

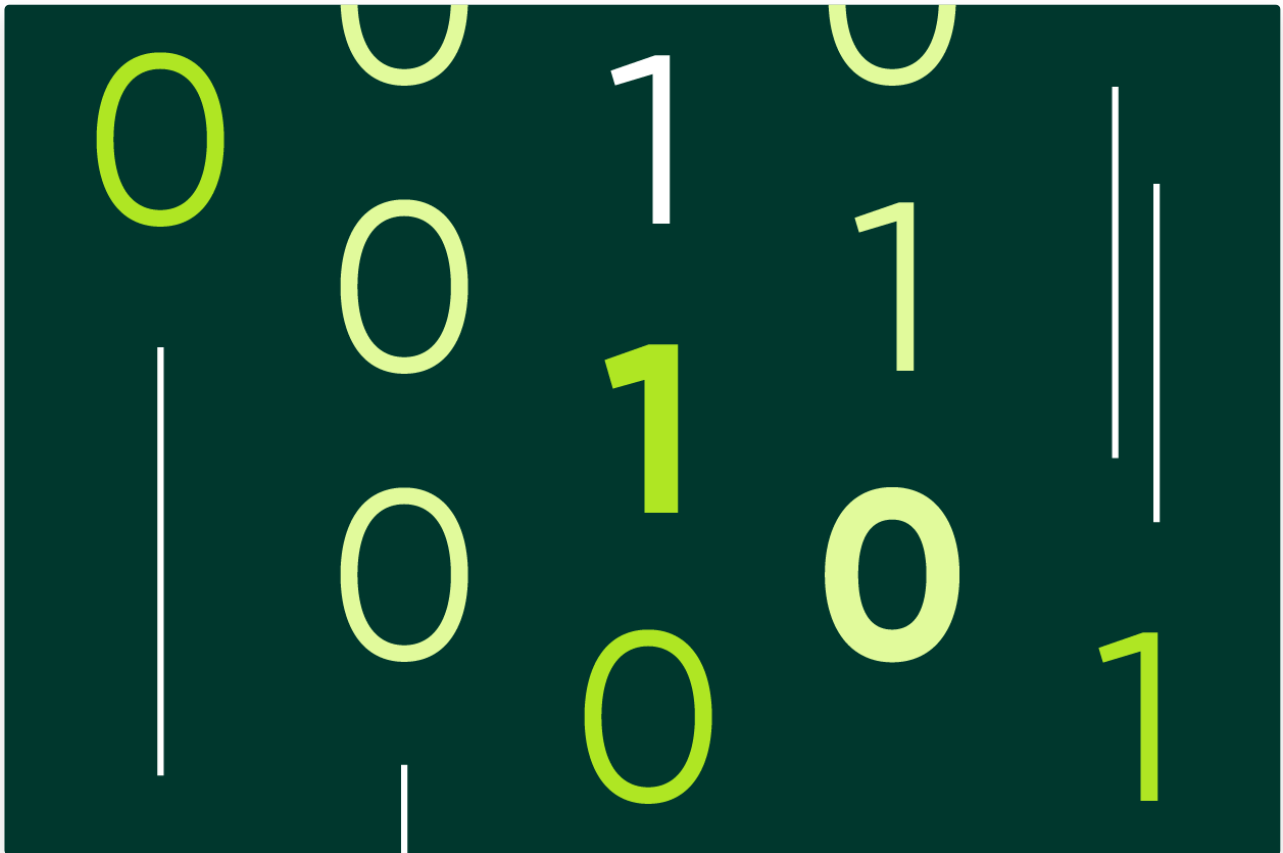
## Binary Data

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### Textbook

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## Binary Data



What if you knew that every time you play a game or use an app on your computer, it works using a secret code made of just two numbers—0 and 1? This is called **binary code**, and it's how computers understand everything from your favorite videos to the games you play. Ready to learn how these tiny 0s and 1s make computers work? Let's begin!

### Binary

[Binary](#) is a special way of counting that computers use to understand and follow instructions. Instead of using regular numbers like 1, 2, or 10, computers use just two numbers: 0 and 1. It's like a secret code that computers can read and use.

In binary, each digit is called a "bit," short for "binary digit." A group of 8 bits makes up a "byte," which is a basic unit of information in computers. By combining these bits in different ways, computers can represent all kinds of data, from numbers to letters and even images.

When we give instructions to a computer, we do it using binary code. Each group of 0s and 1s tells the computer to do different things. This is how computers process and store information very quickly.

## Different Ways to Show Binary

You can explore different ways to show binary code. You might find unique methods for changing information into binary or discover new ways to use binary in technology and coding. There are other ways to show binary code. Think of new ways as you create your forms of binary code in this lesson's activities!

## Critical Thinking Questions

1. How do you think using just two numbers, 0 and 1, can represent all the different things a computer can do, like playing music or showing pictures?
2. If you had to create a new way to send messages using binary code, what other everyday objects or actions could you use to show the 0s and 1s?

## Questions (5)

### 1. True or False: Binary tells the computer what to do.

MULTIPLE CHOICE

Choose the correct answer:

- A. True
- B. False

### 2. What two numbers represent binary data?

MULTIPLE CHOICE

Choose the correct answer:

- A. 0 and 10
- B. 1 and 2
- C. 2 and 3
- D. 0 and 1

### 3. What is binary data?

MULTIPLE CHOICE

Choose the correct answer:

- A. Data stored in a single file format
- B. Data represented using only two digits: 0 and 1
- C. Data collected from multiple sources
- D. Data that changes over time

**4. True or false: Storing text in a word processor is an example of binary data used in computers.**

MULTIPLE CHOICE

**Choose the correct answer:**

- A. True
- B. False

**5. True or False: Binary data can use a combination of any numbers.**

MULTIPLE CHOICE

**Choose the correct answer:**

- A. True
- B. False

## Games (2)

### 1. Binary Data Typing Game

Full Screen

Audio

Instructions

Restart

Pause



0s

100%

When we give instructions

## 2. Binary Data Matching

Full Screen

Audio

Instructions

Answer Key

Pause

Clear All

Check Matches

Attempts: 0

bit


byte

binary

8 bits

A special way of counting that computers use to understand and follow instructions.

0 or 1



# Blocks Pro Challenges (3)

## 1. Binary Balloons

### Binary Balloons

There are many ways you can represent binary code!

Drag at least 6 balloon sprites into your code editing space. Change the color of the balloon using the costumes tab.

Blue balloons will represent 1 and the color yellow represents 0.

Program one balloon to say **Binary**.

#### Requirements

0/2

1 Looks

1 Event

Blocks must be connected to an Event block in order to pass the requirements

Submit

The image shows the Scratch code editor interface for the 'Binary Balloons' challenge. The 'Code' tab is selected, showing a sequence of blocks for a sprite named 'Sprite1'. The blocks are: 'go to random position', 'go to x: 0 y: 0', 'glide 1 secs to random position', 'glide 1 secs to x: 0 y: 0', 'point in direction 90', 'point towards mouse-pointer', 'change x by 10', 'set x to 0', 'change y by 10', 'set y to 0', 'if on edge, bounce', and 'set rotation style left-right'. The 'Costumes' tab is also visible, showing a blue balloon costume. The 'Stage' area on the right shows the sprite 'Sprite1' on a blue background.

## 2. Binary Butterflies

### Binary Butterflies

There are many ways you can represent binary code!

Drag at least 6 butterfly sprites into your code editing space. Change the costume of the butterflies using the costumes tab.

Program some butterflies to look like they are jumping by using the change y blocks. Use a wait block in between the change y blocks.

Jumping butterflies represent 1 and non-jumping butterflies represents 0.

#### Requirements

0/3

2 Motion

1 Event

1 Control

Blocks must be connected to an Event block in order to pass the requirements

The image shows the Scratch code editor interface for the 'Binary Butterflies' challenge. The 'Code' tab is selected, showing a sequence of blocks for a sprite named 'Sprite1'. The blocks are: 'go to random position', 'go to x: 0 y: 0', 'glide 1 secs to random position', 'glide 1 secs to x: 0 y: 0', 'point in direction 90', 'point towards mouse-pointer', 'change x by 10', 'set x to 0', 'change y by 10', 'set y to 0', 'if on edge, bounce', and 'set rotation style left-right'. The 'Costumes' tab is also visible, showing a blue butterfly costume. The 'Stage' area on the right shows the sprite 'Sprite1' on a blue background.

### 3. Binary Band

Challenge

Textbook

#### Binary Band

Use the sound library to represent binary code.

To do this, you will need at least 6 sounds. A higher tone sound represents 1 and a lower tone sound represents 0.

You can search for different sounds using the sound library.

Use the 'play sound [insert sound] until done' block for each note.

#### Requirements

0/2

6 Sound

1 Event

Blocks must be connected to an Event block in order to pass the requirements

Submit

Code Costumes Sounds

Motion

- move 10 steps
- turn 15 degrees
- turn 15 degrees
- go to random position
- go to x: 0 y: 0
- glide 1 secs to random position
- glide 1 secs to x: 0 y: 0
- point in direction 90
- point towards mouse-pointer
- change x by 10
- set x to 0
- change y by 10
- set y to 0
- if on edge, bounce
- set rotation style left-right
- x position

Looks

Sound

Events

Control

Sensing

Operators

Variables

My Blocks

Sprite1

x 0 y 0

Size 100 Direction 90

Stage

Backdrops 1

## Answer Keys & Solutions

### Questions

#### 1. True or False: Binary tells the computer what to do.

MULTIPLE CHOICE

Correct Answer:

- A. True ✓ Correct
- B. False ✗ Incorrect

##### Explanation:

Binary is a special way of counting that tells the computer what it needs to know in order to perform actions.

#### 2. What two numbers represent binary data?

MULTIPLE CHOICE

Correct Answer:

- A. 0 and 10 ✗ Incorrect
- B. 1 and 2 ✗ Incorrect
- C. 2 and 3 ✗ Incorrect
- D. 0 and 1 ✓ Correct

##### Explanation:

These two numbers act as a code to create numbers, letters, words, and more!

#### 3. What is binary data?

MULTIPLE CHOICE

Correct Answer:

- A. Data stored in a single file format ✗ Incorrect
- B. Data represented using only two digits: 0 and 1 ✓ Correct
- C. Data collected from multiple sources ✗ Incorrect

D. Data that changes over time

✗ Incorrect

**Explanation:**

Think about the definition of binary and how it relates to computers.

**4. True or false: Storing text in a word processor is an example of binary data used in computers.**

MULTIPLE CHOICE

**Correct Answer:**

A. True

✓ Correct

B. False

✗ Incorrect

**Explanation:**

Think about how computers store different types of information.

**5. True or False: Binary data can use a combination of any numbers.**

MULTIPLE CHOICE

**Correct Answer:**

A. True

✗ Incorrect

B. False

✓ Correct

**Explanation:**

Remember binary is only 0s and 1s

## Games

### 1. Binary Data Typing Game

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

### 2. Binary Data Matching



**Matching Game Solutions:**

1. →

2. →

3. →

*Students must drag items from the left to match with corresponding items on the right.*