

Encryption and Decoding and Arithmetic Operators

Textbook

Encryption and Decoding



Pirates would often use a secret code to protect the whereabouts of their treasure. At first, it looks like a jumble of random symbols, but with the right key, you can decode the message and uncover its hidden meaning. This is exactly how [encryption](#) works in the digital world! Encryption helps keep our private messages, passwords, and even bank accounts safe from hackers.

Did you know that people have been using secret codes for thousands of years? Ancient civilizations like the Romans created secret messages to protect important information. In this lesson, you'll learn how encryption works, and even try your hand at Morse code, one of the most famous secret communication systems in history!

[Encryption](#) is like a secret code for messages. It's when information gets turned into secret code. Some use encryption to keep information safe.

For instance, when you log into a computer to play games or learn, it's crucial to keep your information safe. Computers ask us to make passwords to do this. Passwords are like secret codes only we know.

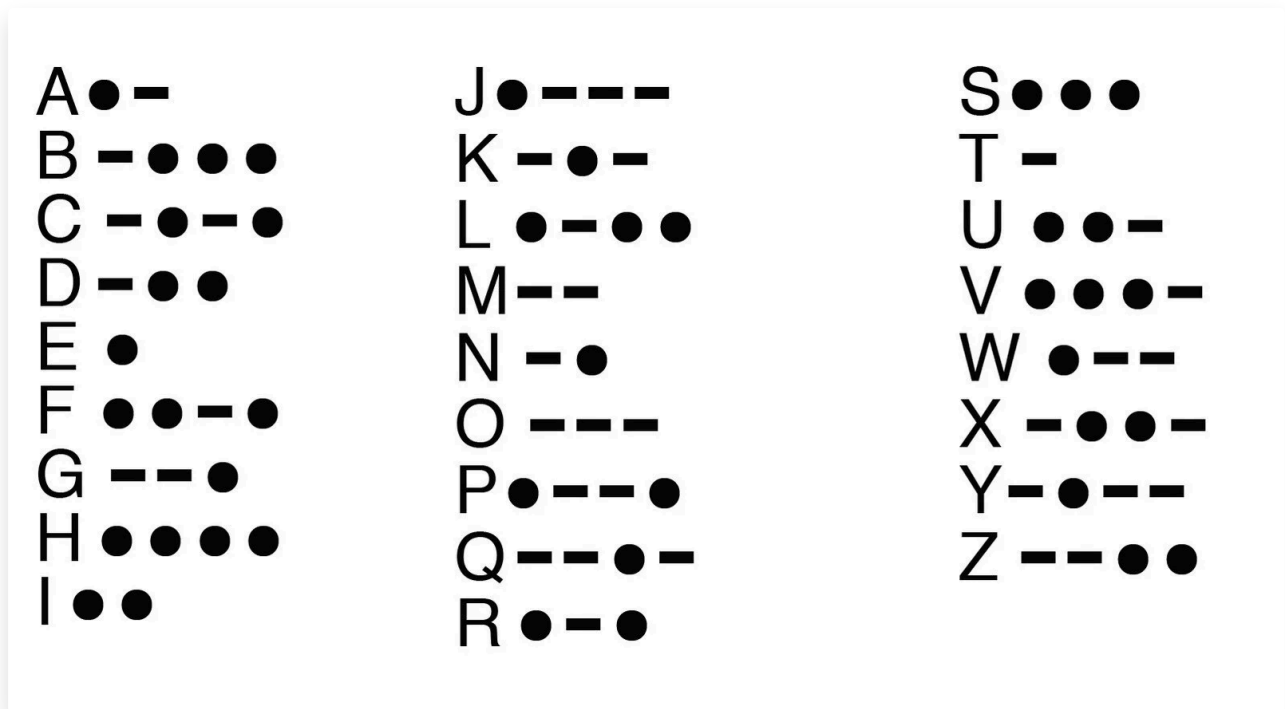
Passwords and secret messages are both types of encryption. To figure out what an encryption says, you need to use a special pattern.

Morse Code

For this lesson's challenges, you will need to use morse code. [Morse code](#) is a way of sending messages using a series of dots (short sounds) and dashes (long sounds), along with breaks in between.

The letter 'S' in Morse code is just three short dots: "...". On the other hand, the letter 'O' is three long dashes: "---". Now, if you put them together, you get "...---...", and that's how you say "SOS" in Morse code. People use "SOS" to signal for help, like when they're in trouble, maybe lost at sea or in the mountains.

Refer to the image below to help you in this lesson's challenges.



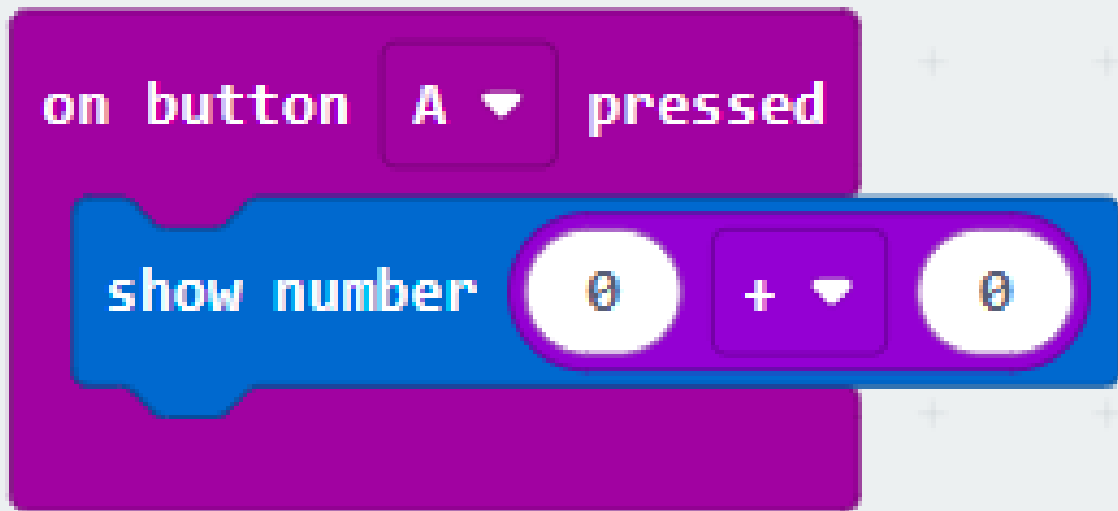
Math and the micro:bit!

Smart math thinking helps you make programs! When you code, you're like a detective solving puzzles with math.

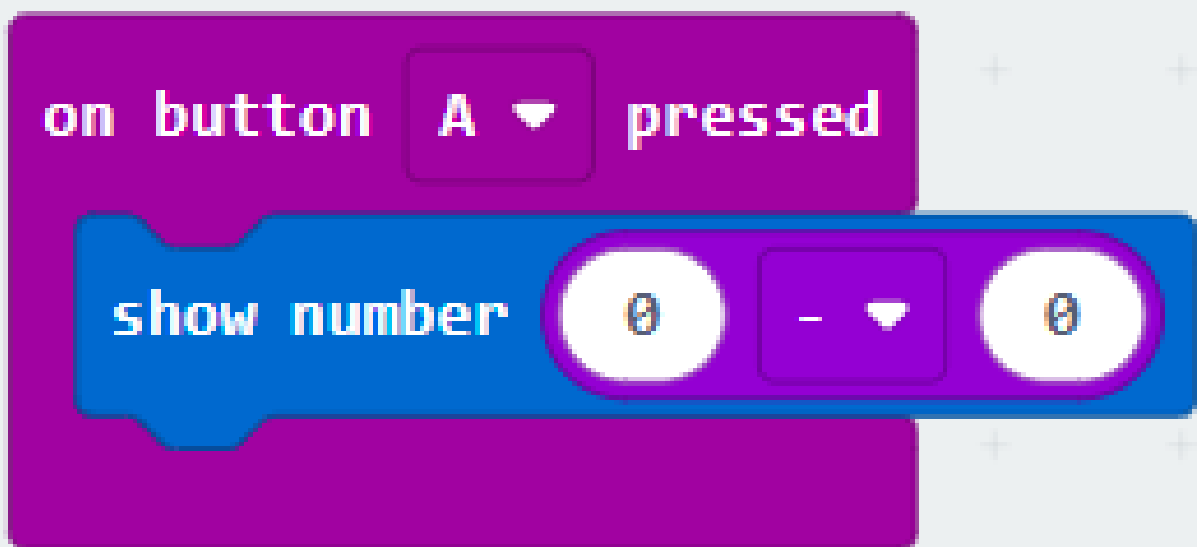
Good coders use math to solve problems. They look closely at the challenge, ask questions, and keep working until they find a solution. Today you will use the micro:bit to do some math!

The micro:bit can do math super fast by using a math tool called arithmetic operators to tell it to add, subtract, multiply, or divide. They look like this:

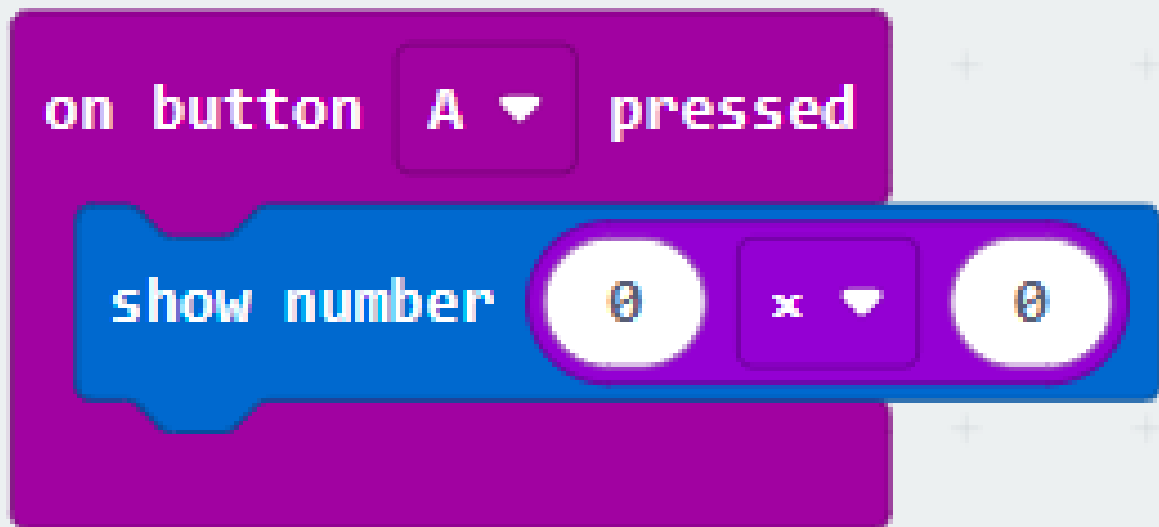
- **Addition (+): Putting Groups Together:** Addition means joining two or more groups to find a total.



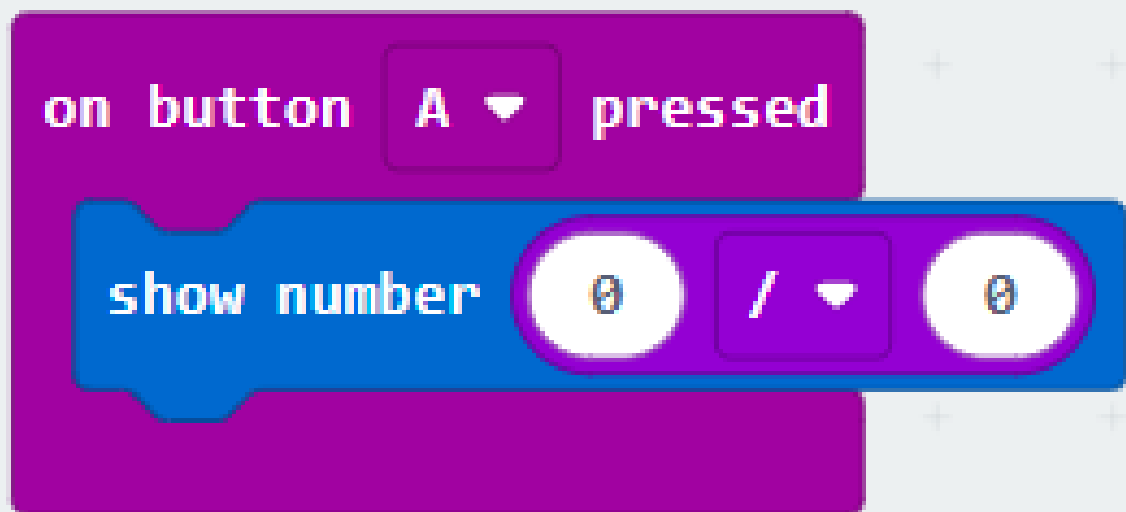
- **Subtraction (-): Taking a Group Away:** Subtraction means taking one group away from another to see what's left.



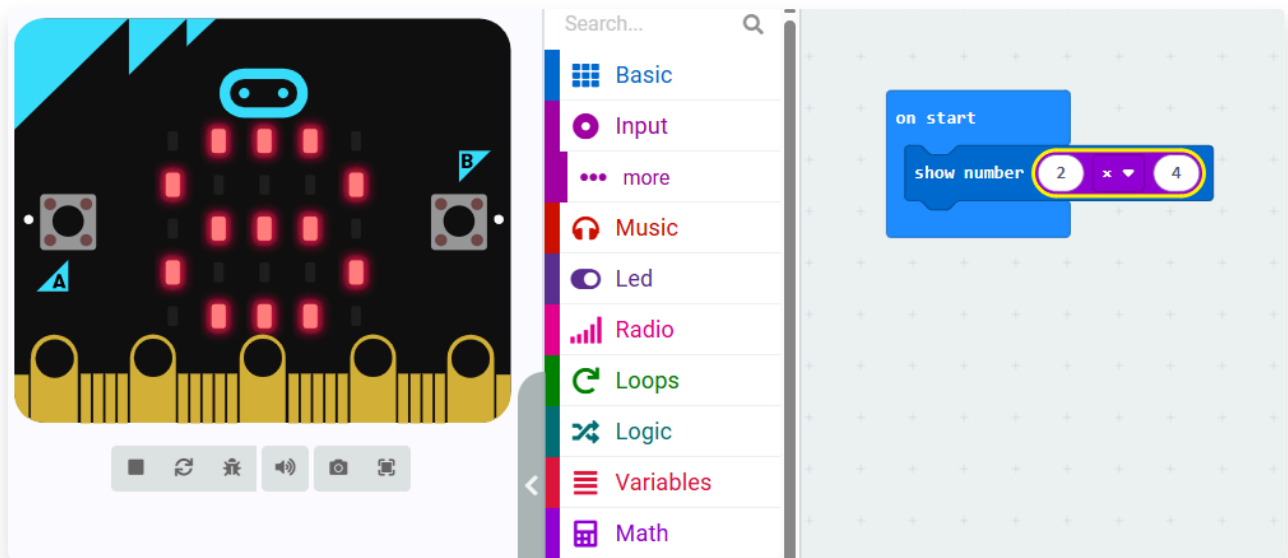
- **Multiplication (*): Combining Equal Groups:** Multiplication is a quick way to combine several groups that are all the same size. (In coding, we often use an asterisk * for multiplication.)



- **Division (/): Sharing into Equal Groups:** Division means sharing a total number into groups that are all the same size. (In coding, we often use a slash / for division.)



Practice!



Go to the Robotics Playground and practice your math skills with a partner! With your partner, design a challenging arithmetic problem (addition, subtraction, multiplication, or division) for them to solve.

1. **Plan it Out in Multiple Ways:** Before writing any code, work with your partner to represent the problem using two different methods on paper.
 - **Drawing or Model:** Use a drawing to show the problem. For example, if your problem is " 5×3 ," draw five groups with three items in each. If the problem is " $10 \div 2$," draw 10 items and circle them into groups of two.
 - **Table:** Create a simple table to show the problem's components.
2. **Write it out:**
 - Clearly state your problem (e.g., "What is 35 divided by 7?")
 - The expected answer
 - *How* your partner should input the numbers (e.g., "Press button A for the first digit, button B for the second," or "Use the accelerometer to select the operation") and display the answer (e.g., "Show the answer scrolling across the LEDs," or "Flash each digit individually").

This planning helps you **analyze the problem** and **ask good questions** upfront.

1. **Code & Solve:** Your partner will now take your problem and program their micro:bit to solve it.
 - **Test and Refine:** If the code doesn't work at first, try different solutions and test again until you get the correct result.
 - **Connect Your Representations:** As you program your micro:bit, think about how the blocks you are using match your drawing and your table.
1. **Introduce a bug:** Once they believe their program is complete, *you* (the problem setter) will secretly introduce one small bug into their code. Their task, as the programmer, is to **find and fix** this bug. This directly hones their debugging and continuing to stay focused skills.
2. **Demonstrate & Discuss:** Watch the micro:bit display the answer.

- **Verify:** Does it match the expected result?
3. **Peer Feedback:** Use these feedback questions to discuss:
- Did the micro:bit solve the problem correctly? How clear was the input method? How easy was it to read the displayed answer?
 - What was one thing your partner did really well in their coding or problem-solving?
 - What's one suggestion to help them improve next time?
4. This is where you **help each other** and **show what you understand in many ways**, not just through the code.
1. **Reflect:** After the activity, take a moment to think about your experience.
- How did you choose smart and correct ways to solve problems?
 - Why is it super important for your micro:bit to do these math steps exactly right?
 - How did you change your plan to fit new challenges (like finding the bug)?
 - How did listening to ideas to get better and faster help you or your partner?
 - Reflect on Representation: After seeing the answer on the micro:bit, which representation was most useful for you and your partner? Was it the drawing, the table, or the code itself? Explain why you chose the representation you did.

Critical Thinking Questions

1. Why is encryption important in today's world? How do websites, apps, and devices use encryption to protect personal information?
2. How do you think Morse code compares to modern encryption methods? What are some advantages and disadvantages of using Morse code as a secret communication system?
3. If you had to create your own secret code, what rules or patterns would you use? How would you ensure only the right people could understand your messages?

Questions (5)

1. What is the main purpose of encryption?

MULTIPLE CHOICE

Choose the correct answer:

- A. To write stories
- B. To make computers faster
- C. To keep messages and information secret
- D. To play games online

MULTIPLE CHOICE

2. What do you need in order to read an encrypted message?

Choose the correct answer:

- A. A flashlight
- B. A secret key or pattern
- C. A math book
- D. A compass

MULTIPLE CHOICE

3. What is Morse code made of?

Choose the correct answer:

- A. Letters and numbers
- B. Pictures and emojis
- C. Dots and dashes
- D. Stars and arrows

MULTIPLE CHOICE

4. True or False: Encryption has only been used in the last 100 years.

Choose the correct answer:

- A. True
- B. False

MULTIPLE CHOICE

5. What role does encryption play when you log in to a website?


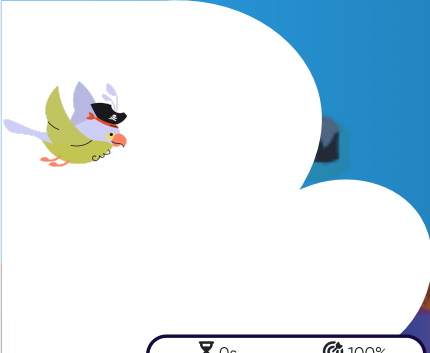
Choose the correct answer:

- A. It makes the website load faster
- B. It hides your personal information from others
- C. It changes the color of the screen
- D. It creates a map of the site

Games (2)

1. Encryption and Decoding Typing

Full ScreenAudioInstructionsRestartPause



0s100%

Encryption is like a secre

2. Encryption and Decoding Memory

Full ScreenAudioInstructionsAnswer KeyPause

Flips: 0

1-●A

2●●●2

3●-●Я

4●●●2

5●-И



6●-●Я

7-T

8-●A

9●-И

10-T



Robotics Challenges (3)

1. Hi There!

Challenge

Textbook

Hi There!

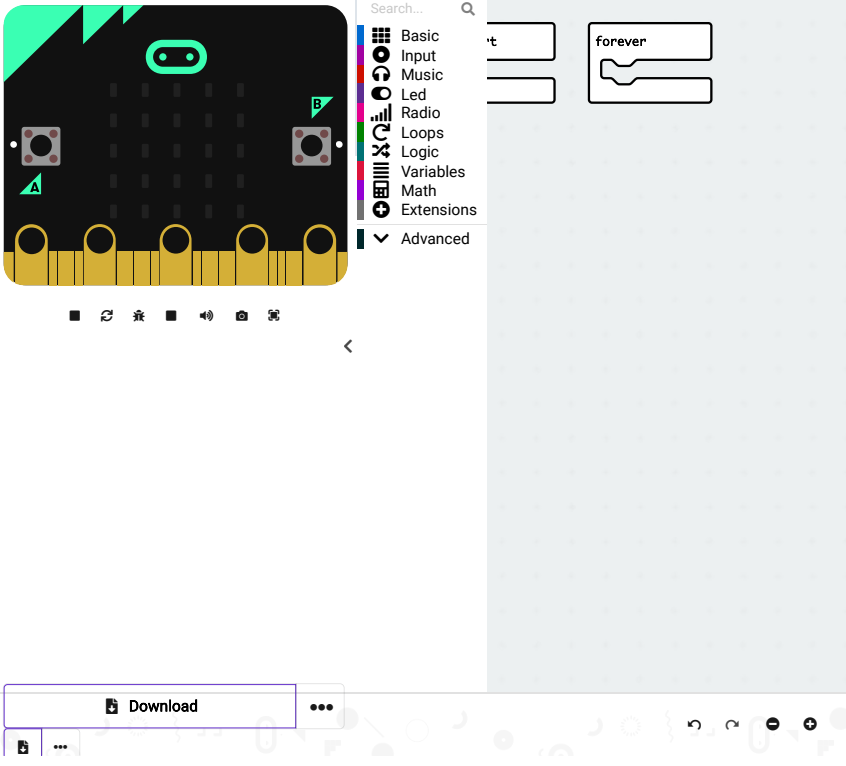
Program the micro:bit to say "Hi" in morse code.

Requirements

- Create your own dots and lines for morse code using the **show LEDs** blocks.
- Clear the screen after each dot LED.
- Pause your code after each **clear screen** block.

Answer Key

Submit



2. Encrypted Names

Challenge

Textbook

Encrypted Names

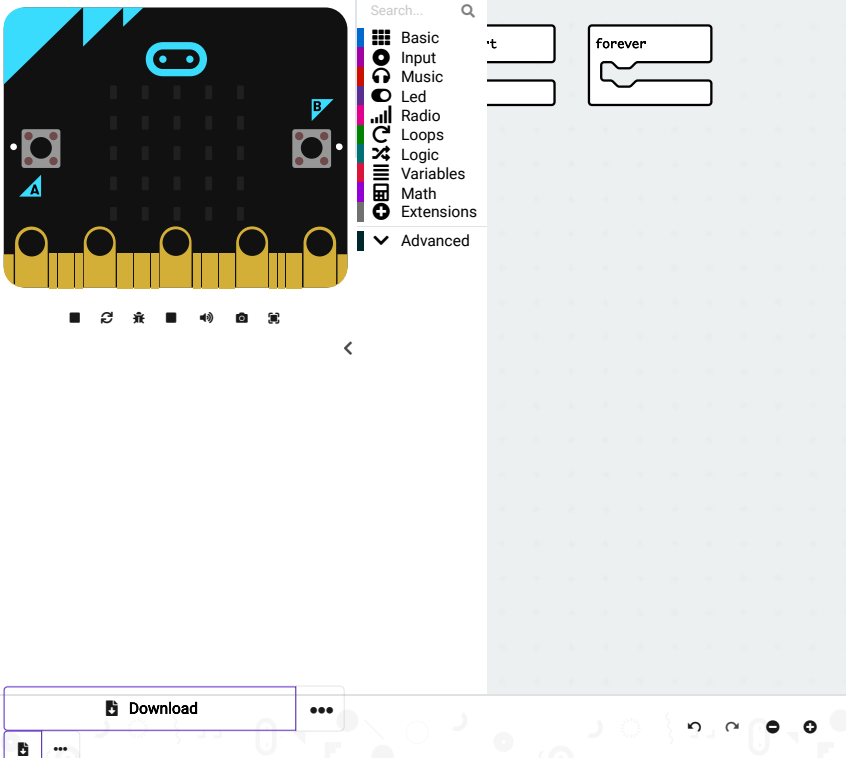
Program the micro:bit to say your name using morse code.

Requirements

- Create your own dots and lines for morse code using the **show LEDs** blocks.
- Clear the screen after each dot and line.
- Pause your code after each **clear screen** block.

Answer Key

Submit



3. Encrypted Animals

Challenge

Textbook

Encrypted Animals

Program the micro:bit to spell your favorite animal in morse code.

Requirements

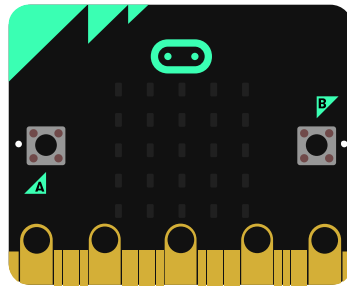
Create your own dots and lines for morse code using the **show LEDs** blocks.

Clear the screen after each dot and line.

Pause your code after each **clear screen** block.

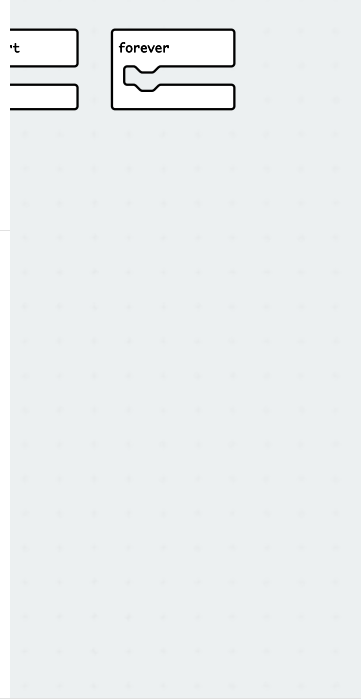
Answer Key

Submit



Search...

- Basic
- Input
- Music
- Led
- Radio
- Loops
- Logic
- Variables
- Math
- Extensions
- Advanced



Download



Answer Keys & Solutions

Questions

1. What is the main purpose of encryption?

MULTIPLE CHOICE

Correct Answer:

- A. To write stories ✗ Incorrect
- B. To make computers faster ✗ Incorrect
- C. To keep messages and information secret ✓ Correct
- D. To play games online ✗ Incorrect

Explanation:

Encryption hides information so only the right people can read it.

2. What do you need in order to read an encrypted message?

MULTIPLE CHOICE

Correct Answer:

- A. A flashlight ✗ Incorrect
- B. A secret key or pattern ✓ Correct
- C. A math book ✗ Incorrect
- D. A compass ✗ Incorrect

Explanation:

Think of encryption like a puzzle—you need something special to solve it.

3. What is Morse code made of?

MULTIPLE CHOICE

Correct Answer:

- A. Letters and numbers ✗ Incorrect

B. Pictures and emojis

✗ Incorrect

C. Dots and dashes

✓ Correct

D. Stars and arrows

✗ Incorrect

Explanation:

Morse code messages are made of short and long beeps.

4. True or False: Encryption has only been used in the last 100 years.

MULTIPLE CHOICE

Correct Answer:

A. True

✗ Incorrect

B. False

✓ Correct

Explanation:

Think about the Romans and other ancient civilizations.

5. What role does encryption play when you log in to a website?

MULTIPLE CHOICE

Correct Answer:

A. It makes the website load faster

✗ Incorrect

B. It hides your personal information from others

✓ Correct

C. It changes the color of the screen

✗ Incorrect

D. It creates a map of the site

✗ Incorrect

Explanation:

It keeps your login details safe from hackers.

Games

1. Encryption and Decoding Typing

2. Encryption and Decoding Memory

Memory Game Pairs:

1. **A●-** An "A" with a dot and a dash ↔ **A●-** An "A" with a dot and a dash
2. **T-** A "T" with a dash ↔ **T-** A "T" with a dash
3. **N-●** An "N" with a dash and a dot ↔ **N-●** An "N" with a dash and a dot
4. **R●-●** An "R" with a dot, a dash, and a dot ↔ **R●-●** An "R" with a dot, a dash, and a dot
5. **S●●●** An "S" with three dots ↔ **S●●●** An "S" with three dots

Students must find all matching pairs by flipping cards and remembering their positions.