

# Loops

## Textbook

# Loops



Giving people directions is a great way to help them reach a destination. Telling them how many steps to take, one by one, would be the WORST way to give directions! If you had to tell them to take every single step while walking that would take forever! Instead, we could tell them to repeat the movement until they reach the destination. That's how loops work in coding—they save time by repeating actions automatically. In this lesson, you'll learn how to use loops to make your micro:bit display patterns again and again without extra coding.

A [loop](#) runs code some number of times. Coders use loops to save time! For example, if I wanted my code to show a happy face and then a heart three times, I can use a loop to do that instead of coding three different instances.

## Finding Patterns and Making Sense

Computers love patterns, and so do mathematicians! When you use loops, you are actually using patterns and structure to help understand and connect mathematical ideas.

Here's how loops show us patterns:

- **Spotting Repetition:** Loops help us see when things repeat. If you have to do the same thing over and over, that's a pattern! Loops let us use that pattern in our code.
- **Building a Plan:** When you decide how many times a loop should run, you're making a logical plan. This is like planning out steps in a math problem.

- **Connecting Ideas:** Loops connect the idea of repetition (a pattern) to saving time (efficiency), which is a big idea in math and computer science.
- **Looking for Similarities:** Once you learn about loops, you'll start seeing patterns and repetition everywhere – in music, in dance, in how seasons change, and in other coding problems! Loops help you solve similar problems in different situations.

## Assessing Your Solutions: Does It Make Sense?

When you create a loop, it's really important to assess the reasonableness of your solution. This means asking yourself: "Does my code actually do what I want it to do? Does it make sense?"

Here's how to check your work:

- **Estimate First:** Before you run your code, predict what you think the micro:bit will do. If you tell it to repeat 3 times, do you expect to see the pattern 3 times?
- **Check Calculations:** If you set a loop to run 5 times, does it really show the pattern 5 times, or does it do it 4 or 6 times? Watch closely!
- **Verify Your Plan:** Explain your loop to a friend. "My code should show a heart and a smiley face, and then *repeat that two more times* for a total of three." Does your explanation match what the micro:bit does?

By asking "Does this solution make sense? How do you know?", you'll become a super coder who always checks their work!

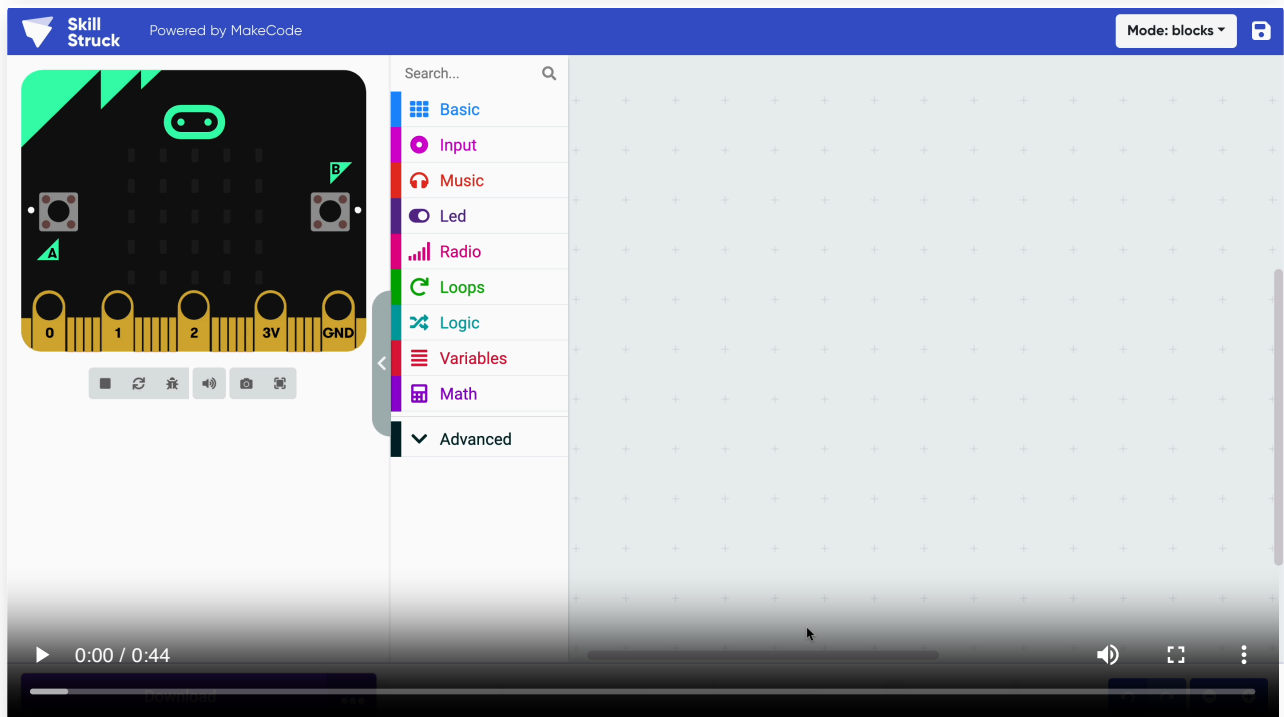
## Code It!: Loops

1. Drag the `on start` block into your code editor.
2. Drag a `repeat # times` block into your code editor and connect it in the `on start` block.
3. Drag two `show icon` blocks and connect them in the `repeat # times` block.
4. Select a heart icon and then the smiley icon on the two `show icon` blocks.
5. Then, type the number 3 in the loop block.

This code tells the micro:bit to show a heart and then a smiley face on repeat three times when you press the play button.

## Forever Loops

`Forever` loop blocks run your code over and over until you tell it to stop. `Forever` blocks can be helpful when you want the same code to repeat nonstop.



## Code It!: Forever Loops

Practice coding an algorithm that shows a heart and then a smiley face on repeat.

1. Drag a **forever** block into your code editor.
2. Drag two **show icon** blocks and connect them in the **forever** block.
3. Select a heart icon and then the smiley icon on the two **show icon** blocks.

When you hit play to start the code, those two things should happen on repeat forever.

*Adopted from [microbit.org](https://microbit.org) platform*

## Critical Thinking Questions

1. How do loops make coding more efficient? Can you think of examples outside of computers where repetition is useful?
2. Why might a forever loop be useful in a program? When might you NOT want to use one?
3. How could loops be used in a real-world invention to help people in their daily lives?

## Questions (5)

### 1. What does a repeat # times loop do?

MULTIPLE CHOICE

Choose the correct answer:

- A. Runs code only once
- B. Runs code many times until you stop it
- C. Runs code a certain number of times you choose
- D. Runs code only when you press a button

### 2. You are coding a light to blink on and off again and again continually. Which block is best for this?

MULTIPLE CHOICE

Choose the correct answer:

- A. Repeat 1 time
- B. Show once
- C. Forever block
- D. On start block

### 3. Why do coders use loops in their programs?

MULTIPLE CHOICE

Choose the correct answer:

- A. To make the code longer
- B. To repeat actions without writing them over and over
- C. To break the program
- D. To confuse people

### 4. You used a loop to show a heart and smiley three times. What would you change to make it happen five times instead?

MULTIPLE CHOICE

Choose the correct answer:

- A. Change the heart icon
- B. Add more show icon blocks
- C. Change the number in the repeat block to 5
- D. Use a forever block

## 5. What is the main difference between a repeat loop and a forever loop?

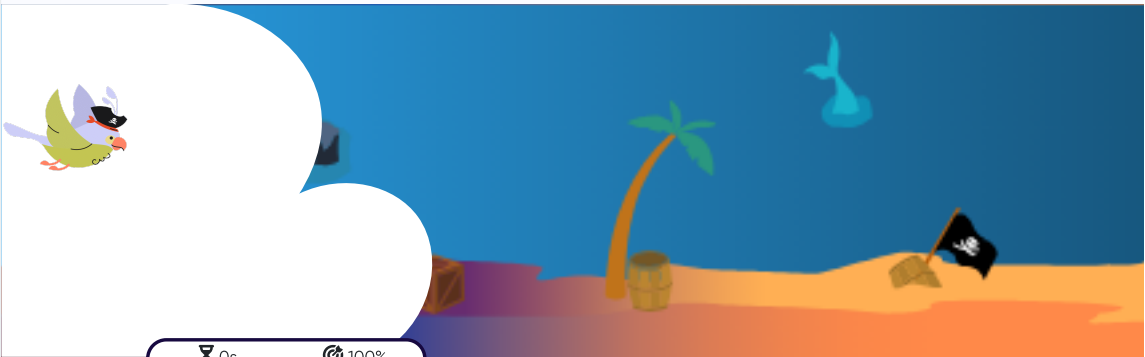
Choose the correct answer:

- A. Repeat loops are used only for games
- B. Repeat loops stop after a number of times; forever loops don't.
- C. Repeat loops go on forever
- D. They do the same thing

## Games (2)

### 1. Loops Typing

Full Screen Audio Instructions Restart Pause



0s 100%

Loops save time by repe

2. Loops Memory

Full Screen

Audio

Instructions

Answer Key

Pause

Flips: 0

1on start

2show icon

3Forever




4repeat # times

5Forever

6show icon

7on start

8repeat # times



# Robotics Challenges (10)

## 1. Repeating Pattern

Challenge

Textbook

### Repeating Pattern

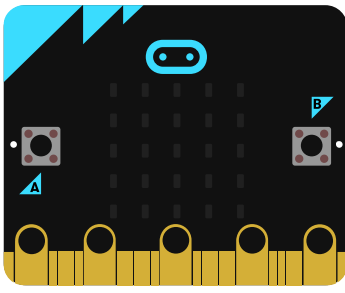
Create a repeating pattern of 2 icons using the **forever** block.

**Requirements**

- Use a forever block in your code.
- Show two icons.

Answer Key

Submit



Search...

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

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...

## 2. A Mix of Six

Challenge

Textbook

### A Mix of Six

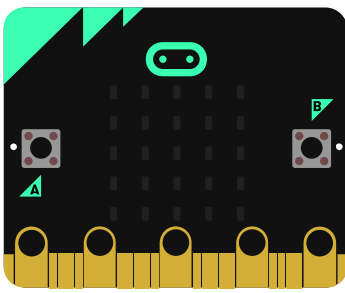
Create a repeating pattern of 6 icons using the **forever** block.

**Requirements**

- Use a forever block in your code.
- Show a pattern of 6 icons.

Answer Key

Submit



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### 3. A Word That Describes You

Challenge

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#### A Word That Describes You

Code the micro:bit to repeat a word that describes yourself.

You will need a string block and forever loop block for this challenge.

Requirements

Use a forever block in your code.

Show a word that best describes you.

Answer Key

Submit

Step 1

Begin with the **forever** block.

A Word That Describes You Step 1 of 3

1 Next

Toolbox

Search...

Basic

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### 4. Hands Up

Challenge

Textbook

#### Hands Up

Create a person on the micro:bit waving their hands up and down 4 times.

Requirements

Use an 'on start' block and create a loop that repeats 4 times.

Create designs that make a look like a person is waving their arms up and down.

Answer Key

Submit

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## 5. Lemonade For Sale!

Challenge

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Lemonade For Sale!

Imagine you are running a lemonade stand.

Code the micro:bit to show a flashing sign to advertise your lemonade! Then, program the code to repeat 4 times.

### Requirements

- Use an 'on start' block and create a loop that repeats 4 times.
- Show a lemonade sign using a string block.

Answer Key

Submit

Basic

Input

Music

Led

Radio

Loops

Logic

Variables

Math

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forever

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## 6. Dance Dance

Challenge
 Textbook

## Dance Dance

Create a person on the micro:bit using a **show LEDs** block. Program the person to look like they are dancing nonstop.

**Requirements**

- Use a forever block in your code.
- Create designs that make it look like a person is dancing.

Answer Key 
  
Submit

Search...  
  
 Basic  
 Input  
 Music  
 Led  
 Radio  
 Loops  
 Logic  
 Variables  
 Math  
 Extensions  
 Advanced

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## 7. Beating Heart

[illegible]

## 8. Countdown from 5

Challenge
 Textbook

## Countdown from 5

Create a repeating countdown timer from the number 5. You will need a separate block for each number.

---

Countdown from 5
Step 1 of 1

1
 Done

---

### Requirements

- Use a forever block in your code.
- Use 'show number' blocks to code a countdown beginning with 5 and ending in 0.

**Answer Key**

**Submit**

## Step 1

Create a repeating countdown timer from the number 5. You will need a separate block for each number.

Countdown from 5 Step 1 of 1

1
 Done

---

### Toolbox

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forever

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## 9. Jumping Animal

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### Jumping Animal

Create an animal using the **Show LEDs** block. Then, program the animal to move up and down nonstop, like it's jumping, on the micro:bit.

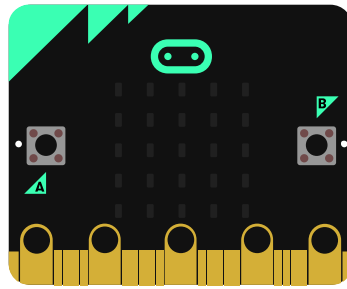
#### Requirements

Use a forever block in your code.

Code at least 2 'show LEDs' blocks to show an animal jumping up and down.

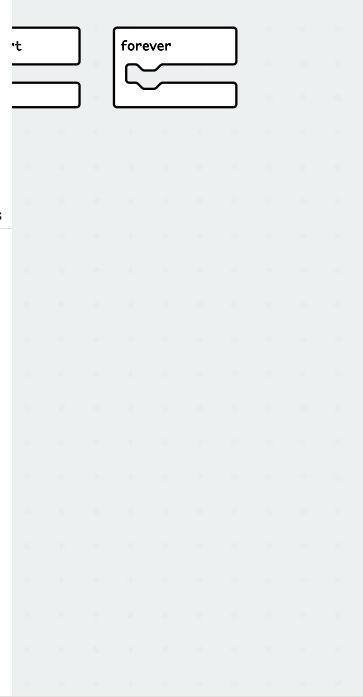
Answer Key

Submit



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## 10. Flashing Emotions

Challenge

Textbook

### Flashing Emotions

Flash at least 3 different emotions on the micro:bit. These flashing emotions should repeat 5 times.

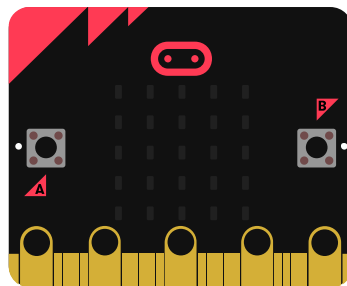
#### Requirements

Flash 3 different emotions

Use a 'repeat' loop block in your code

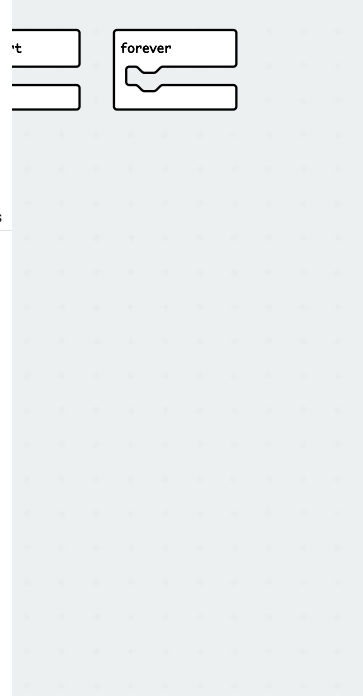
Answer Key

Submit



Search...

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## Answer Keys & Solutions

### Questions

#### 1. What does a repeat # times loop do?

MULTIPLE CHOICE

Correct Answer:

- A. Runs code only once ✗ Incorrect
- B. Runs code many times until you stop it ✗ Incorrect
- C. Runs code a certain number of times you choose ✓ Correct
- D. Runs code only when you press a button ✗ Incorrect

#### Explanation:

You decide how many times the loop repeats.

#### 2. You are coding a light to blink on and off again and again continually. Which block is best for this?

MULTIPLE CHOICE

Correct Answer:

- A. Repeat 1 time ✗ Incorrect
- B. Show once ✗ Incorrect
- C. Forever block ✓ Correct
- D. On start block ✗ Incorrect

#### Explanation:

Forever blocks keep going.

#### 3. Why do coders use loops in their programs?

MULTIPLE CHOICE

Correct Answer:

A. To make the code longer

✗ Incorrect

B. To repeat actions without writing them over and over

✓ Correct

C. To break the program

✗ Incorrect

D. To confuse people

✗ Incorrect

#### Explanation:

Loops help save time and make code shorter.

**4. You used a loop to show a heart and smiley three times. What would you change to make it happen five times instead?**

MULTIPLE CHOICE

**Correct Answer:**

A. Change the heart icon

✗ Incorrect

B. Add more show icon blocks

✗ Incorrect

C. Change the number in the repeat block to 5

✓ Correct

D. Use a forever block

✗ Incorrect

#### Explanation:

You can change how many times a loop runs by changing the number.

**5. What is the main difference between a repeat loop and a forever loop?**

MULTIPLE CHOICE

**Correct Answer:**

A. Repeat loops are used only for games

✗ Incorrect

B. Repeat loops stop after a number of times; forever loops don't.

✓ Correct

C. Repeat loops go on forever

✗ Incorrect

D. They do the same thing

✗ Incorrect

### 1. Loops Typing

*Typing game - no answer key needed. Students practice typing the provided content.*

### 2. Loops Memory

**Memory Game Pairs:**

1. ↔
2. ↔
3. ↔
4. ↔

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