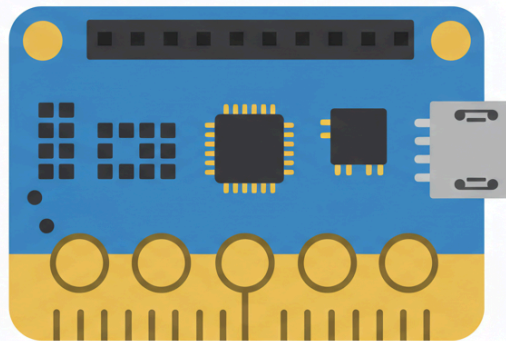


Getting to Know the micro:bit Robot

Textbook

Getting to Know the micro:bit Robot



Introduction to Robotics

[Robotics](#) has come a long way, evolving from simple machines to advanced robots capable of complex tasks. Today, robots are used in many areas, like medicine, space, and homes, thanks to improvements in AI and sensors.

Robots help solve human challenges in many ways. In healthcare, they assist with precise surgeries. They also work in dangerous places, like defusing bombs or exploring deep oceans, keeping people safe. Additionally, robots

Robots are often inspired by nature. For example, robotic arms and legs are modeled after human limbs to mimic movement. Some robots copy insects or birds to move efficiently in tasks like search-and-rescue. Even plant growth has inspired robots that adapt and move in different environments. By studying nature, engineers make robots that are more flexible and efficient. assist in caring for the elderly and helping those with disabilities.

Welcome to the micro:bit Tutorial

Watch this video first to get to know your microbit:



What is the micro:bit?

The [micro:bit](#) is a pocket-sized robot. You can program this robot with code that you create!! The programs you write are downloaded to the micro:bit's processor. The micro:bit then follows the instructions in the code, essentially doing what you told it to do. Learn more about the micro:bit's processor by watching this video:



Writing Programs with Algorithms

So where do we write these programs that will be played on the micro:bit? We will learn how to use algorithms to tell the micro:bit what to do. An [algorithm](#) is a set of clearly defined, logical steps to solve a problem. An algorithm is like a set of step-by-step instructions for solving a problem or completing a task.

This course uses the micro:bit simulator. Let's go over how to use it!

Show a Heart

Let's start programming the micro:bit! The micro:bit has lights that can show different shapes. Let's try some out. To show a heart, use the following code.

```
1 basic.show_icon(IconNames.HEART)
```

Try it!

Now, when you hit "Run", the micro:bit will show a heart shape.

Something to keep in mind, in Python you must match capitalization, spacing, punctuation, and spelling exactly. So if it's not working, check to make sure it matches exactly.

Show Other Icons

Now, to make different shapes, replace the word HEART in your code with other names.

```
1 basic.show_icon(IconNames.HAPPY)
```

Try it!

Here's a list of icons you could try.

SMALL_HEART	MEH	GIRAFFE	TRIANGLE
YES	TSHIRT	SKULL	LEFT_TRIANGLE
NO	ROLLERSKATE	UMBRELLA	CHESSBOARD
SAD	DUCK	SNAKE	DIAMOND
CONFUSED	HOUSE	RABBIT	SMALL_DIAMOND
ANGRY	TORTOISE	COW	SQUARE
ASLEEP	BUTTERFLY	QUARTER_NOTE	SMALL_SQUARE
SURPRISED	STICK_FIGURE	EIGHTH_NOTE	SCISSORS
SILLY	GHOST	PITCHFORK	
FABULOUS	SWORD	TARGET	

Pause

Want your icon to stick around longer? Add a pause in your algorithm after the heart icon block to tell the computer you want it to pause here for some amount of time.

```
1 basic.pause(2000)
```

The pause number is measured in milliseconds. This means that entering 2000 will pause for 2 seconds. 5000 will pause for 5 seconds.

You will also notice that your code runs top to bottom. The first line of code will run first, then the next one, and so on. So if you want your program to pause, you need to put the `basic.pause()` code right in the spot you want the program to pause.

```
1 basic.show_icon(IconNames.HEART)
2 basic.show_icon(IconNames.HAPPY)
3 basic.pause(2000)
4 basic.show_icon(IconNames.SILLY)
```

Adopted from microbit.org platform

Critical Thinking Questions

- Robots are often inspired by nature. Can you think of a specific animal or plant that could inspire a new type of robot to solve a real-world problem, and explain why?
- If an algorithm is a set of step-by-step instructions, how is writing an algorithm for a robot like planning out a detailed recipe for cooking?
- How is a robot performing a series of actions, like showing an icon then pausing, similar to how a traffic light works to control cars?

Questions (10)

1. You want to make a program that shows three different icons in a row with a 1-second pause between each one. How many pause commands do you need?

MULTIPLE CHOICE

Choose the correct answer:

- A. 0 pause commands
- B. 1 pause command
- C. 2 pause commands
- D. 3 pause commands

2. A student writes this code but the micro:bit shows an error. What is most likely wrong?

MULTIPLE CHOICE

```
basic.show_icon(IconNames.heart)
```

Choose the correct answer:

- A. The word "heart" should be "HEART"
- B. There should be no parentheses
- C. The word "basic" is spelled wrong
- D. The code needs a pause command

3. You want to create a story using icons where a house appears, then after 2 seconds a rabbit appears, then after another 2 seconds a butterfly appears. Which code structure makes the most sense?

MULTIPLE CHOICE

Choose the correct answer:

- A. Show all icons first, then add all pauses
- B. Show house, pause, show rabbit, pause, show butterfly
- C. Add all pauses first, then show all icons
- D. Show icons with no pauses between them

4. A student wants their program to pause for half a second. What number should they use in the pause command?

MULTIPLE CHOICE

Choose the correct answer:

- A. 0.5
- B. 50
- C. 500
- D. 5000

5. Looking at this code, what will happen when you run it?

```
basic.show_icon(IconNames.HAPPY) basic.show_icon(IconNames.SAD) basic.pause(1000)
basic.show_icon(IconNames.ANGRY)
```

Choose the correct answer:

- A. Happy face shows for 1 second, then sad face shows, then angry face shows
- B. Happy face shows, then sad face shows, then 1-second pause, then angry face shows
- C. All three faces show at the same time with a 1-second delay
- D. Only the angry face will show after 1 second

6. You want to make a simple animation that shows a small heart, then a regular heart, then a small heart again. Which icons from the list would work best?

MULTIPLE CHOICE

Choose the correct answer:

- A. HEART, SMALL_HEART, HEART
- B. SMALL_HEART, HEART, SMALL_HEART
- C. HEART, HEART, SMALL_HEART
- D. SMALL_HEART, SMALL_HEART, HEART

7. A student wants to show a duck icon but their code shows an error. What is wrong with their code?

MULTIPLE CHOICE

```
basic.show_icon(IconNames.DUCK )
```

Choose the correct answer:

- A. There should be a space before "DUCK"
- B. There should be no space after "DUCK"
- C. There should be spaces around the parentheses
- D. The spacing is correct

8. You want to create a program that shows different shapes in this pattern: triangle, pause, square, pause, diamond. How many total lines of code will you need?

MULTIPLE CHOICE

Choose the correct answer:

- A. 3 lines
- B. 5 lines
- C. 6 lines
- D. 8 lines

9. Debug the following code:

DEBUG CODE

Code to Debug:

```
1 basic.showicon(IconNames.HEART)
```

10. Debug the following code:

DEBUG CODE

Code to Debug:

```
1 basic.show_icon(IconNames.happy)
2 basic.pause(2000)
```

Robotics Challenges (5)

1. Beating Heart

Challenge

Textbook

Beating Heart

Create a program where the micro:bit shows a heart icon. The icon will alternate between the **HEART** and the **SMALL_HEART** icons, so that it looks like a beating heart.

Requirements

Display the HEART icon 3 times

Display the SMALL_HEART icon 3 times

Answer Key

Submit

Step 1

Display the **HEART** icon

Beating Heart Step 1 of 3

1

Next

Toolbox

1 def on_forever():

2 pass

3 basic.forever(on_forever)

4

Download

2. Growing Diamond

Challenge

Textbook

Growing Diamond

Create a program the looks like a diamond growing two times.

Start by displaying the **SMALL_DIAMOND** icon.

Then display the **TARGET** icon.

Finally, display the **DIAMOND** icon.

Display each icon 2 times.

Requirements

Show the SMALL_DIAMOND icon twice

Show the TARGET icon twice

Show the DIAMOND icon twice

Answer Key

Step 1

Display the **SMALL_DIAMOND** icon

Growing Diamond Step 1 of 4

1

Next

Toolbox

1 start

forever

Basic

Download

3. Your Mood

Challenge

Textbook

🔊 Your Mood

Create a program where the micro:bit displays three icons that reflects how you are feeling today!

Requirements

Display 3 icons.

Answer Key

Submit

Search...

Basic
Input
Music
Led
Radio
Loops
Logic
Variables
Math
Advanced

art

forever

Oops, there is a problem converting your code to Python.

We are unable to convert your code to Python.

Done

Download

4. Icon Story

Challenge

Textbook

🔊 Icon Story

Create a story using at least 5 icons. Using just images you can tell a short story!

Requirements

Display at least 5 icons.

Answer Key

Submit

Step 1

Display an icon showing an emotion you've felt today.

Icon Story Step 1 of 2

1 Next

Toolbox

1 def on_forever():
2 pass
3 basic.forever(on_forever)
4

Download

5. Emoji Party!

Challenge

Textbook

Emoji Party!

Display all the different emoji faces that the micro:bit can do!

In any order display the following icons: **HAPPY**, **SAD**, **CONFUSED**, **ANGRY**, **ASLEEP**, **SURPRISED**, **SILLY**, **FABULOUS**, **MEH**

Requirements

Display at least 9 icons.

Answer Key

Submit

Step 1

Display an emoji icon

EMOJI PARTY Step 1 of 2



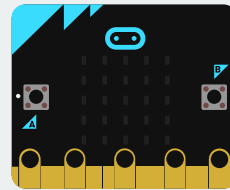
1

Next

Toolbox

Search

```
1 def on_forever():
2     pass
3     basic.forever(on_forever)
4
```



Download



Answer Keys & Solutions

Questions

1. You want to make a program that shows three different icons in a row with a 1-second pause between each one. How many pause commands do you need?

MULTIPLE CHOICE

Correct Answer:

- | | |
|---------------------|-------------|
| A. 0 pause commands | ✗ Incorrect |
| B. 1 pause command | ✗ Incorrect |
| C. 2 pause commands | ✓ Correct |
| D. 3 pause commands | ✗ Incorrect |

Explanation:

Think about where you need pauses between the three animals.

2. A student writes this code but the micro:bit shows an error. What is most likely wrong?

MULTIPLE CHOICE

Correct Answer:

- | | |
|---------------------------------------|-------------|
| A. The word "heart" should be "HEART" | ✓ Correct |
| B. There should be no parentheses | ✗ Incorrect |
| C. The word "basic" is spelled wrong | ✗ Incorrect |
| D. The code needs a pause command | ✗ Incorrect |

Explanation:

Python cares about using capital and lowercase letters correctly.

3. You want to create a story using icons where a house appears, then after 2 seconds a rabbit appears, then after another 2 seconds a butterfly appears. Which code structure makes the most sense?

MULTIPLE CHOICE

Correct Answer:

- A. Show all icons first, then add all pauses ✗ Incorrect
- B. Show house, pause, show rabbit, pause, show butterfly ✓ Correct
- C. Add all pauses first, then show all icons ✗ Incorrect
- D. Show icons with no pauses between them ✗ Incorrect

4. A student wants their program to pause for half a second. What number should they use in the pause command?

MULTIPLE CHOICE

Correct Answer:

- A. 0.5 ✗ Incorrect
- B. 50 ✗ Incorrect
- C. 500 ✓ Correct
- D. 5000 ✗ Incorrect

Explanation:

Remember that pause time is measured in milliseconds, not seconds.

5. Looking at this code, what will happen when you run it?

MULTIPLE CHOICE

Correct Answer:

- A. Happy face shows for 1 second, then sad face shows, then angry face shows ✗ Incorrect
- B. Happy face shows, then sad face shows, then 1-second pause, then angry face shows ✓ Correct
- C. All three faces show at the same time with a 1-second delay ✗ Incorrect
- D. Only the angry face will show after 1 second ✗ Incorrect

Explanation:

Each line of code happens one after another in order.

6. You want to make a simple animation that shows a small heart, then a regular heart, then a small heart again. Which icons from the list would work best?

MULTIPLE CHOICE

Correct Answer:

- A. HEART, SMALL_HEART, HEART ✗ Incorrect
- B. SMALL_HEART, HEART, SMALL_HEART ✓ Correct
- C. HEART, HEART, SMALL_HEART ✗ Incorrect
- D. SMALL_HEART, SMALL_HEART, HEART ✗ Incorrect

Explanation:

Start with the small version, grow to big, then shrink back to small.

7. A student wants to show a duck icon but their code shows an error. What is wrong with their code?

MULTIPLE CHOICE

Correct Answer:

- A. There should be a space before "DUCK" ✗ Incorrect
- B. There should be no space after "DUCK" ✓ Correct
- C. There should be spaces around the parentheses ✗ Incorrect
- D. The spacing is correct ✗ Incorrect

Explanation:

Extra spaces in the wrong places can cause problems in Python code.

8. You want to create a program that shows different shapes in this pattern: triangle, pause, square, pause, diamond. How many total lines of code will you need?

MULTIPLE CHOICE

Correct Answer:

A. 3 lines

✗ Incorrect

B. 5 lines

✓ Correct

C. 6 lines

✗ Incorrect

D. 8 lines

✗ Incorrect

Explanation:

Count each show command and each pause command you need.

9. Debug the following code:

DEBUG CODE

Incorrect Code:

```
1 basic.showicon(IconNames.HEART)
```

Correct Solution:

```
1 basic.show_icon(IconNames.HEART)
```

Explanation:

This code is missing an underscore.

10. Debug the following code:

DEBUG CODE

Incorrect Code:

```
1 basic.show_icon(IconNames.happy)
2 basic.pause(2000)
```

Correct Solution:

```
1 basic.show_icon(IconNames.HAPPY)
2 basic.pause(2000)
```

Explanation:

Icon names need to be capitalized