# Girls in STEAM 2024

# Activity Book

## Activities Include:




With funding from Canada

# Magic Math

## Magic Mind Read

Girls in STEAM 2024

**Supplies:**

Deck of cards (1)
Calculator or Notepad & Pen (optional)

**People required:**

2 or more

**Procedure:**

1. Remove jokers and instructions from the deck of cards.
2. Give the deck of cards a shuffle in your preferred style.
3. Have a friend pick any card from the deck without showing you and tell them to remember the card they chose.
4. You might want to give them a calculator or paper to record their math.
5. Have the friend take the number on their card and double the amount (an ace is worth 1, jacks are worth 11, queens are worth 12, and kings are worth 13).
6. Add 3 to the amount.
7. Multiply the amount by 5.
8. Add 1 if the card is a heart, add 2 if a spade, add 3 if a diamond, and add 4 if a club.
9. To figure out what card was chosen, subtract 15 from the total. The first number represents the card's value, and the second digit represents the suit using the values above. You can just tell them their card, or you can do a fun reveal (see at the end of all tutorials).

**Example:**

If I chose the 7 of diamonds
7 x 2 = 14
14 + 3 = 17
17 x 5 = 85
85 + 3 = 88
88 – 15 = 73
7 is the card value and 3 represents the suit, diamonds.

So why does this work?

Where n = Number and s = Suit:
n * 2 = 2n
(2n + 3) * 5 = 10n + 15
10n + 15 + s

You're just adding a 0 to your number and then the suit is 1-2-3-4 where the 0 should be. The extra 15 is just a misdirection to make it more difficult for the audience to see what you're doing. You can always just tell the audience that it works because of ✨MAGIC✨

# 9 of Lies

## Girls in STEAM 2024

**Supplies:**

Deck of cards (1)

**People required:**

2 or more

**Procedure:**

1. Remove jokers and instructions from the deck of cards.
2. Give the deck of cards a shuffle in your preferred style.
3. Have an audience member count out any 9 cards and put the rest aside.
4. Place the cards in 3 piles of 3, face down.
5. Have the audience member pick up one pile and look at the bottom card.
6. They must memorize the card and place it back down without shuffling.
7. Pick up the three piles in a specific order, with the pile they looked at on top. This means their card should be 3rd from the top.
8. Tell them to lie to you and tell you any card that isn't theirs (no jokers).
9. Count out the number/letter first, letter by letter, and place down a card from the top for each letter, then place the rest of the deck on top
10. Count out the word "OF" in the same way, then place the rest of the deck on top
11. Count out the suit in the same way (always with an "S" on the end), then place the rest of the deck on top
12. Now count out the word "TRUTH" and flip over the "H" or 5th card, this will be the card they chose

**Example:**

Imagine the numbers 1-9 represent 9 different cards after a card has been selected. The 3 will represent the card chosen and the one represents the top of the deck. The person lies and says they have the King of Hearts or Three of Diamonds.

1-2-3-4-5-6-7-8-9

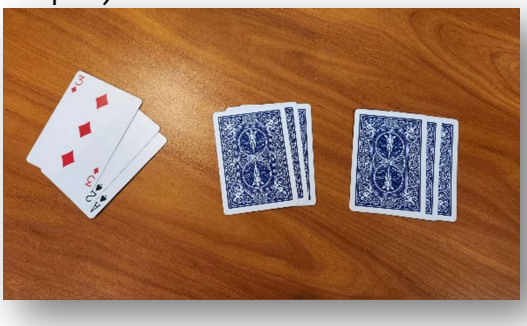
| | | | | | |
|---|---|---|---|---|---|
| K-I-N-G | > | 5-6-7-8-9-4-3-2-1 | T-H-R-E-E | > | 6-7-8-9-5-4-3-2-1 |
| O-F | > | 7-8-9-4-3-2-1-6-5 | O-F | > | 8-9-5-4-3-2-1-7-6 |
| H-E-A-R-T-S | > | 1-6-5-2-3-4-9-8-7 | D-I-A-M-O-N-D-S | > | 6-7-1-2-3-4-5-9-8 |

So why does this work?

No matter what card they say, there are at least 3 digits in all card numbers. There are always 2 digits in the word “OF”. There are at least 5 digits in all suits. Following the right pattern and placing the remaining deck on top after each step will move the chosen card to the centre. Once it is there, any 5-Letter (like TRUTH or MAGIC) word will get you to the chosen card... but you can just say it works because of ✨MAGIC✨

Step 4)

Step 5)



Step 7)

Step 9)

Step 10)

Step 11)

Step 12)

# 21-Card Waterfall

## Girls in STEAM 2024

**Supplies:**

Deck of cards (1)

**People required:**

2 or more

**Procedure:**

1. Remove jokers and instructions from the deck of cards.
2. Give the deck of cards a shuffle in your preferred style.
3. Count out 21 cards in 3 columns face up, dealing cards from left to right, row by row (see below for diagram... dealing order is very important).
4. Have the audience member mentally choose one card, but do not say it out loud.
5. Have them tell you which column their card is in (1, 2, or 3)
6. Pick up the columns, without mixing up the order of the cards, and always place their column between the other two piles
7. Repeat steps 3-6
8. Repeat steps 3-6 again
9. At this point, their card will be the middle card in the middle column (4th from the top and bottom)
10. You can reveal their card by saying it out loud, or by eliminating the two outside columns and making it seem like you're trying to guess, or any other way you want to make the reveal (see at the end of all tutorials)

**Example:**

Imagine the 0 is the card chosen, the numbers below are the order they are stacked:

| Deal 1: | | | Deal 2: | | | Deal 3: | | | Deal 4: | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | Y | Z | Y | Y | Y | Y | Y | Y | Y | X | Y |
| **0** | Y | Z | Y | Y | Y | X | X | Z | X | Z | X |
| X | Y | Z | Y | X | **0** | Z | Y | Y | Z | Y | X |
| X | Y | Z | X | X | X | **0** | X | Z | Z | **0** | Z |
| X | Y | Z | X | X | Z | Z | Z | Y | Y | X | Y |
| X | Y | Z | Z | Z | Z | Y | X | X | Z | Y | Z |
| X | Y | Z | Z | Z | Z | X | Z | Z | Y | X | Z |
| **2** | **1** | **3** | **1** | **3** | **2** | **2** | **1** | **3** | | | |

So why does this work?

When we place the column with their card between the other two columns, it moves all of those 7 cards into the middle 3 rows on deal two. Doing the same thing on deal three moves the 3 middle cards in that column onto the middle row. Doing the same thing again on deal four will put the middle card in the middle column and the middle row. Or if anyone else asks you... just say it works because of ✨MAGIC✨

Step 3)

Step 5)

Step 7)

Step 8)

Step 9)

Step 10)

# Special Card Reveals

## Girls in STEAM 2024

Doing a trick to find someone's chosen card is part of the process, but just saying their card out loud can lack the "wow factor" people look for in a magic trick, so try being creative and come up with some fun ways to reveal that you know their card. Some examples of reveals are noted below.

1) Narrowing Down Your Options: Rather than just saying "Your card is X", you can think it over and say things like... "Well, it's not in this pile, and it's not in this one". It builds up some suspense as you act as though you're thinking over your options.

2) Misdirection: Get it wrong a couple of times first. Act like you thought you could do the trick but then you must have made a mistake, only to surprise them with their card that you clearly did know all along.

3) Extra Flourish: Using one or both of the above, narrow it down to a small stack of 4-7 cards. Put the known card on either the top or bottom and have it stick out about a half centimeter from the other cards. Have the participants stick out their fist with their thumb facing up and slide the stack of cards between their index and middle fingers. If you position them correctly, when you smack the cards out of their hand, only their card will remain because it was lodged tighter than the rest. Get them to say their card before turning it over and see their reaction when it matches. This one takes a lot of practice but is a real 'wow' moment for the audience.

These work well for the mind read and 21-card tricks. 9 of Lies has a built-in reveal already but be creative and see if you can alter the tricks to trick your friends who will probably also know how these ones work. Magic is just finding ways to do something others can't explain. If you can make up your own pattern to find a card that isn't obvious to the audience, then you can create your own magic tricks.

# Password Cypher

Girls in STEAM 2024

**Supplies:**

Cypher wheel sheet (1)

Fastener (1)

Scissors

Markers

**People required:**

Individual

**Procedure:**

1. Write out the alphabet inside the small circle on the cypher wheel.
2. Write out a series of symbols, letters, and numbers on the bigger circle (make sure you are using symbols found on a keyboard).
3. Cut out both circles.
4. Align both cut out circles so the smaller one is visible on top of the bigger circle and push the fastener through the center.
5. Choose a point where both circles align where the alphabet letter aligns with the appropriate symbol/letter/number (this will help you identify what alphabet letter is associated with the correct symbol/letter/number).

Using this cypher, students can create a strong password using symbols, letters and numbers which spell out an easy to remember word in a complex way.

Having a password that is at least 8 characters long (longer is better), a mixture of uppercase and lowercase letters, using numbers and symbols, and having no ties to personal information (nothing that could be easily guessed).

**Pro tip:**

Keep your cypher wheel somewhere safe to yourself to ensure an extra level of protection.

# Northern Plains Telephone Trades

Girls in STEAM 2024
Developed by Wanuskewin

We know that Northern Plains Indigenous people did a lot of trading between different cultural groups—it is how things like shark teeth and obsidian end up in the opimihāw Valley! However, these various cultural groups did not always speak the same language, so how did they communicate? One of the ways was through trader's sign language. The challenge was that, because not everyone spoke the same language, these signs could often be misinterpreted. We are going to play a game to demonstrate how difficult it can be to communicate across a language barrier.

We will split the group into 2-4 teams of about 6 people each. This game is a combination of Telephone and Charades, and students will have to figure out a way to describe an object without speaking. Everyone will line up and face away from the artifact table; the student closest to it will be assigned an item and must come up with a sign, gesture, or action to describe the object. They will then tap the next person in line on the shoulder, so they turn around and act out their chosen sign/gesture. That sign/gesture will then be passed along the line in a similar fashion until it reaches the end. Once the last person receives the sign, they will come to the artifact table and try to guess the item that was given to the first person.

**Procedure:**

1. Lay out all the items on the artifact table.

2. Split the class into 2-4 groups of about 6-8 students and have them stand in a straight line facing away from the artifact table. They are only allowed to turn around when they are tapped on the shoulder.

3. When the teams are ready, have the students closest to the artifact table come up to the table and assign an item to them. For the first round, pick an easier item for them to create a sign/gesture (e.g., bison horn spoon, glove, bow, and arrow), and have each round after getting harder and harder (e.g., bison fat, rawhide). You can help the students come up with a sign/gesture if they need it but try to let them figure it out themselves. Remind the students that they cannot say the name of the item aloud.

4. When the students are ready, send them back to their teams and have them start passing the message on by tapping the next person's shoulder to have them turn around and receive the sign/gesture. Remind students that they do not have to understand the sign, just pass it to the next person.

5. When the message reaches the student at the end, that student can come back to the table to make their guesses. They have 3 guesses to get it right; you can help them by prompting them to show the sign they were given and giving them prompting questions like “Well what do you think it is?” or “Do you think that it is a tool or material?” This is usually when the first student might try to jump in and say that the final sign/gesture was not what they gave—remind the students that this is a part of the game and miscommunication is normal. Let them know whether they guessed correctly or incorrectly.

6. Ask the students if it was easy or hard to understand the message, and then remind them that most groups who were trading had to deal with these kinds of miscommunications all the time and emphasize the importance of working together to communicate.

7. Repeat the game as many times as you want, but have the students rearrange themselves in their teams so that a new person is at the front and back of the line each time.

Wanuskewin

# Micro:bit-Rock, Paper, Scissors

Girls in STEAM 2024

**Supplies**

- Laptop (1)
- Micro;bit (1)
- USB B cord (1)
- Battery pack (optional)
- Internet
- Makecode.microbit.org

If you do not have a micro;bit, or USB, there is an option to use the online virtual micro;bit on the website for this activity.

**People required:**

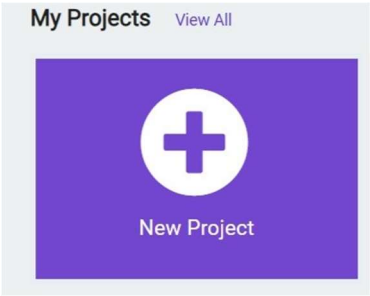
Individual or pairs

**Objective:**

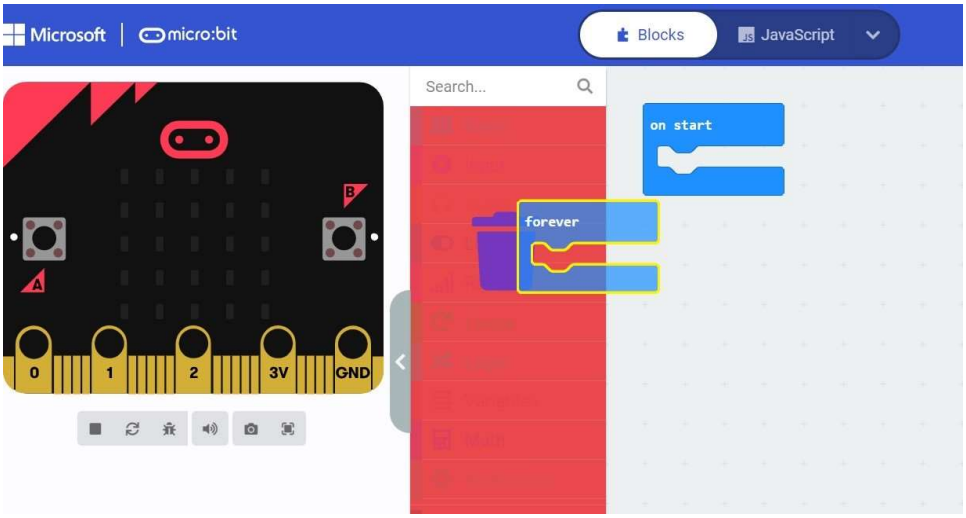
Play a game of Rock, Paper, Scissors by shaking a micro;bit to reveal an image in the LED lights!

Step 1:

Open a New Project on the MakeCode Microbit website https://makecode.microbit.org/# by clicking big purple “NEW PROJECT” button. Name your project “Rock Paper Scissors” then click the green “done” button.

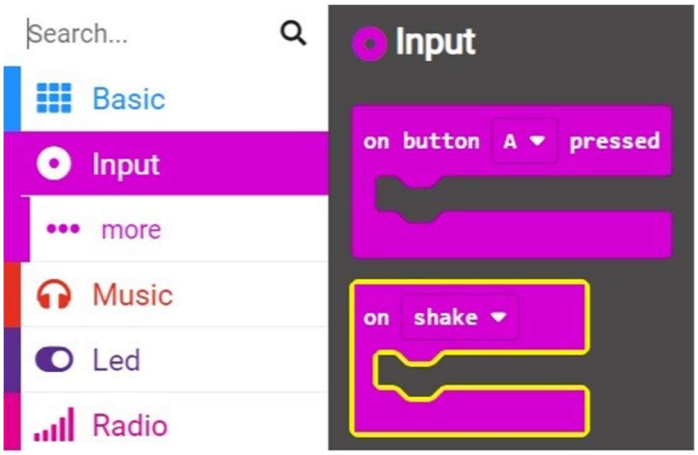



Once you have opened your project, remove the blue “on start” and “forever” block of code by clicking and dragging them over the menu task bar.



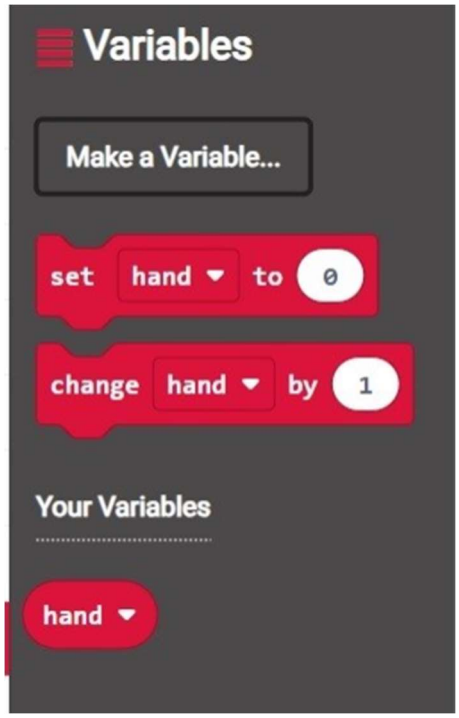

Step 2:

Go into the light purple Info toolbar and click the “on shake” loop block code. It will appear in your workspace!




Step 3:

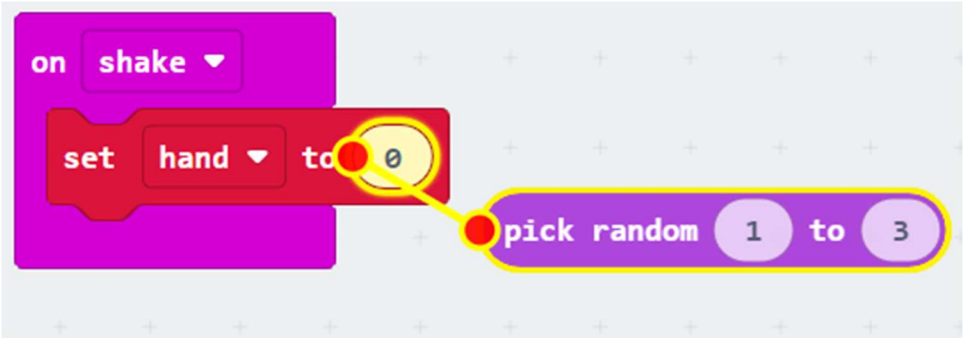
Create a “hand” variable Click on the red Variables category in the toolbox. Click on the **Make a Variable** button. Give your new variable the name “hand” and click Ok. Click on the Variables category in the Toolbox again. You’ll notice that there are some new blocks that have appeared. Drag a set hand block into the on shake block. This code tells the microbit to start the game when it shakes.





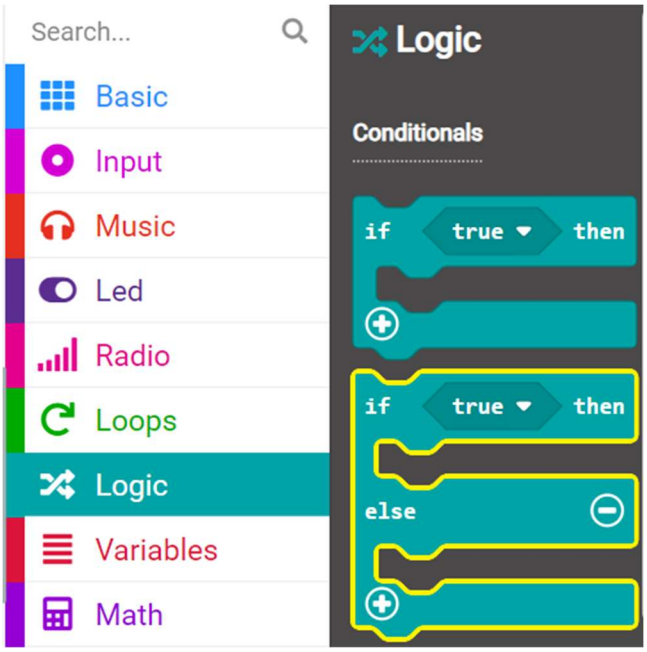
Step 4:

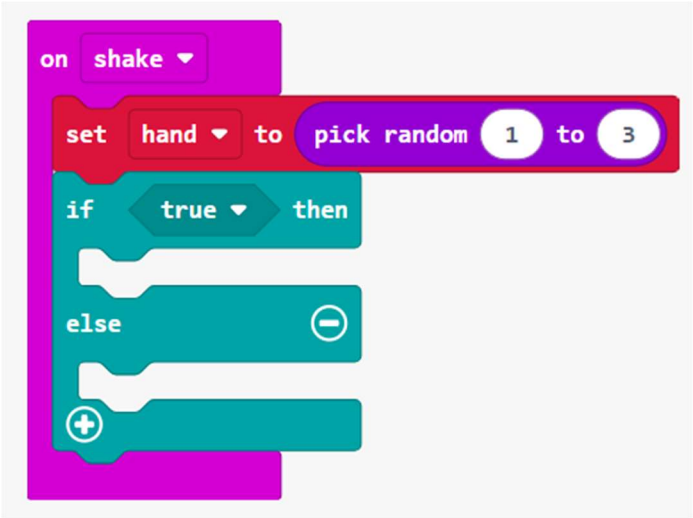
Click on the dark purple Math category in the Toolbox. Drag a pick random block and drop it into the set hand block replacing the number 0. A yellow line will appear when you hold the Pink Random block to zero, when you see it will drop into the 0 spot. Now when we shake our micro:bit, the variable hand will contain a random number between 1 and 3.




Step 5:

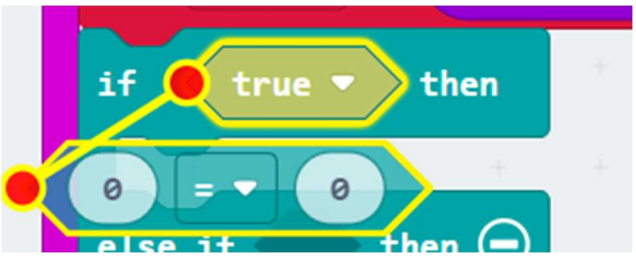
Click on the Logic category in the Toolbox. Drag the if true then else block out to the workspace and drop it into the on shake block under the set hand block.

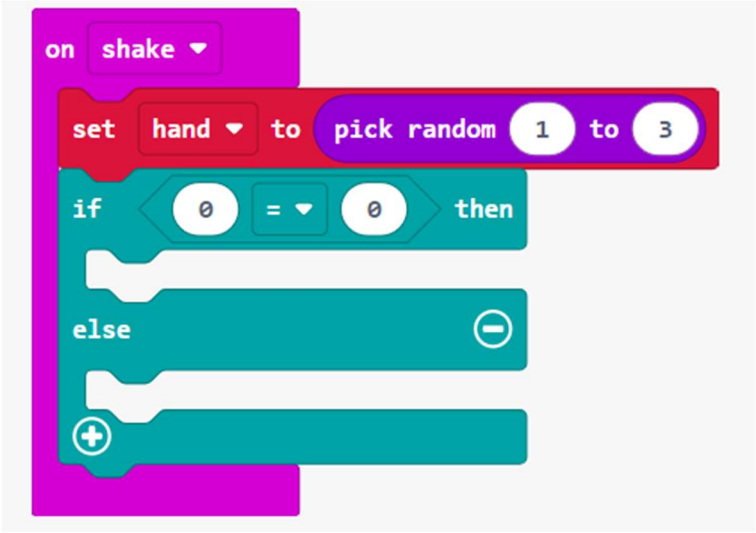





Step 6:

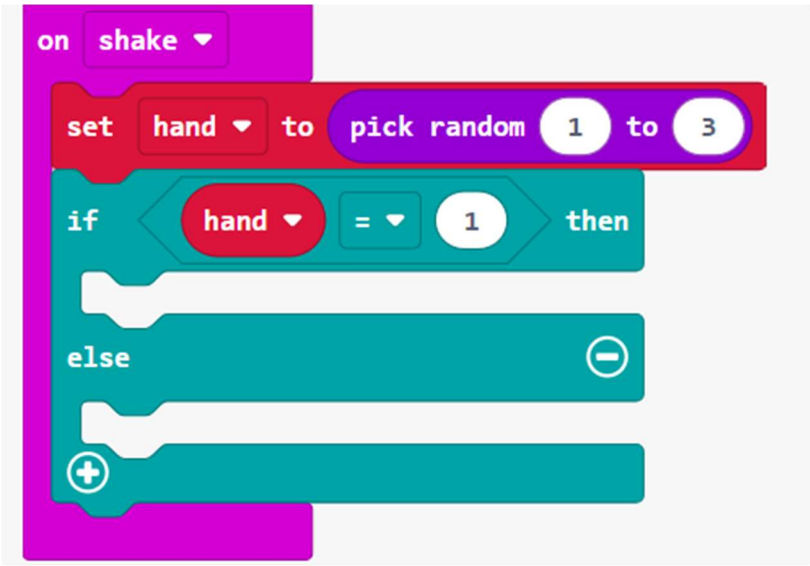
From the Logic category, drag a 0 = 0 comparison block and drop it into the if true then else block replacing **true**.



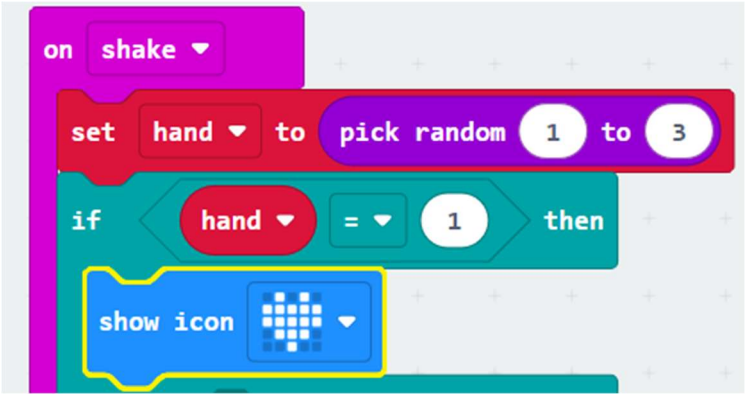
Step 7:

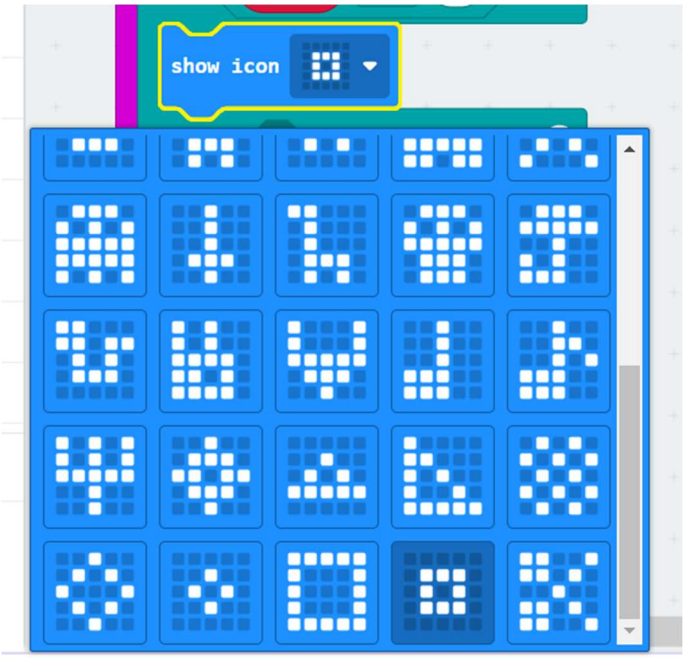
Click on the Variables category in the Toolbox. Drag a hand block out and drop it into the 0 = 0 comparison block replacing the first **0**. Click on the second 0 in the comparison block and change to **1**.




Step 8:

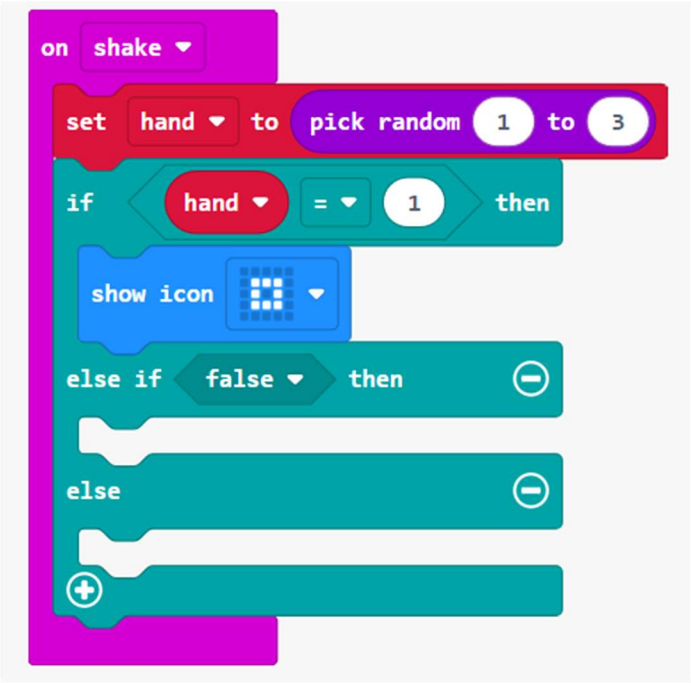
Click on the Basic category in the Toolbox. Drag a show icon block out and drop it under if hand = 1 then. In the show icon block, click on the Heart icon and instead select the small square icon from the options to represent a Rock.





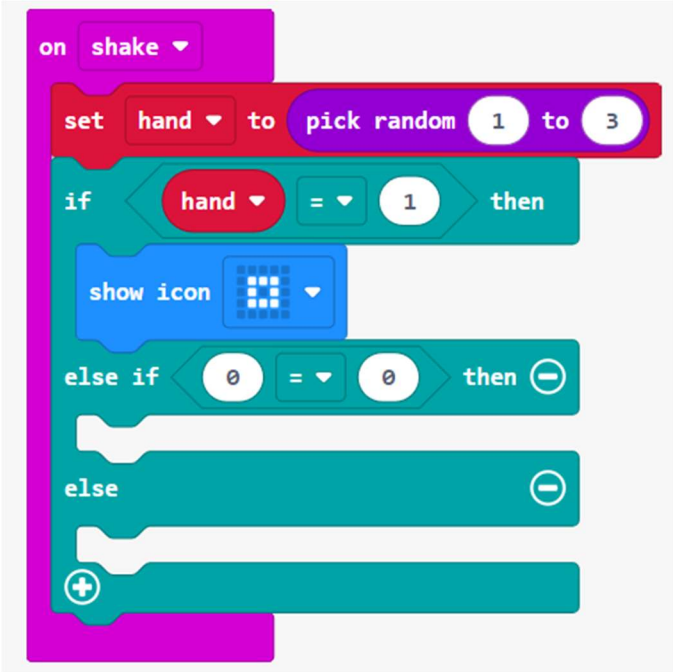

Step 9:

At the bottom of the if then else block, click on the plus '+' sign. This will expand the code to include an else if clause.



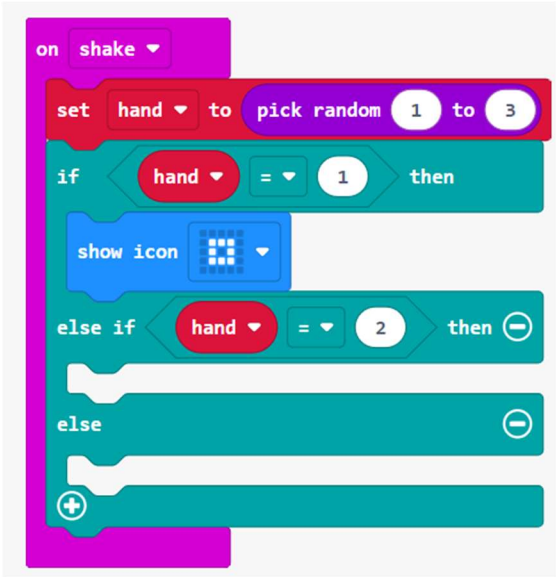
Step 10:

From the Logic category, drag a 0 = 0 comparison block and drop it into the open space next to the else if clause.



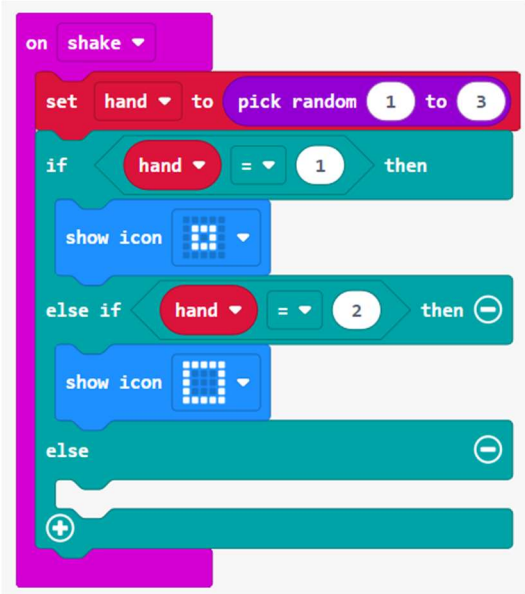

Step 11:

From the Variables category, drag a hand block and drop it into the 0 = 0 comparison block replacing the first **0**. Click on the second 0 in the comparison block and change to **2**.



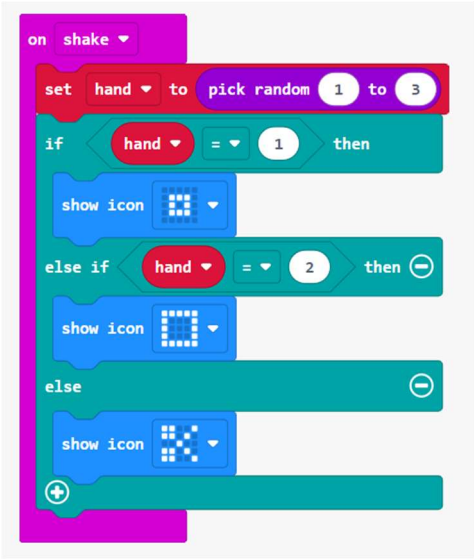
Step 12:

From the Basic category, drag a show icon block out and drop it under else if hand = 2 then. In the show icon block, click on the Heart icon and instead select the large square icon to represent Paper.




Step 13:

For the last input, go to the Basic category and drag another show icon block out and drop it into the last opening under the else. In the show icon block, click on the Heart icon and select the Scissors icon. You have now finished your Rock Paper Scissors microbit code. Now you can download the code onto your physical microbit!



Downloading:

Connect it to your computer and click the Download button. Follow the instructions to transfer your code onto the micro:bit. Once your code has been downloaded, attach your micro:bit to a battery pack and challenge a friend to a game of Rock, Paper, Scissors!

# Fingerprint Finds

Girls in STEAM 2024

**Supplies:**

Pencil

Clear tape

Fingerprint Finds worksheet

**People required:**

Individual

**Procedure:**

1. Start off by making sure your hands are clean and dry.
2. Using a pencil, scribble inside the designated scribble space repeatedly.
3. Rub your finger over the pencil marks on the scribble space.
4. Place the finger with the pencil mark on to the sticky side of the clear tape.
5. Place the tape onto the Fingerprint Finds worksheet in the appropriate location.
6. Repeat steps 1-5 using all your fingers (thumb, index, middle, ring, and pinky), and both hands.
7. Identify and analyze your own fingerprint structure!

We all have different fingerprints which are unique to only us. Fingerprints help crime analysis find out who was where based on their fingerprint pattern. Different kinds of fingerprints include loop, whorl and arches. Use this activity to find your own unique fingerprint pattern!

# Solar Bugs

Girls in STEAM 2024

**Supplies:**

Markers/pencil crayons

Scissors

Vibrating motor (1)

Googly eyes (3-4)

Solar cell (1)

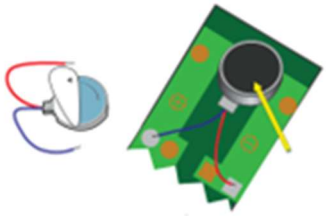
Double sided foam tape (1)

**People required:**

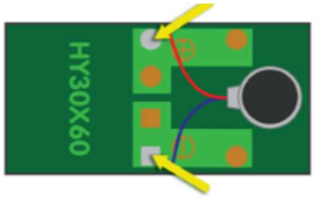
Individual or in pairs

**Procedure:**

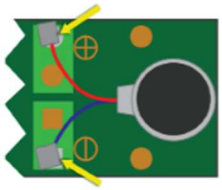
1. Color and cut out bug body of your choice
2. Peel the backing from the self-sticking vibrating motor. Stick it to the underside of the solar cell where shown:



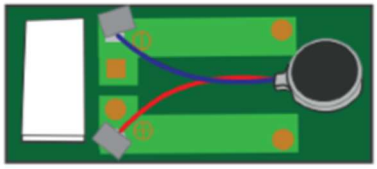
3. Position the motor wires as pictured. Use the silver conductive tap to tape the motor wires to the silver dot (It doesn’t matter which wire connects to which contact)



4. Use two small pieces of Tape to secure the wires to the square contacts as shown:



5. Peel one side of the foam tape and stick it to the underside of the solar cell as shown:



6. Peel other side of the foam tape and stick it on top of the bug body
7. Stick 3-4 googly eyes on the bottom to act as “legs” and help the bug scoot across a surface.
8. Place the Solar Bot in the direct Sun or use a UV light and watch your project bug around!

**Behind the science:**

Solar panels work as a type of renewable energy! The UV rays from the sun give power to the solar panel to provide us energy with the help of tiny particles called photons. When the sun shines on a solar panel, the panel turns the light energy into power.

The most common power usage comes from fossil fuels, making the switch to renewable energies will help contribute to reducing greenhouse gas emissions. Greenhouse gases allow our Earth to retain warmth and maintain temperatures that support life. If there were no greenhouse gases in our atmosphere, the Earth would have an average temperature of –20 °C!

Although we need greenhouse gases to stay warm on our planet, too many of these gas molecules in our atmosphere contribute to climate change which has a negative effect on the natural cycles working together to keep Earth’s life alive.