering logs plan out a unique world in Hack Minecraft. What would it look like and who would live there?

Engage

We all wrote down something we wanted to create in Hack Minecraft. Now LET'S DO IT. Find a partner and decide together which world you want to make. Before you start though, I will be giving you some more challenges to make it harder. Be prepared!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

Challenge of the Day:

30 mins

Sit with your partner and decide which world you want to try and work on. You will have the whole class period so try to think of one you can do in that time frame.

Before you start going I will give you a few specifications that your final project MUST include. These are:

- At least one variable
- At least one control block
- At least one thing that is randomized

This means I will be looking specifically for these three types of blocks!

If you need help with anything see if you and your partner can figure it out. If you can't then see if someone at another group can help you. If you all can't then raise your hand and I'll come by!

When learners are done, they will share their creations with the class.

Closing

15 mins

Sharing

Use the remaining time in class to share what the learners hacked or created on their own. Remind learners to share their creations on Kano World!

Evaluation

Ask learners to find one partner and turn and talk to answer the following questions. What did everyone like about the creations? What was difficult? What is a new skill you learned that will help next time you use Hack Minecraft. Have learners record their answers in their engineering logs.

On a post-it note that the educator passes out, have the learners write one idea they have for next time to use Hack Minecraft

Extension

Have learners fill out the “Minecraft Challenge” worksheet that can be found in the appendix.

Kano Clean-up

5 mins

Power down and put away Kanos

Hack Minecraft Challenge

anyone can make™

Name: _____ **Date:** _____

Explorer Questions

Directions: For this Hack Minecraft Challenge, you had to be creative and create your own program. Below, draw a picture and write at least five sentences explaining what your program did in Hack Minecraft..

Programmer Questions

Directions: In the Hack Minecraft Challenge you had to use the following blocks:

- At least one variable
- At least one control block
- At least one one thing that is randomized

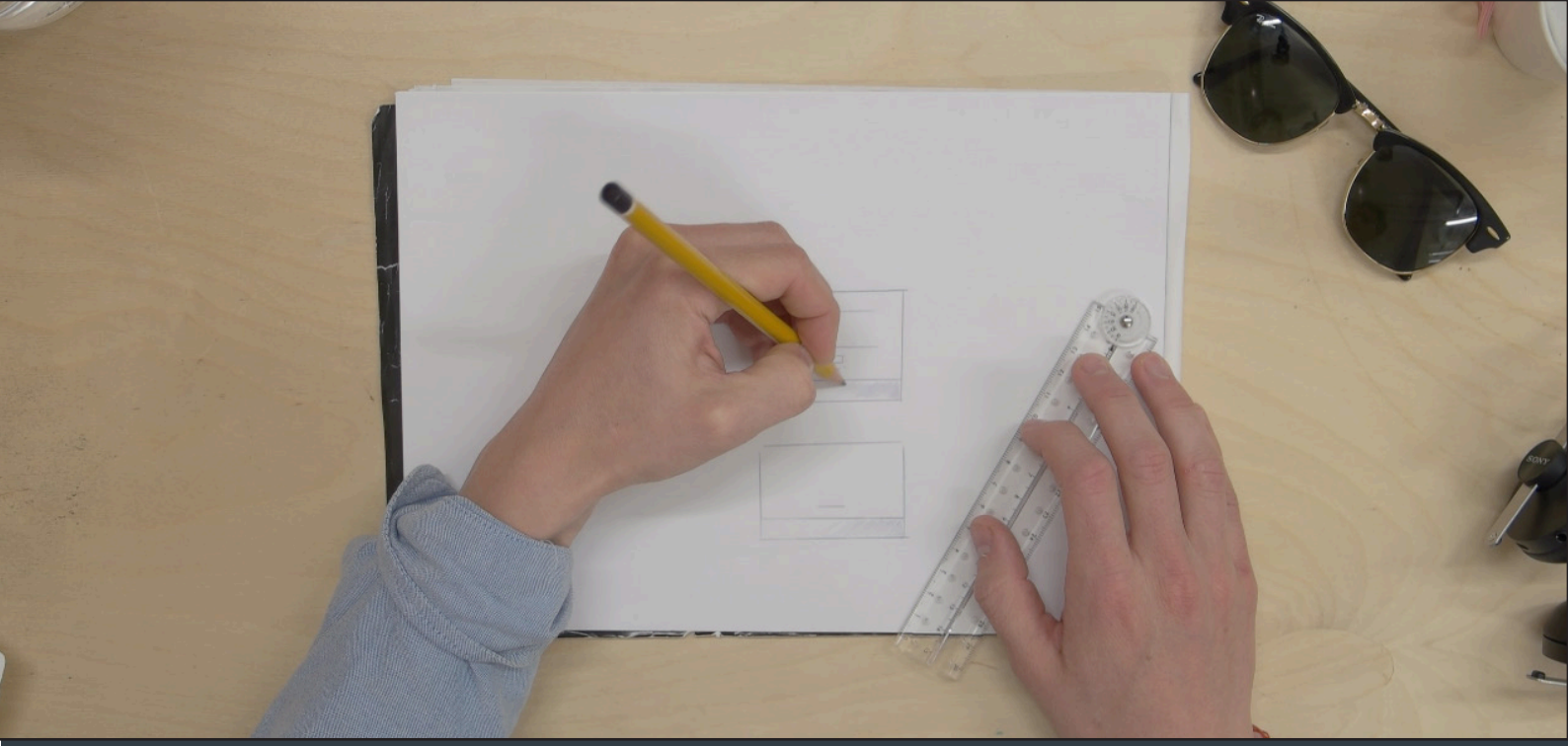
In the space below, can you explain in your own words how you used each block and what that block did when used.

Hack Minecraft Challenge

anyone can make™

Creator Question

Directions: Part of coding is thinking about ways to improve your projects. Below, draw a design on how you could improve your Hack Minecraft Challenge for next time! Label the drawing explaining how you would improve it.



LESSON 15

Design Thinking

Intermediate **2hrs** (Can split into multiple sessions)

In this lesson you will use the popular Design Thinking framework to design your own product and give important feedback to Kano!

OBJECTIVES

- Learners can identify the steps in Design Thinking.
- Learners understand what it means to give constructive feedback and how that applies to design thinking.

STANDARDS

NGSS:

3-5-ETS1-1 D 3-5-ETS1-2 MS-ETS1-1 D MS-ETS1-2

CSTA:

K-2: 1A-AP-15
3-5: 1B-AP-13, 1B-IC-20
6-8: 2-AP-16, 2-AP-17
9-12: 3A-AP-13

Introduction

15 mins

What is your favorite toy or game? Gather a list from the learners and write it on a board. Everything you named was thought out before it was made. For example, when we decide which way to walk to a store, or when we think about writing an essay, we think about it before making a decision.

Today, we are going to talk about Design Thinking. Walkthrough each of the steps and ask learners for examples of things they've tested or been part of testing.

Empathize

Work to fully understand the experience of the user for whom you are designing. Do this through observation, interaction and immersing yourself in their experiences.

Define

Process and synthesize the findings from your empathy work in order to form a user point of view that you will address with your design.

Ideate

Explore a wide variety of possible solutions through generating a large quantity of diverse possible solutions, allowing you to step beyond the obvious and explore a range of ideas.

Prototype

Transform your ideas into a physical form so that you can experience and interact with them and, in the process, learn and develop more empathy.

Test

Try out high-resolution products and use observations and feedback to refine prototypes, learn more about the user and refine your original point of view.

Explain what Kickstarter is and why it's a good way to validate an idea - the public gives you a response on whether they are interested in your idea and puts down money to support it. It also helps early companies to get a product out and test with people instead of creating in a room and launching without user feedback. You can even show some Kickstarter projects on the projector.
Explain that Kano was a Kickstarter that raised over 1.5m USD on the platform. Kano continues

to grow with feedback from learners and teachers around the world. Today, you will give Kano feedback. You can use this presentation!

Collect Kanos 5 mins

Retrieve Computers, Turn On, Log In

Other resources:

Paper, pencil, crayons (optional)

Exploration Activities

Challenge 1: 30 mins

Break into groups of four and each group chooses one Kano app:

- Make Art
- Make Minecraft
- Terminal Quest
- Make Snake

Answer the questions (in writing to share with Kano):

- What is your favorite part of the app?
- What is challenging about the app?
- What would you improve about the app?

Class to discuss some of the feedback.

Challenge 2: 20 mins

You have just used Design Thinking to give Kano feedback on one of the apps already on it. Now what if you can give a recommendation for a new app? Taking the feedback you heard from the class, use Design Thinking to create your own app.

- What problem are you looking to solve with the app?
- What is the app and its purpose? Who would want to use it? In your groups, use pen and paper to write out your thoughts.

Challenge 3:

30 mins

Break learners into groups and have them think of a few brands and their logos.
What do you like about those brands? What about their logos?
What don't you like about the brands or logos?
What does a logo express about a brand?

Discuss as a class.

Then, open up Kano kits and launch Make Art.
Logo frenzy!

Choose two Logos from world.kano.me [**Example 1, Example2**]and recreate them in Make Art - add your own creative flair to these logs.

Challenge 4:

30 mins

Create your logo for the app you designed in Challenge 2!
First, sketch out the logo on paper & pencil (if available).

Then code in Make Art!
Save your work and share to Kano World!

Closing

15 mins

Sharing

Groups share their apps and logos. The class can vote on their favorite! Remind learners to fill out their engineering logs!

Extension

Have learners fill out the "Design Thinking" worksheet that can be found in the appendix.

Kano Clean-up

5 mins

Power down and put away Kanos

LESSON 16

Building a Better World

Beginner **1 hr 30 mins** (Recommended over 2 days)

Learners critically evaluate their world and surroundings and use Make Art and Make Minecraft to picture a more ideal world.

OBJECTIVES

- Learners to get introduced to product development and a popular framework, Design Thinking.
- Learners to get exposure to Kickstarter and the idea of raising money to start a business.
- Learners to understand the importance of getting and giving feedback when designing a product.

STANDARDS

- **NGSS:**
  3-5-ETS1-1 D 3-5-ETS1-2 MS-ETS1-1 D MS-ETS1-2
- **CSTA:**
  K-2: 1A-AP-15
  3-5: 1B-AP-13, 1B-IC-20
  6-8: 2-AP-16, 2-AP-17, - 2-AP-17
  9-12: 3A-AP-13

MATERIALS NEEDED

Design Thinking Lesson

Introduction

10 mins

Linking

If you could change one thing about your community what would it be? Do you want access to more parks and bike lanes? Do you want a heavy metal concert to happen every Friday? Take a few minutes to write or draw your thoughts out.

Once learners are done, have a few people share out their thoughts on what they would like to add to their community space.

Engage

For the next few days, we want to think of ourselves as engineers, policy Learners, and activists. There are a lot of problems in our community, but that means that there are a lot of creative solutions to these problems!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

45 mins

Challenge 1: What is Design Thinking?

If your learners have forgotten, review what Design Thinking is. Make a note that we will be using this thought process to think of ways we can improve our communities.

Challenge 2: Community Problems + Solutions

So what does Design Thinking have to do with anything? Well, today we are all going to receive a challenge. Before we do this, break into groups of four.
You are a team tasked with identifying a problem in your community and propose an innovative solution to solve that problem.

In groups of four, you will need to:

- Identify the problem in your community
- Use design thinking to define your problem
- Use Kano to prototype and test a solution
- Pitch your proposal to the class

Be creative! You can choose any app (Minecraft, Make Art, Make Music) to express your ideas.

Learners work on defining their problem and coming up with ideas for their test and prototype. They come up with a plan to use Kano to express their ideas.

Save your work and share to Kano World!

Closing

20 mins

Sharing

Learners will share their ideas (as they are now) with the class. Ask learners to state what the problem identified was, why it was important to them, and then their creative idea.

Evaluation

Before learners leave have them write in their engineering logs what was difficult about this challenge. Also, have them answer how they overcame this difficulty.

As a homework extension, have learners finish their proposed solutions to the challenge. They can also spend the next day in class finalizing their work

Extension

Have learners fill out the “Design Thinking” worksheet, if they haven’t already, that can be found in the appendix.

Kano Clean-up

5 mins

Power down and put away the Kanos

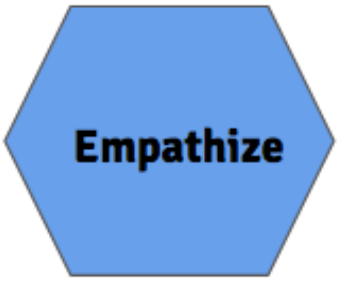
Design Thinking

anyone can make™

Name: _____ Date: _____

Explorer Questions

Directions: Fill out each section by reflecting on your Design Challenge Project!

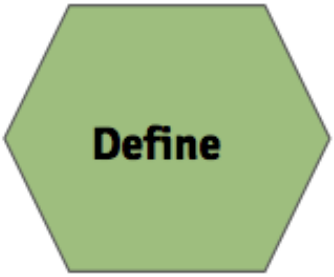


Watch and Listen: What population will you work with?

_____

_____

_____

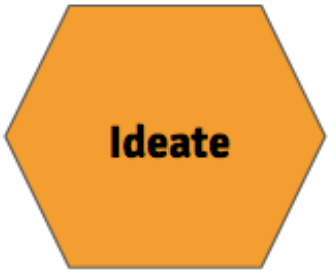


What is your idea/vision based upon the population and the problem you will work with?

_____

_____

_____

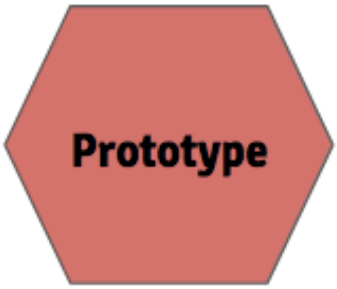


What ideas did you brainstorm?

_____

_____

_____

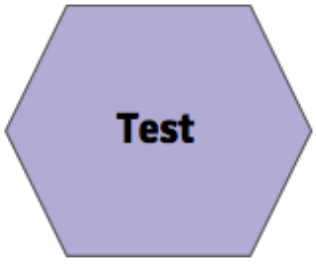


Provide a brief explanation of your prototype.

_____

_____

_____



How will you test your prototype?

_____

_____

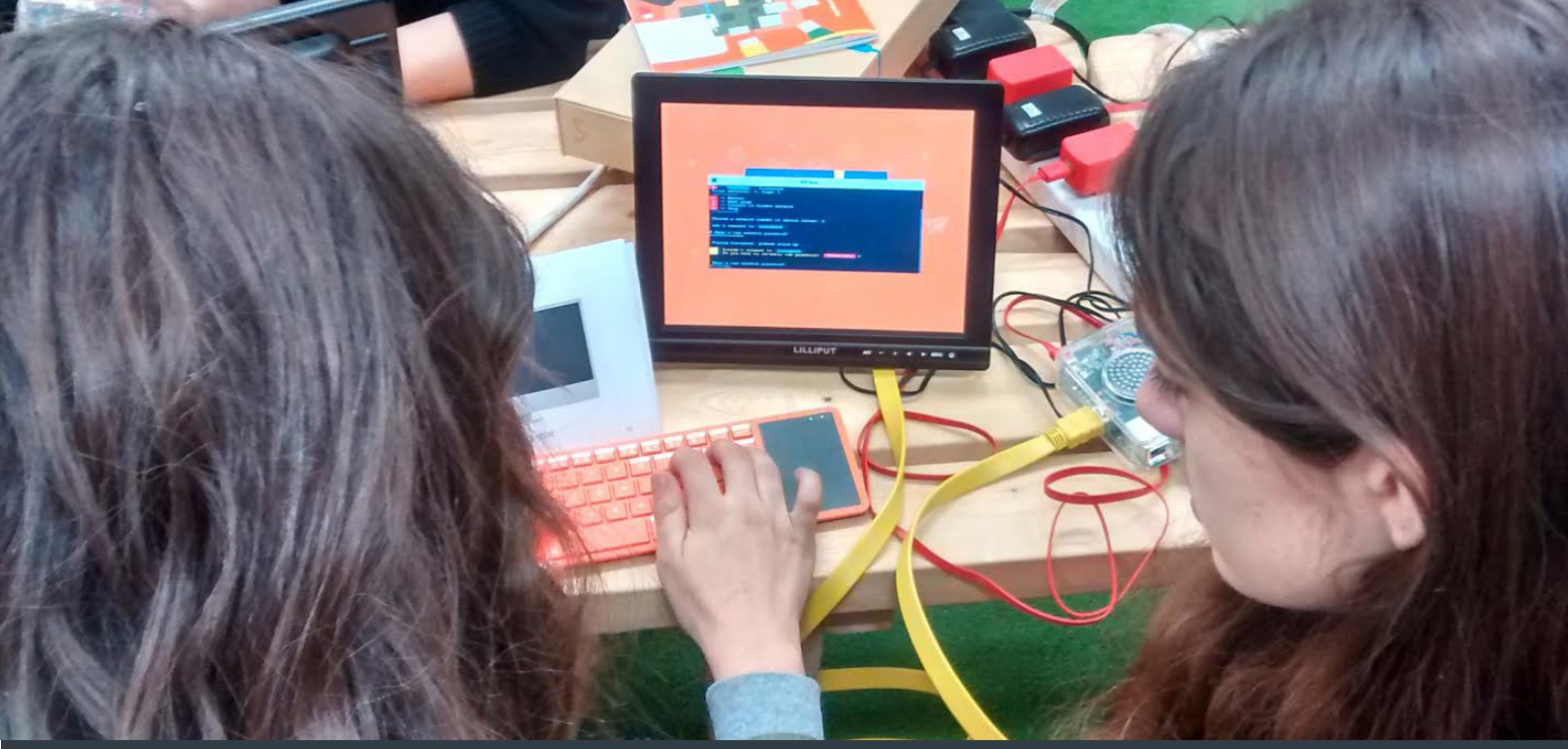
_____

Programmer Question

Directions: When you created your prototype you had to code a portion of the project on Kano. What did you code? Why did you use that coding environment? What were the limitations of that coding environment for your project?

Creator Question

Directions: Part of coding is thinking about ways to improve your projects. Below, draw a design on how you could improve your Design Thinking Project for next time! Label the drawing explaining how you would improve it.



LESSON 17

Celebrate Creation!

Beginner 1 hr 30 mins

Learners will show off the work they have completed and flex their new coding skills!

OBJECTIVES

- Learners will articulate their projects and what they did to complete them
- Learners will critique their classmates and give constructive feedback

Introduction

10 mins

Linking

We have done a lot with our Kanos! Learned to build, create, and make new things! Can you draw a picture representing your time with Kano?

Engage

Today we get to celebrate and show off all the super cool things we have created! Today is about giving constructive feedback to our friends and thinking of more ways we can be innovative!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In..

Exploration Activities

45 mins

Challenge 1: How to Critique?

Today, we want to share with everyone the work we did over the past few weeks and also give a critique on our work so we can improve for next time. A critique is when we give an analysis or feedback on something.

It is great to have an opinion on something but we want to make sure we can articulate something. We are never allowed to say we do or do not like something “just because.”

If I am giving feedback to another person I want to be able to explain my thoughts, feelings, and reasoning.

For example, if I am asked if I like a book and I say “yes” I may explain myself by saying, “The book was very interesting. It had characters that I could identify with. Like the main character in the story, I am the younger sister and know what it is like to have an older sibling.”

In this example I explain why I liked a book. I could identify with the main character and it helped me appreciate the story more.

We all have feelings and opinions with reasons behind them. We want to make sure we are expressing this!

Also, for this exercise we want to frame our critiques in a positive framework. If we see something we don't like we should not say "that is stupid" or "that is dumb or ugly." Instead we want to frame everything in a way that the person can grow. If you are wondering why there is a rock on top of the tree ask the question: "Hey, maybe next time we should have rocks on the ground."

Let's practice this! Everybody draw a quick picture in 5 minutes. I'll count down and yell "Go" loudly and you can start. After the 5 minutes you will stop and turn and talk to a partner. Critique their work!

Challenge 2: Kano World Gallery Walk

Now that we have learned to critique, we will go around in groups to share our work! Each group will spend 10 minutes at the Kanos to explain their work and then we will switch!

Challenge 3: Group Celebration

Hopefully we got to see everyone's work! Now turn and talk to your neighbour and share what was your favorite Kano creation! What idea was super cool.

Closing

15 mins

Sharing

This is our last day with the Kanos, so let's give some feedback on what our experience was. In your engineering logs, answer the following questions:

- What did you like about Kano?
- What was your favorite class?
- What class do you wish was different? Why?

On a post-it note, before you leave today, rate your time with Kano. If you loved it give it a 5! If you hated it give it a 1. Post it on the door as you walk out!

Kano Clean-up

5 mins

Power down and put away Kanos

Appendix

KANO
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Kano Implementation Tips

Bringing Kano to your learning environment is a new and exciting step! Below are a few tips to get you ready for your first day!

1. **Label Your Kanos:** Number your Kano Computer and Screen boxes for easy assignment
2. **Set Up a Routine:** Before the first day using the Kanos decide where you want the Kanos to live and how learners will take them out and put them away each session
3. **Assign Partners or Groups:** Decide who you would like to work together!
4. **Know How to Put Kanos Away:** Did you know that all your Kano pieces can fit inside the yellow box? Once learners have all built their Kano, show them how the keyboard and all the cables will fit easily in the back of the screen and yellow box. This will help cables stay in good condition!
5. **Set Up a Kano World Account:** If you would like to create a class account where you can have every learner share their work online you can create a class profile at world.kano.me
6. **Creating Kano Roles:** Creating jobs and responsibilities for the Kanos gives ownership to the kits. Sample Roles Include:

- Kano Keeper: Checks to make sure Kanos are put away correctly
- Time Keeper: Manages time for each activity and tells the group when to put Kanos away

Creative Computing Curriculum Standard Alignment

			Build A Computer	Explore Kano	Intro to Make Art	Pixel Hack	Pattern Perfection	Intro to Terminal Quest	Intro to Scratch	Scratch Dance Party	Intro to Kano Code	Kano Code Part 2	Kano Code Challenge	Intro to Hack Minecraft	Terraform Minecraft	Hack Minecraft Challenge	Design Thinking
US K12CS	**Algorithms and Programming**	Algorithms	○	○	○	○	●	○	○	○	●	●	○	○	○	○	●
	Algorithms and Programming	Control	○	○	○	○	○	○	○	○	●	○	●	○	○	○	●
	Algorithms and Programming	Program Dev	○	○	○	○	○	●	●	○	●	○	○	●	●	○	○
	Computing Systems	Devices	○	●	○	○	○	○	○	○	●	○	○	○	○	○	○
	Computing Systems	Hardware	●	○	●	○	○	○	○	○	●	○	○	○	○	○	○
	Computing Systems	Troubleshooting	○	○	○	●	○	○	○	●	●	○	○	○	○	●	○
CSTA	**K-2: 1A-AP-09**		○	●	○	○	○	○	○	○	○	○	○	○	○	○	○
	K-2: 1A-AP-10		○	○	●	●	●	○	●	●	●	●	●	●	●	●	○
	K-2: 1A-AP-11		○	○	●	●	●	○	●	●	●	●	●	●	●	●	○
	K-2: 1A-AP-12		○	○	●	●	●	○	●	●	●	●	●	●	●	●	○
	K-2: 1A-AP-14		○	○	○	○	○	○	●	○	○	○	○	○	○	○	○
	K-2: 1A-AP-15		○	○	●	●	●	○	●	●	●	●	●	●	●	●	●
	K-2: 1A-CS-01		●	●	○	○	○	○	○	○	○	○	○	○	○	○	○
	K-2: 1A-CS-02		●	●	○	○	○	○	○	○	○	○	○	○	○	○	○
	K-2: 1A-CS-03		○	●	○	○	○	○	○	○	○	○	○	○	○	○	○
	K-2: 1A-DA-07		○	○	○	○	●	○	○	○	○	○	○	○	○	○	○
	3-5: 1B-AP-10		○	○	●	●	●	○	●	●	●	●	●	●	●	●	○
	3-5: 1B-AP-11		○	○	●	●	●	○	●	●	●	●	●	●	●	●	○
	3-5: 1B-AP-12		○	○	●	●	●	○	●	●	●	●	●	●	●	●	○
	3-5: 1B-AP-13		○	○	○	○	○	○	○	○	○	○	○	○	○	○	●
	3-5: 1B-AP-15		○	○	●	●	●	○	●	●	●	●	●	●	●	●	○
	3-5: 1B-AP-16		○	○	●	●	●	○	●	●	●	●	●	●	●	●	○
	3-5: 1B-AP-17		○	○	●	●	●	○	●	●	●	●	●	●	●	●	○
	3-5: 1B-CS-01		●	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	3-5: 1B-CS-02		●	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	3-5: 1B-CS-03		○	○	○	○	○	○	●	○	○	○	○	○	○	○	○
	3-5: 1B-IC-20		○	○	○	○	○	○	○	○	○	○	○	○	○	○	●
	6-8: 2-AP-12		○	○	●	●	●	○	●	●	●	●	●	●	●	●	○
	6-8: 2-AP-13		○	○	●	●	●	○	●	●	●	●	●	●	●	●	○
	6-8: 2-AP-16		○	○	●	●	●	○	●	●	●	●	●	●	●	●	●
	6-8: 2-AP-17		○	○	○	○	○	○	○	○	○	○	○	○	○	○	●
	9-10: 3A-AP-18		○	○	●	●	●	○	●	●	●	●	●	●	●	●	●

Creative Computing Curriculum Standard Alignment

			Build A Computer	Explore Kano	Intro to Make Art	Pixel Hack	Pattern Perfection	Intro to Terminal Quest	Intro to Scratch	Scratch Dance Party	Intro to Kano Code	Kano Code Part 2	Kano Code Challenge	Intro to Hack Minecraft	Terraform Minecraft	Hack Minecraft Challenge	Design Thinking
COMMON CORE	CCSS.MATH.PRACTICE.MP1		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	CCSS.MATH.PRACTICE.MP2		○	○	●	●	●	○	●	●	●	●	●	●	●	●	○
	CCSS.MATH.PRACTICE.MP3		○	○	●	●	●	○	●	●	●	●	●	●	●	●	○
	CCSS.MATH.PRACTICE.MP4		○	○	●	●	●	○	○	○	○	●	○	○	○	●	○
	CCSS.MATH.PRACTICE.MP5		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	CCSS.MATH.PRACTICE.MP7		○	○	●	○	●	○	○	○	○	○	○	●	●	●	○
	CCSS.MATH.PRACTICE.MP8		○	○	○	○	●	○	○	○	○	○	○	○	○	○	○
	CCSS.MATH.CONTENT.1.G.A.2		○	○	○	●	○	○	○	○	○	○	○	○	○	○	○
	CCSS.MATH.CONTENT.2.G.A.1		○	○	○	●	○	○	○	○	○	○	○	○	○	○	○
	CCSS.MATH.CONTENT.3.OA.D.9		○	○	○	○	●	○	○	○	○	○	○	○	○	○	○
	CCSS.MATH.CONTENT.4.OA.C.5		○	○	○	○	●	○	○	○	○	○	○	○	○	○	○
	CCSS.MATH.CONTENT.5.G.B.3		○	○	○	●	○	○	○	○	○	○	○	○	○	○	○
	CCSS.MATH.CONTENT.6.G.A.3		○	○	○	●	○	○	○	○	○	○	○	○	○	○	○
	CCSS.MATH.CONTENT.HSG.MG.A.3		○	○	○	●	○	○	○	○	○	○	○	○	○	○	○

Student Engineering Log

Keeping Track of Your Work on Kano

We recommend that you use an Engineering Design Notebook (EDN) in your class to help learners track their progress and be reflective of their time on Kano. You can use a notebook, binder, or folder for the EDN, as long as it is completely devoted to the work completed on the Kano. The EDN will hold any notes, drawings, handouts, or assignments that are related to Kano.

Each student will be responsible for their own EDN. It will be their responsibility to organize, update, and monitor. As the educator, you can use the EDN as an assessment piece and collect it to track student progress. We recommend that you require each student to keep their notebook's information in chronological order.

Included is a daily log your learners can use to track their progress as they work on Kano.

Your personal Engineering Design Notebook will include:

- Class handouts
- Daily logs and notes
- All sketches, plans, and drawings
- Notes from design reviews
- Calculations relevant to your project
- Documentation of the evolutionary changes of your project
- All completed and returned assignments
- Final (turned-in) version of any individual assignments that are due

Student Engineering Log

What was your challenge?

How did you solve this challenge?

What worked? What didn't work?

How can we make it better? How can we change it for next time?

In Class Reflection

Surveys + Kano

We always want to make sure that we are collecting information from our learners and educators on how Kano is doing in your learning environment.

We would love to hear from you on any feedback you may have for Kano. Below are two surveys you and your learners can fill out:

Teacher Survey

Student Survey

Also, on the following page you will find a sample survey you can use in your classroom to access your learners' experiences with the Kano computer kits!

KANO Student Survey

We really want to know what you thought of Kano. By completing this survey you're helping us to make Kano even better for other learners!

Name: _____

Class: _____

School: _____

For the below questions please indicate how strongly you agree or disagree with the following statements. Please circle only one answer.

Kano is fun	Disagree	Unsure	Agree
Kano is easy to use	Disagree		Agree
Kano is helping me learn more	Disagree	Unsure	Agree
Kano lets me explore topics I'm interested in.	Disagree	Unsure	Agree
I feel like I can be creative on the Kano	Disagree	Unsure	Agree
What I am learning on the Kano will help me later in life	Disagree	Unsure	Agree
I like to work with a partner on the Kano	Disagree	Unsure	Agree
I feel like I can learn at my own pace on the Kano	Disagree	Unsure	Agree
I feel like I understand programming languages more	Disagree	Unsure	Agree
I feel like I understand hardware and software more.	Disagree	Unsure	Agree

Circle your favorite apps on the Kano:

 Kano Code

 Make Snake

 Terminal Quest

 Hack Minecraft

 Make Pong

Story Mode

 Make Light

 Make Art

 Other

Circle your least favorite apps on the Kano:

 Kano Code

 Make Snake

 Terminal Quest

 Hack Minecraft

 Make Pong

Story Mode

 Make Light

 Make Art

 Other

Circle all the adjectives that describe a STEM job:

Fun	Creative	Exciting	
High paying	Easy	Boring	Make the world a better place
Flexible	Repetitive	Challenging	
Hard	Working alone	Teamwork	

Share anything else about your Kano experience:

Teacher Reflection Guide

1. What went well in this lesson? Why?

2. What problems did I experience? Why?

3. What could I have done differently?

4. What did I learn from this experience that will help me in the future?

5. Preparation and research - What could I have done differently?

6. Assessment – Does my method(s) of assessment measure what I want? How did the class do? What should I change for next time?

Build Kano Answer Key

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ANSWER KEY:

Explorer Questions:

1. Memory Card: This gives the Kano powers and can hold thousands of songs, games and ideas. The operating system lives in here
2. Power Pieces: Gives power to the Kano
3. HDMI Cable: Lets the Kano display images
4. Keyboard + Mouse: Is the input device you can type into
5. Sound Sensor: Lets you listen to the world around you
6. Raspberry Pi: The brain of the Kano Computer
7. DIY Speaker: Gives the Kano a voice. Is made of four parts (power, speaker, circuit board, and sound)
8. USB Hub: Gives your Kano connection powers
9. Power Board: Gives the Kano a power button

1. Graphics Chip
2. HDMI
3. USB

Programmer Questions

1.

Hardware	Software
Raspberry Pi, Memory Card, Power Pieces, Speaker, HDMI Cable, Keyboard, Case, Screen	Make Art, Kano Code, Terminal Quest, Scratch, Make Snake, Make Pong, Make Light, Hack Minecraft

2. Inputs: Keyboard **Outputs:** Screen

Creator Question

Let the learners be creative on what kind of computer they want to create. Some key components they should have though:

- The operating system (memory card, hard drive, etc.)
- A display (screen, TV, etc)
- Power of some sort
- A way to input information (keyboard, touch screen, etc.)

Explore Kano Answer Key

ANSWER KEY:

Explorer Questions:

1. Make Art: use text-based code (CoffeScript) to code. The text lets you create art with text based code.
2. Make Pong: uses block code to hack and modify pong.
3. Make Snake: uses python to modify Snake.

Programmer Question

Were there any other apps that you discovered? If so write their name, provide a description of the app, and draw what the app's logo looks like below!

Learners can pick any app. Some apps include: TuxPaint, Powerup (Make Light), Scratch, Hack Minecraft, Terminal Quest, etc. For each added app, learners should provide one sentence on what the app is and code language used (if applicable).

Creator Question:

Let learners be creative! It can be any app they want! It can be an app they already played on or a new idea. Make sure there is a drawing!

Intro to Make Art Answer Key

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ANSWER KEY

Explorer Questions

1. The gray space is used to type out your code, the white space is the canvas that displays the code in image form
2. This block brings you back to the gray coding space
3. This block shows you the code to create shapes
4. This block shows you the code to draw lines
5. This block shows you the code to move your coded objects on the canvas
6. This block shows you the code to add text
7. This block shows you the code to create loops or how to get a random number
8. This block shows you the code to add or change color

Programmer Questions:

What does Syntax error mean? How do you fix it?

Syntax error means that in your code there is an error that is due to spelling, capitalization, or incorrect parameters. When you see this, Make Art will tell you where the syntax is. Go to the line where the error is and see if you can figure it out. You can use the buttons on the left to show what the correct code syntax should be. Also, if you click hint on the top right it will tell you what the correct code will be in a challenge.

In the challenge "Sunny Day," you have the completed code below. In the below code, explain which words can be changed to modify the outcome and which things have to stay the same.

In this code, you can change "blue," "yellow," and "150" with "background", "color", and "circle" staying the same. You could also change "circle" to another shape if you wanted to change from a circle.

Creator Question

Make sure that each shape (square, circle, and rectangle) is represented in the drawing. Some learners may be able to write out the correct code to create each shape as well!

Pixel Hack Answer Key

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ANSWER KEY

Explorer Questions:

Answers will be varied by age level

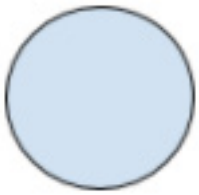
Challenge Name	Shapes, Lines, Angles Discovered
Pong	Rectangle, Square, Circle, right angles, parallel lines, perpendicular lines
Asteroids Ship	Lines, triangles, acute angles, obtuse angles
Tetris	Rectangle, Square, right angles, parallel lines, perpendicular lines
Loot Chest	Rectangle, Square, right angles, parallel lines, perpendicular lines
Variables	Rectangle, Square, Circle, right angles, parallel lines, perpendicular lines
Diamond Sword	Rectangle, Square, Circle, right angles, parallel lines, perpendicular lines
Steve	Rectangle, Square, Circle, ellipse, right angles, parallel lines, perpendicular lines, 360 degrees
RPG Mage	Rectangle, Square, Circle, ellipse, right angles, parallel lines, perpendicular lines, 360 degrees
For Loop	Circle, ellipse, triangles, parallel lines, lines, 180 degrees, 360 degrees, acute angle
8-bit Sunset	Rectangle, Square, right angles, parallel lines, perpendicular lines
Color Frenzy	Rectangle, Square, right angles, parallel lines, perpendicular lines
8-bit Grass Block	Rectangle, Square, right angles, parallel lines, perpendicular lines
8-bit Diamond Block	Rectangle, Square, right angles, parallel lines, perpendicular lines

Pixel Hack Answer Key

Shapes could look like the following:

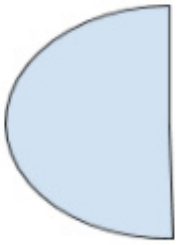
Square

Circle

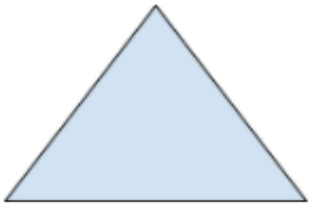


Ellipse

Arc



Polygon



Creator Question

Below is a rubric you can use to evaluate projects:

All Learners	Most Learners	Some Learners
• Have 1 drawing that shows their art work • 1 label for each drawing on how to code it	• Have 1 drawing that shows their project • 1 - 3 labels in the drawing explaining their project • 5 sentences explaining their project • Use of color and stroke for modifying the code	• Have 1 drawing that shows their project • +4 labels in the drawing explaining their project • 5 sentences explaining their project • Use of color and stroke for modifying the code

Pattern Perfection Answer Key

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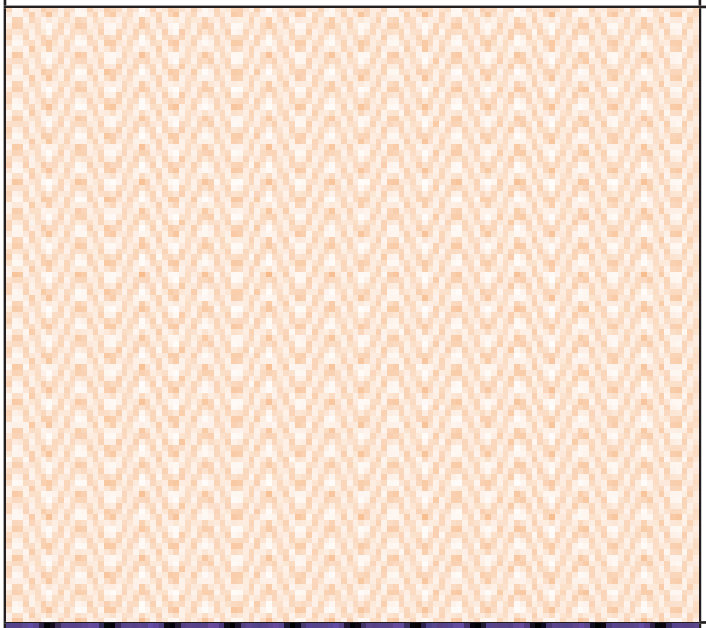
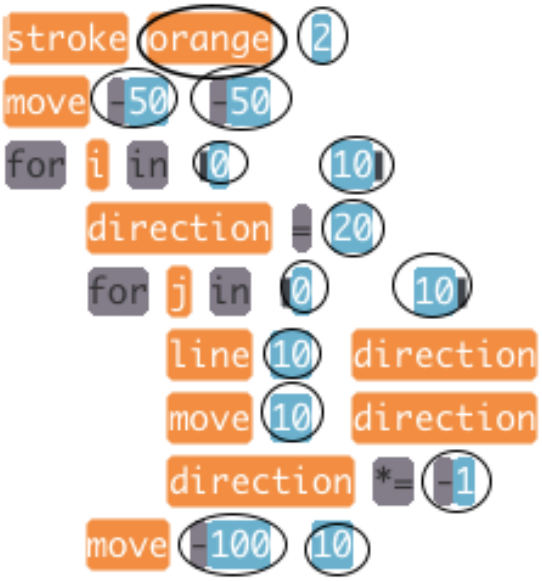
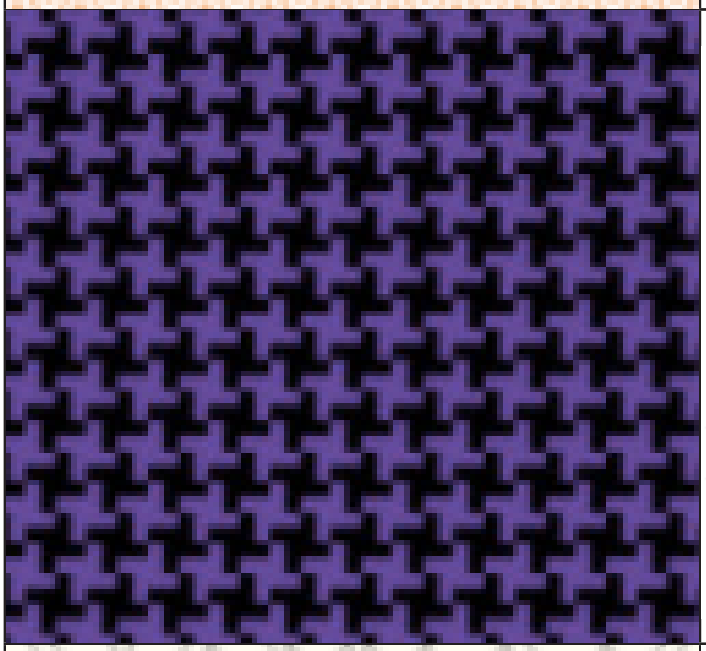
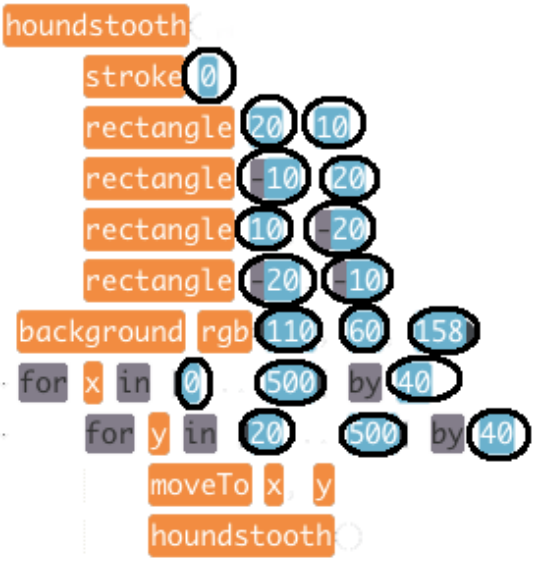
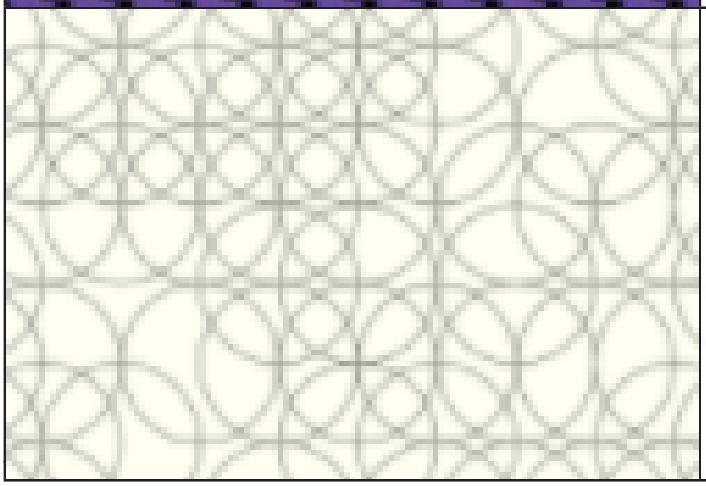
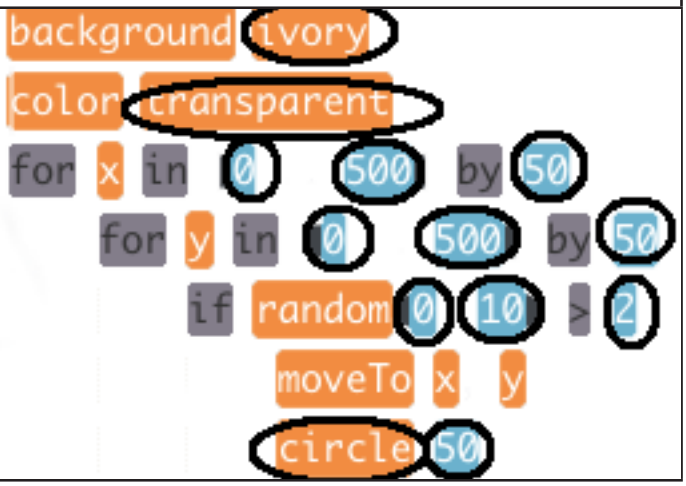
ANSWER KEY
Explorer Questions

Challenge	Source Code
	
	
	

Pattern Perfection Answer Key

Programmer Question:

Below is a detailed explanation of the code above.

- You are setting the background color to black
- You are setting the stroke size to be 30 and the stroke color to be red
- You are setting the color to transparent so we can have a stroke with no fill color
- You are creating a for loop that will work with numbers 0 to 350, intervals of 50. This is a loop that will create circles within circles that will radiate outward
- You are creating another for loop inside the first for loop that will work with the numbers 0 to 2, intervals of 0.1. This loop will create a second loop that will go all around the circle, letting us draw in the pattern
- You are creating an arc between number 0 to 350, by intervals of 50. This creates the numerous small arcs inside each circle and gives the varied look we see in the pattern.

Below is a rubric you can use to evaluate projects:

All Learners	Most Learners	Some Learners
• Identify the background is black • Identify the size and color of the stroke used • That there are 2 loops that are creating the circles • You can change all the numbers and words in blue	• Identify the background is black • Identify the size and color of the stroke used • Identify we set a color to transparent to create shapes • That there are 2 loops that are creating the circles • The arcs create the numerous shapes we see in the circles • You can change all the numbers and words in blue	• Identify the background is black • Identify the size and color of the stroke used • Identify we set a color to transparent to create shapes • That there are 2 loops that are creating the circles • Identify the 1st loops create the circles • Identify that the 2nd loop creates the design in the loops • The arcs create the numerous shapes we see in the circles • You can change all the numbers and words in blue

Creator Question

Allow learners to be as creative as they want. There needs to be a drawing with clear ideas on how to use loops to create their patterns. It doesn't need to be perfect, just thoughtful.

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Intro to Scratch Answer Key

ANSWER KEY

Explorer Questions

Scratch Category	What Do These Blocks Do?
Motion	These blocks move your character
Looks	These blocks change the appearance of your character
Sound	These blocks allow you to add sound
Pen	These blocks allow you to control the pen aspect of Scratch (note, you will most likely not have this block as unknown)
Data	Variable and list blocks live under the data category
Events	These blocks are the ones that let you start your program, they are event indicators, meaning when something happens the code will run
Control	These blocks allow you to create loops, conditionals, or add time to your code
Sensing	These blocks will sense changes in your program (if it touches an edge, something happens differently in your program)
Operations	These blocks allow you to add math operations to your code
More Blocks	Here you can make your own blocks

Intro to Scratch Answer Key

Programmer Questions

Directions: Below are two examples of Scratch blocks. In your own words, describe what each block would do in Scratch.

1. When the green flag is clicked, it will start all the code blocks under it.
2. When this block is used it will play the meow sound until it is finished
3. When this block is used it will turn the character 15 degrees to the right

Below is a sample of code from Scratch. What do you think the program will do when it runs?

- When the green flag is clicked,
- Say “Dance party!” for 2 seconds
- Then repeat 10 times
- Turn 15 degrees to the right
- Wait 0.2 seconds
- Turn 15 degrees to the left
- Wait 0.2 seconds

Debug It!

There is no event block (like when the green flag is clicked or key clicked) to start the block sequence!

Creator Question

Learners should have a drawing that is clearly labelled. The labels should explain what is happening in the game. More advanced learners will be able to explain which code blocks they can use to create the labelled aspects of their game.

Programmed to Dance Answer Key

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Explorer Questions

Below is a rubric you can use to evaluate projects:

All Learners	Most Learners	Some Learners
• Have 1 drawing that shows their project • 5 sentences explaining their project • Sentences should clearly articulate the why and how of the project (why the design the picked and how they coded it)	• Have 1 drawing that shows their project • 1 - 3 labels in the drawing explaining their project • 5 sentences explaining their project • Sentences should clearly articulate the why and how of the project (why the design the picked and how they coded it) • 1- 2 sentences will reference explicitly the code used	• Have 1 drawing that shows their project • +4 labels in the drawing explaining their project • 5 sentences explaining their project • Sentences should clearly articulate the why and how of the project (why the design the picked and how they coded it) • +3 sentences will reference explicitly the code used

Programmer Questions

Below is a rubric you can use to evaluate projects:

All Learners	Most Learners	Some Learners
• 1 sentence for each required block used. • A clear explanation of the why in picking the block	• +2 sentence for each required block used. • A clear explanation of the why in picking the block • An explanation of the sequence the code follows	• +2 sentence for each required block used. • A clear explanation of the why in picking the block • An explanation of the sequence the code follows • An explanation for why their code is more efficient than other coding environments that could be used

Creator Question

Allow learners to be as creative as they want. There needs to be a drawing with clear labelling and details for improvements to the project

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ANSWER KEY

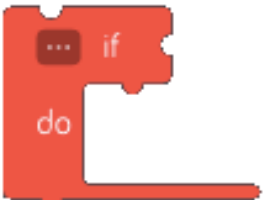
Explorer Questions

Intro to Kano Code Answer Key

Variable

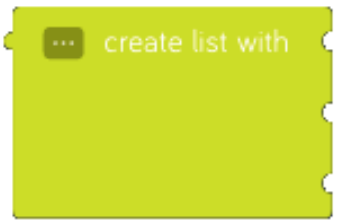
Events

Math



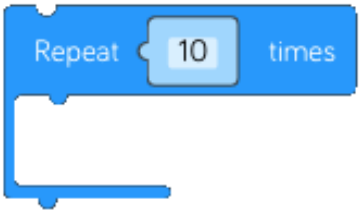
Logic

Color



Lists

Draw



Control

Intro to Kano Code Answer Key

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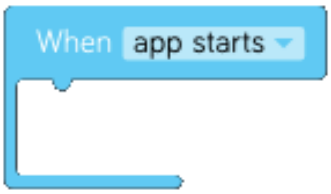
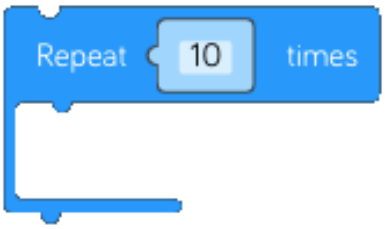
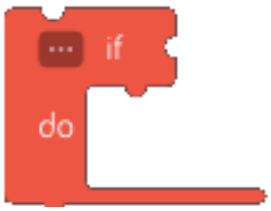
Programmer Questions



This block lives under Events. It is used to start the code, so when the app starts the code will run everything inside it.



This block lives under Control. It is used to create a loop, so when this block is used it will loop the code blocks inside it 10 times.



This block lives under Logic. It is used to create a conditional statement, so when this block is used it will first check to see if something happens. If it happens (is true) then it will do the next block inside the conditional block.

Creator Question

Let learners be creative in their designs. There should be a clear drawing with labelling that shows their thinking and ways to create the code.

Intro to Kano Code Pt. 2 Answer Key

ANSWER KEY

Explorer Questions

What were the two challenges you worked on today? What did you do in each challenge? How did you remix them?

Make sure learners name the challenge and explain what the goal of each challenge was. They should have also changed at least one thing from this challenge.

What did you remix in the challenge "Parade"? What could you remix for next time?

Learners have multiple areas they can change in this challenge. They could change the numbers, stickers, or even how the loop operates. Learners should be able to articulate what they changed and how that modified their challenge

What did you remix in the challenge "Sticker Randomiser"? What could you remix for next time?

Learners have multiple areas they can change in this challenge. They could change the stickers, add a loop, or even sound. Learners should be able to articulate what they changed and how that modified their challenge
Programmer Questions

Programmer Questions

Below is a detailed explanation of each block of code:

- Control block. When the app starts it will do something/the activation code to start
- Loop/every frame do what is coded below
- A sticker will move -6 pixels (this means to the left of the screen)
- Use of conditional statement: If the sticker's position is less than -100
- If less than -100 do the following: move the sticker to x: 600, y: 100 (far-right edge of screen)
- If less than -100 do the following: after moving to the far-right edge of screen the sticker will change to a random one in the vehicles category

While looking for answers make sure learners can at least articulate the following:

- Starts the code
- A loop is started, meaning we will repeat the code below
- The sticker is moving (if can articulate, to the left)
- A conditional (logic) statement is used to say if something happens do this…
- If the sticker is off the screen, move back to the start
- After it is at the start change to a random vehicle sticker

Creator Question

Let learners be creative! Potentially, they could see things like the block designed and explained what it does to a program/code when it is used.

Kano Code Challenge Answer Key

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ANSWER KEY

Explorer Questions

Below is a rubric you can use to evaluate projects:

All Learners	Most Learners	Some Learners
• Have 1 drawing that shows their project • 5 sentences explaining their project • Sentences should clearly articulate the why and how of the project (why the design the picked and how they coded it)	• Have 1 drawing that shows their project • 1 - 3 labels in the drawing explaining their project • 5 sentences explaining their project • Sentences should clearly articulate the why and how of the project (why the design the picked and how they coded it) • 1- 2 sentences will reference explicitly the code used	• Have 1 drawing that shows their project • +4 labels in the drawing explaining their project • 5 sentences explaining their project • Sentences should clearly articulate the why and how of the project (why the design the picked and how they coded it) • +3 sentences will reference explicitly the code used

Programmer Questions

Below is a rubric you can use to evaluate projects:

All Learners	Most Learners	Some Learners
• 1 sentence for each required block used. • A clear explanation of the why in picking the block	• +2 sentence for each required block used. • A clear explanation of the why in picking the block • An explanation of the sequence the code follows	• +2 sentence for each required block used. • A clear explanation of the why in picking the block • An explanation of the sequence the code follows • An explanation for why their code is more efficient than other coding environments that could be used

Creator Question

Allow learners to be as creative as they want. There needs to be a drawing with clear labelling and details for improvements to the project

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Intro to Terminal Quest Answer Key

ANSWER KEY

Explorer Questions

Terminal Command	What Will the Command Do?
ls	List content in current file
cat	List content in a file
cd	Change directories to the one specified
-a	View files that begin with a "."
mv	Move a file and place it in a specific directory
echo	Echo or repeat a set of words (strings) in terminal (the shell)
mkdir	Create a new directory
nano	Edit files

Programmer Questions

Answer: ls lists the content of a current directory/file while cat lists the content of files that you are not currently in.

Creator Question

Be creative! Let learners make predictions or even create new characters and worlds.

Intro to Hack Minecraft Answer Key

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ANSWER KEY

Explorer Questions

Hack Minecraft Categories	What Do These Blocks Do?
Craft	These blocks creates and sets the Minecraft blocks.
Blocks	These blocks let you select a random block, wool, or assign a specific Minecraft block
Text	These blocks let you create words or sentences with Minecraft blocks
Position	These blocks let you modify the x, y, or z position of the Minecraft blocks
Player	These blocks let you modify the position of the player in Hack Minecraft
Control	These blocks allow you to create loops
Logic	These blocks allow you to create conditional statements (if, else, then)
Math	These blocks allow you to use math numbers and operations
Variables	These blocks allow you to create variables (words-strings, numbers, etc.)

Programmer Questions

1. These code blocks say:

- When "C" is pressed
- Write "kano"
- At position 0 , 0 , 0
- In wood blocks

2. These code blocks say:

- When "R" is pressed
- Every 300 milliseconds
- Set a floor
- Of 5 x 5 blocks
- In stone blocks

3. These code blocks say:

- When "B" is pressed
- Set a 3 x 3 floor
- To blocks that are flowers

Creator Question

Let learners be creative in what they decide to build. In order to build a house in the sky they would either need to be in the sky already or use the position blocks to move them around. Both solutions are acceptable!

Terraform Answer Key

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ANSWER KEY

Explorer Questions

Learners should draw either all or part of their structure to the best of their ability. Let them color and add detail as they like!

Reflection Questions:

What were the 3 formations?

All Learners	Most Learners	Some Learners
• Have 3 formations • 1 sentence for each formation	• Have 3 formations • 1 - 2 sentence for each formation • 1 sentence on the code blocks used	• Have 3 formations • +2 sentence for each formation • +2 sentence on the code blocks used

What is one structure that they could have created another way?

Answers can include using other blocks, building with individual blocks, using loops, etc. Let them be creative!

How did they use the Kano Blocks? Why was using code better or worse?

You will get a variety of answers. The main objective is to see if they can recognize if their code was efficient. Was there a way to build the same structure in less time? Was there a way to build their structure that would make it more detailed?

Programmer Questions

For this question learners should be demonstrating critical thinking on how to create a structure with the code blocks. Examples of creating structures quickly would be to:

- Use the craft block to create a sphere, cube, or pyramid
- Use a loop to repeat a structure
- Use conditionals and loops to give parameters for their structures

Creator Question

Learners should have a drawing that is clearly labeled. The labels should include which blocks would be used. For more advanced learners, they may explain why they used the blocks they picked.

Hack Minecraft Challenge Answer Key

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ANSWER KEY

Explorer Questions

Below is a rubric you can use to evaluate projects:

All Learners	Most Learners	Some Learners
• Have 1 drawing that shows their project • 5 sentences explaining their project • Sentences should clearly articulate the why and how of the project (why the design the picked and how they coded it)	• Have 1 drawing that shows their project • 1 - 3 labels in the drawing explaining their project • 5 sentences explaining their project • Sentences should clearly articulate the why and how of the project (why the design the picked and how they coded it) • 1- 2 sentences will reference explicitly the code used	• Have 1 drawing that shows their project • +4 labels in the drawing explaining their project • 5 sentences explaining their project • Sentences should clearly articulate the why and how of the project (why the design the picked and how they coded it) • +3 sentences will reference explicitly the code used

Programmer Questions

Below is a rubric you can use to evaluate projects:

All Learners	Most Learners	Some Learners
• 1 sentence for each required block used. • A clear explanation of the why in picking the block	• +2 sentence for each required block used. • A clear explanation of the why in picking the block • An explanation of the sequence the code follows	• +2 sentence for each required block used. • A clear explanation of the why in picking the block • An explanation of the sequence the code follows • An explanation for why their code is more efficient than other coding environments that could be used

Creator Question

Allow learners to be as creative as they want. There needs to be a drawing with clear labelling and details for improvements to the project

Design Thinking Answer Key

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ANSWER KEY

Explorer Questions

Fill out each section by reflecting on your Design Challenge Project!

For this section learners should have:

- A defined problem they are trying to solve
- A community (local, state, national, international) community they want to work with
- An articulated idea on how they can solve the problem
- A list of a few ideas they had to solve the problem
- The winning idea and a prototype design for the idea
- A clear understanding of how they would test their prototype to get feedback

Programmer Question

When you created your prototype you had to code a portion of the project on Kano. What did you code? Why did you use that coding environment? What were the limitations of that coding environment for your project?

Below is a rubric you can use to evaluate projects:

All Learners	Most Learners	Some Learners
• 1 sentence explaining what was coded • 1 sentence explaining what Kano App they used • 1 sentence explaining the pros and cons of that Kano App	• 2 - 3 sentences explaining what was coded • 2 - 3 sentences explaining what Kano App they used • An explanation of the sequence the code follows • 2 - 3 sentences explaining the pros and cons of that Kano App	• +3 sentences explaining what was coded • +3 sentences explaining what Kano App they used • An explanation of the sequence the code follows • +3 sentences explaining the pros and cons of that Kano App • An explanation for why their code is more efficient than other coding environments that could be used

Creator Question

Allow learners to be as creative as they want. There needs to be a drawing with clear labelling and details for improvements to the project

KANO

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