Binary Pixel Art

Educator's Guide

Overview

CS Hands-On is a 501(c)(3) nonprofit teaching computational thinking skills through technology-free lessons and activities. This curriculum is built to teach fundamental computer science concepts in an engaging, hands-on way. In this mission, students use binary to create their own drawings.

Prerequisite Knowledge

There are no prerequisites to this lesson.

Lesson Details

Travelling to Logicland, students will learn to break problems down into smaller parts with Lex. Students will learn how computers represent information and images using binary, then use binary to complete three drawings.

This lesson was developed for students ages 6 to 12 and can be modified for all skills and ages. This lesson takes roughly 30 minutes.

Learning Objectives

Key Question

How can you use binary to create pixel art?

Key Terms

Binary: A language computers use to represent information, where there are two possible states represented by the numbers 0 and 1.

Pixel: Small squares that combine to form images on digital screens.

Curriculum Standards

Students should be able to...

- Explain how computers use binary to communicate (Patterns)
- Read and interpret binary (Literacy)
- Use binary to draw pictures representing pixels on a screen (Creative Arts)

View standards addressed here

Lesson Plan

Materials

- Binary Pixel Art worksheet (per student)
- Coloring tools: Markers, colored pencils, crayons, etc. (per student)

Setup

- Hand out a Binary Pixel Art worksheet to each student
- Set up your classroom to have students sitting individually or in groups

ANSWER KEY & LESSON ANNOTATIONS

Logicland
Mission 1

Name: _____ Date: _____

Binary Pixel Art

You've arrived at Logicland!

Lex wishes you a warm welcome to Logicland! At Logicland, Lex loves using logic when thinking and making decisions. To kick off your exciting journey on this planet, Lex will introduce you to the wonders of binary.

What is Binary?

Binary is the **language** computers use to **represent information**. Binary only uses **two digits: 0 and 1**. Just like how we use English to communicate and remember information, computers use binary!

1 = True

0 = False

(Binary is similar to a light bulb switch!)

Specifically, computers use electronic signals that have two states: **1 meaning true** and **0 meaning false**. Computers use binary to assign these signals as true or false to store and represent information.

Why do Computers use Binary?

Computers use binary because it's **simple** and easy to manage! Binary is a quick way to represent an electronic signal's **on and off states**. Compared to systems like decimals (ten digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9), it makes more sense for computers to communicate using binary (two digits: 0 and 1)!

Put your Detective Caps On!

Lex recently received several paintings from his talking computer, Lexa. However, Lexa only speaks in binary so Lex needs your help translating them! Using colored pencils, follow the binary code below to reveal the pictures. Use **0 to represent a blank pixel** and **1 to represent a colored pixel**.

0 blank pixel

1 colored pixel

What are pixels?
Pixels are super tiny squares that come together to display all sorts of images on a digital screens!

CS Hands-On Binary Pixel Art 1

Reflect

Other than in computers, when would it be helpful to track information with true and false values?

Examples include storing true or false values to measure if a light bulb is on or off, tracking which days of the week someone has soccer practice.

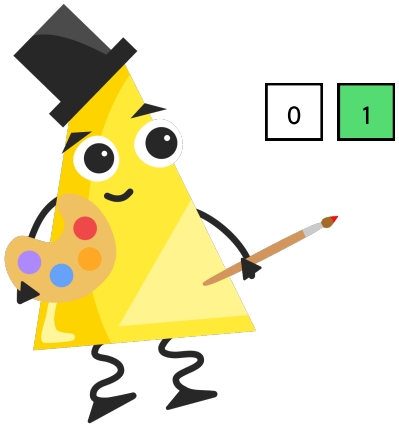
Logicland
Mission 1

Lexa's Binary Paintings

0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	1	0	0
0	1	1	1	0	1	1	1	0
0	1	1	1	1	1	1	1	0
0	1	1	1	1	1	1	1	0
0	0	1	1	1	1	1	0	0
0	0	0	1	1	1	0	0	0
0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0

1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	0	0	1	0	0	1	1
1	1	0	0	1	0	0	1	1
1	1	1	1	1	1	1	1	1
1	0	0	1	1	1	0	0	1
1	1	0	1	1	1	0	1	1
1	1	1	0	0	0	1	1	1
1	1	1	1	1	1	1	1	1

1	1	1	1	0	1	1	1	1
1	1	1	0	0	0	1	1	1
1	1	0	0	0	0	0	1	1
1	0	0	0	0	0	0	0	1
1	1	0	0	0	0	0	1	1
1	1	0	0	0	0	0	1	1
1	1	0	0	1	0	0	1	1
1	1	0	0	1	0	0	1	1
1	1	0	0	1	0	0	1	1



Wrap up & reflect

Group students into pairs and have them discuss the following reflection questions. Afterwards, have students share their ideas as a class.

- What are the advantages of using binary?

  Computers prefer using binary because binary can easily represent an electronic signal's on and off states with the two numbers in binary: 0 and 1. Having only 2 numbers also makes the logic simpler and concise!