

LEDs, Debugging, and Troubleshooting

Textbook

LEDs, Debugging, and Troubleshooting

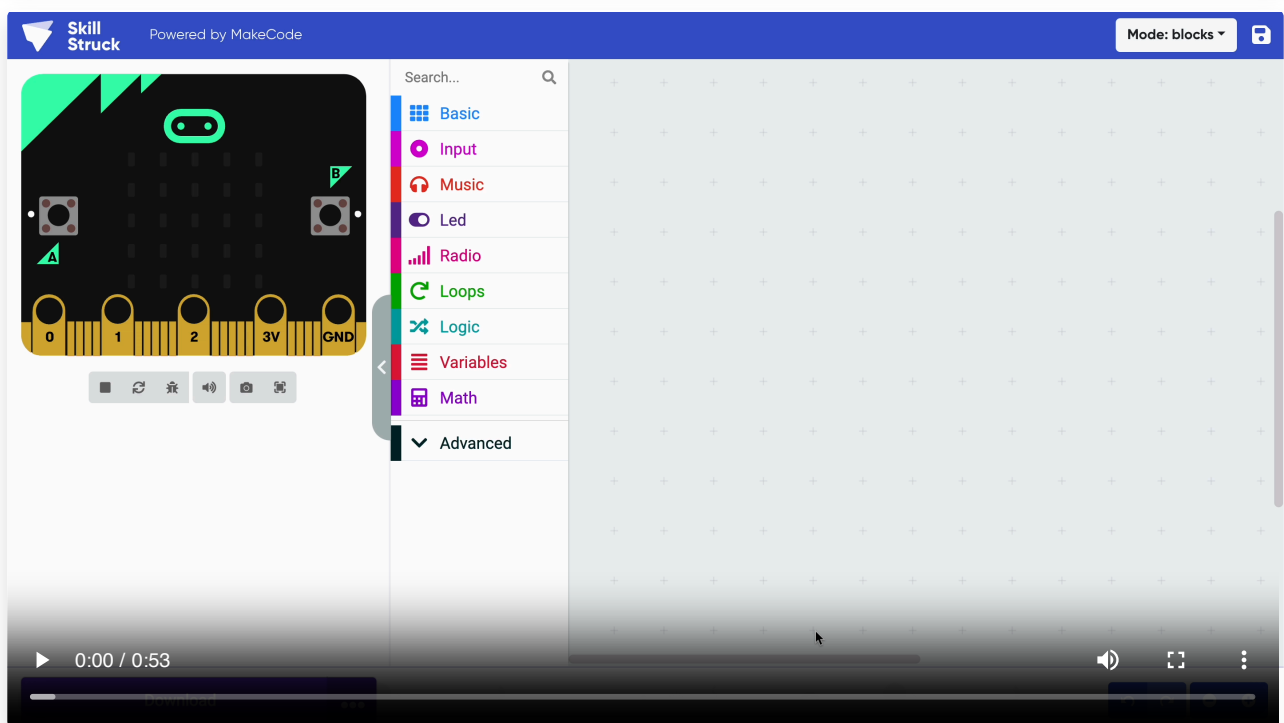


Clock is ticking down in the game, you have the ball, ready to make the final shot. You press the shoot button on the controller...nothing happens. You get super frustrated! Technology isn't perfect, and sometimes we have to figure out what went wrong. That's where debugging and troubleshooting come in! Just like detectives solve mysteries, programmers and engineers solve problems in their code and devices. Today, you'll learn how to create custom LED designs on the micro:bit and how to fix errors when things don't go as planned.

LEDs and Outputs

You have learned how to show icons, but what if you could create your own icon using the micro:bit's LEDs? [LED](#) stands for "Light Emitting Diode." It's a tiny electronic device that can make light when electricity goes through it. We use LEDs in lights, signs, and even in some toys!

Watch this video to learn more about the micro:bit's LEDs.

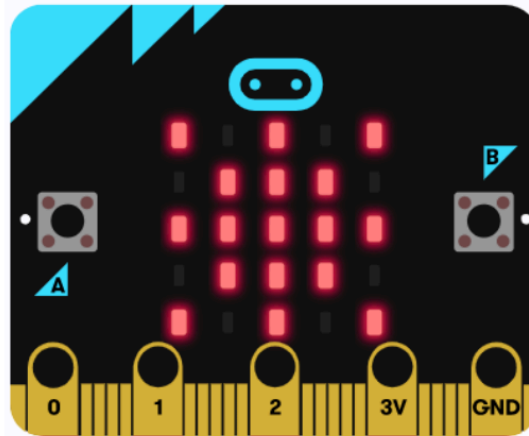


Code It! – Show LEDs

Let's practice coding a snowflake design to appear on the micro:bit.

1. Drag the **on start** block into the code editor.
2. Drag the **show LEDs** block and connect it within the **on start** block. Both blocks can be found in the *basic* category.
3. Design a snowflake design on the **show LEDs** block.

This will tell the micro:bit to show your snowflake design when you click play.



Downloading to the micro:bit

Once you have finished coding your program on the platform, it's time to try it on the micro:bit if you have a physical one available. Remember, you can do this by following 2 basic steps.

1. Download your program from the code editor on your computer. Your program needs to download as a **.hex file**.
2. Transfer the program from your computer to the micro:bit where it is stored in the micro:bit's memory. We call this "flashing", because the micro:bit stores it in its flash memory. To do this, plug the USB cable into the USB port at the top of the micro:bit. Then, plug the other end of the cable into the USB socket of your computer. You should see the micro:bit appear on your computer like a USB drive. Look for **MICROBIT**. As the program is copying over, you'll see a light blinking on the micro:bit. When the light stops blinking you can test out your programming creation!

Important note: **DO NOT DELETE** the two files in the MICROBIT extension.

Adopted from microbit.org platform

Debugging and Troubleshooting

[Troubleshooting](#) is the process of identifying, assessing, and solving problems or issues that come up with computers, electronic devices or systems.

Sometimes, computers can have problems just like puzzles that need solving. Here are some common troubleshooting steps to help fix computer issues:

- Check if the computer is plugged in and turned on.
- Make sure all cables are connected properly.
- Restart the computer to see if that solves the problem.
- Check for error messages on the screen and search online for solutions.

Debugging in Programming



When we write computer programs, sometimes they don't work as expected. This is where debugging comes in handy. Debugging is like being a detective, finding and fixing mistakes in the code.

There are different kinds of mistakes, or "bugs," that can sneak into our programs:

- **Syntax Errors:** These are like spelling or grammar mistakes in your code. For example, typing `prtn` instead of `print`. The computer usually tells you about these right away!
- **Logical Errors:** These are trickier! A logical error means your code *looks* correct, but it doesn't do what you *want* it to do. It's like giving someone directions to the park, but your directions actually lead them to the library instead. The directions are clear, but they lead to the wrong place!

Here are some steps to debug a program:

- Read the code carefully to understand what it's supposed to do.
- Look for any errors or bugs in the code, like missing punctuation or typos.
- Use print statements to check the values of variables as the program runs.
- Break the code into smaller parts and test each part individually.
- Use a debugger tool to step through the code and see where it goes wrong.
- Make changes to the code to fix the bugs.
- Test the program again to make sure it works correctly.

When Software Acts Up: Troubleshooting Tips

Sometimes, the programs you use on your computer don't work right. Don't worry! This is called **troubleshooting**, which means finding out why something isn't working and fixing it. It's like being a computer helper!

Here are some common problems and simple ways to try and fix them:

Problem 1: The Screen Looks Stuck or Funny

- **Try This: Refresh the Screen!**

- Press the **F5 key** on your keyboard. Or, if you're on a website, click the circular arrow button next to the address. This is like giving your screen a quick clean-up!

Problem 2: An App Stops Working or Freezes

- **Try This First: Close and Reopen the App!**

- Click the "X" to close the program. Then, open it again.

- **If That Doesn't Work: Restart Your Computer!**

- Turn your computer all the way off, wait a moment, then turn it back on. This gives your computer a fresh start!

Problem 3: An App Still Has Problems or Won't Start

- **Check If It Fits (Compatibility):**

- Some apps only work on certain computers. Check if your computer is strong enough or new enough for the app. The app's box or website will usually tell you.

- **Get Updates:**

- Software programs get better over time with **updates!** These updates fix problems. If an app isn't working, see if there's an update and install it. This is super important for games and web browsers!

Imagine you're playing a video game on your computer, but it suddenly freezes. Here's how you could troubleshoot the problem:

- First, try closing the game and reopening it to see if that solves the issue.
- If it keeps freezing, check if your computer meets the game's system requirements.
- Update your graphics drivers to the latest version.
- If the problem persists, search online for solutions or contact the game's support team for help.

Critical Thinking Questions

1. Why do you think debugging is such an important skill for programmers and engineers?
2. Can you think of a time when you had to troubleshoot a problem, even if it wasn't related to computers? How did you solve it?
3. If you designed a robot, what troubleshooting steps would you include to make sure it always works properly?

Questions (5)

1. You wrote code to show a snowflake design on the micro:bit LEDs, but nothing lights up when you run it. What is the best first step to debug this?

MULTIPLE CHOICE

Choose the correct answer:

- A. Redesign the snowflake pattern
- B. Check if the micro:bit is connected and turned on
- C. Delete all files from the micro:bit USB drive
- D. Update your graphics drivers

2. You see an error message when running your micro:bit program. What is a useful way to find exactly where the code breaks?

MULTIPLE CHOICE

Choose the correct answer:

- A. Break the code into smaller parts and test each one
- B. Delete the entire program and start over
- C. Ignore the error message and try again
- D. Copy someone else's code without checking

3. When troubleshooting a frozen video game, what is a good troubleshooting approach?

MULTIPLE CHOICE

Choose the correct answer:

- A. Closing and reopening the game to test if the freeze stops
- B. Ignoring the freeze and playing another game
- C. Restarting your phone instead of your computer
- D. Buying a new computer immediately

4. Your micro:bit LEDs are supposed to show a heart, but instead they show random lights. What is the best debugging step?

MULTIPLE CHOICE

Choose the correct answer:

- A. Step through the code line by line and look for bugs
- B. Replace the micro:bit with a new one without testing
- C. Delete all your programs from the computer
- D. Use a different USB cable without checking code

5. What is the correct order of steps when downloading your micro:bit program?

MULTIPLE CHOICE

Choose the correct answer:

- A. Download the .hex file, connect micro:bit via USB, copy file to micro:bit
- B. Connect micro:bit via USB, copy file, then download .hex file
- C. Delete micro:bit files, download .hex file, connect micro:bit
- D. Restart your computer, then download .hex file, then connect micro:bit

Games (2)

1. LEDs, Debugging, and Troubleshooting Typing


Full Screen

Audio

Instructions

Restart

Pause



0s 100%

Technology isn't perfect,

2. LEDs, Debugging, and Troubleshooting Category

Full Screen

Audio

Instructions

Answer Key

Pause

Clear All

Check Order

Attempts: 0

Randomly pressing buttons without knowing what they do.

Check for error messages on the screen and search online for solutions.

Restart the computer to see if that solves the problem.

Check if the computer is plugged in and turned on.

Unplugging everything without checking or labeling cables.

Getting frustrated and giving up right away.

Ignoring any error messages or warnings.

Make sure all cables are connected properly.

Helpful Troubleshooting Strategies

Unhelpful Troubleshooting Strategies

Robotics Challenges (6)

1. The Letter 'C'

[Challenge](#)
[Textbook](#)

The Letter 'C'

Create the letter C on your LED screen using the **show LEDs** block. C stands for coding!

Requirements

Create the letter C on your 'show leds' block

[Submit ↗](#)

[Download](#)

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

2. Favorite Animal

[Challenge](#)
[Textbook](#)

Favorite Animal

What is your favorite animal? Try and recreate your favorite animal on the LED display.

Requirements

Recreate your favorite animal on the LED display

[Answer Key](#)

[Submit](#)

[Download](#)

3. Checkerboard

Challenge

Textbook

Checkerboard

Create a checkerboard using the **show LEDs** block and program it to show when you press play.

Requirements

- Create a checkerboard design on the 'show LEDs' block.

Answer Key

Submit

Step 1

Begin with the **on start** block. Create a checkerboard that will show when you press play.

Checkerboard Step 1 of 1

1 Done

Toolbox

Search...

Basic

Input

Music

Led

Radio

Loops

Logic

Variables

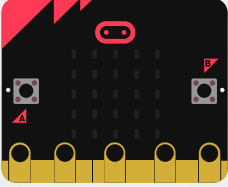
Math

Extensions

Advanced

Download

forever



4. Let it Snow

Challenge

Textbook

Let it Snow

Create a snowflake design using the **show LEDs** block and program it to show when you press play. Then, clear your screen so the screen is left blank.

Requirements

- Create your own snowflake design.
- Clear the screen after your design shows.

Answer Key

Submit

Step 1

Begin with the **on start** block.

Let it Snow Step 1 of 3

1 Next

Toolbox

Search...

Basic

Input

Music

Led

Radio

Loops

Logic

Variables

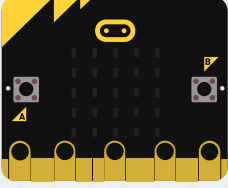
Math

Extensions

Advanced

Download

forever



5. Three Lines

Challenge

Textbook

Three Lines

Code three lines to show on your LED screen using the **Show LEDs** block. Pause your creation for 2 seconds.

Requirements

Design three lines on the 'show LEDs' block.

Pause your code for 2 seconds after the three lines show

Answer Key

Submit

Step 1

Begin with the **on start** block.

Three Lines Step 1 of 6

1

Next

Toolbox

Search...

Basic

Input

Music

Led

Radio

Loops

Logic

Variables

Math

Extensions

Advanced

Download

...

forever

LED screen showing three horizontal lines

6. Flash of Lightning

Challenge

Textbook

Flash of Lightning

Now make your lightning flash!

Code 4 lightning bolts to show. Program the lightning bolts to flash using a **clear screen** and **pause** block between each **LED** block.

Requirements

Show 4 flashing lightning bolts

Use 'clear screen' and 'pause' blocks to make the lightning bolts flash

Answer Key

Submit

Step 1

Begin with the **on start** block.

Flash of Lightning Step 1 of 3

1

Next

Toolbox

Search...

Basic

Input

Music

Led

Radio

Loops

Logic

Variables

Math

Extensions

Advanced

Download

...

forever

LED screen showing 4 flashing lightning bolts

Answer Keys & Solutions

Questions

1. You wrote code to show a snowflake design on the micro:bit LEDs, but nothing lights up when you run it. What is the best first step to debug this?

MULTIPLE CHOICE

Correct Answer:

- A. Redesign the snowflake pattern ✗ Incorrect
- B. Check if the micro:bit is connected and turned on ✓ Correct
- C. Delete all files from the micro:bit USB drive ✗ Incorrect
- D. Update your graphics drivers ✗ Incorrect

Explanation:

Always make sure your device is powered and connected before changing the code.

2. You see an error message when running your micro:bit program. What is a useful way to find exactly where the code breaks?

MULTIPLE CHOICE

Correct Answer:

- A. Break the code into smaller parts and test each one ✓ Correct
- B. Delete the entire program and start over ✗ Incorrect
- C. Ignore the error message and try again ✗ Incorrect
- D. Copy someone else's code without checking ✗ Incorrect

Explanation:

Testing smaller sections helps isolate the problem area.

3. When troubleshooting a frozen video game, what is a good troubleshooting approach?

MULTIPLE CHOICE

Correct Answer:

- A. Closing and reopening the game to test if the freeze stops ✓ Correct
- B. Ignoring the freeze and playing another game ✗ Incorrect
- C. Restarting your phone instead of your computer ✗ Incorrect
- D. Buying a new computer immediately ✗ Incorrect

Explanation:

Testing simple fixes first can solve many problems.

4. Your micro:bit LEDs are supposed to show a heart, but instead they show random lights. What is the best debugging step?

MULTIPLE CHOICE

Correct Answer:

- A. Step through the code line by line and look for bugs ✓ Correct
- B. Replace the micro:bit with a new one without testing ✗ Incorrect
- C. Delete all your programs from the computer ✗ Incorrect
- D. Use a different USB cable without checking code ✗ Incorrect

Explanation:

Looking through each line of code can help to find bugs.

5. What is the correct order of steps when downloading your micro:bit program?

MULTIPLE CHOICE

Correct Answer:

- A. Download the .hex file, connect micro:bit via USB, copy file to micro:bit ✓ Correct
- B. Connect micro:bit via USB, copy file, then download .hex file ✗ Incorrect
- C. Delete micro:bit files, download .hex file, connect micro:bit ✗ Incorrect

D. Restart your computer, then download .hex file, then connect micro:bit

✗ Incorrect

Explanation:

First get the program file ready before moving it to the device.

Games

1. LEDs, Debugging, and Troubleshooting Typing

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

2. LEDs, Debugging, and Troubleshooting Category

Category Solutions:

Category 1: Helpful Troubleshooting Strategies

- Check if the computer is plugged in and turned on.
- Make sure all cables are connected properly.
- Restart the computer to see if that solves the problem.
- Check for error messages on the screen and search online for solutions.

Category 2: Unhelpful Troubleshooting Strategies

- Getting frustrated and giving up right away.
- Ignoring any error messages or warnings.
- Randomly pressing buttons without knowing what they do.
- Unplugging everything without checking or labeling cables.

Students must sort items into their correct categories.