

SAM LABS CELEBRATES  
VALENTINE'S DAY



# Valentine's Day: Upper Elementary

Recommended Read Aloud: **A to Z Mysteries: Secret Admirer** by Ron Roy

The recommended read aloud is a great way to introduce our upper elementary Valentine's Day activity: sending secret messages.

Engage students in discussion after the read aloud about how secret messages were sent in the book, as well as other ways to send messages.

This video is a great introduction for students to binary



Click [here](#) for additional resources!

Introduce students to **binary** code-the language that computers use.

### Things to share:

- Binary code is made up of two symbols (0 and 1)
- A 0 represents being 'turned off', while a 1 represents being 'turned on'
- Binary code can be used to represent whole numbers. These whole numbers are called **denary (decimal)**
- We do this by filling in a chart. An example is shown below:

In this example, the values 8, 2, and 1 are turned on. Adding those values together gives us the number represented: **11**

So:  
**01011 = 11**

|               |           |          |          |          |          |
|---------------|-----------|----------|----------|----------|----------|
| <b>Denary</b> | <b>16</b> | <b>8</b> | <b>4</b> | <b>2</b> | <b>1</b> |
| <b>Binary</b> | 0         | 1        | 0        | 1        | 1        |

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Student handouts and activities can be found [here](#)

Using Activity 1 linked above, follow the I-do, We-do, You-do model to work through converting binary to denary (decimal), and denary (decimal) to binary.

After completing Activity 1, have students think and discuss how binary code could be used to represent letters and send a secret code.

Take a byte out of Valentine's Day 

Activity 1

|        |    |   |   |   |   |
|--------|----|---|---|---|---|
| Denary | 16 | 8 | 4 | 2 | 1 |
| Binary | 1  | 1 | 0 | 0 | 1 |

Remember, in binary 1 means 'turned on', while 0 means 'turned off'. So, **11001** is the same as **16 + 8 + 1** or **25**.  
**11001 = 25**

Determine the denary, or decimal number shown in each binary table below.

|        |    |   |   |   |   |
|--------|----|---|---|---|---|
| Denary | 16 | 8 | 4 | 2 | 1 |
| Binary | 1  | 0 | 1 | 1 | 1 |

10111 = \_\_\_\_\_

|        |    |   |   |   |   |
|--------|----|---|---|---|---|
| Denary | 16 | 8 | 4 | 2 | 1 |
| Binary | 0  | 0 | 1 | 1 | 1 |

00111 = \_\_\_\_\_

|        |    |   |   |   |   |
|--------|----|---|---|---|---|
| Denary | 16 | 8 | 4 | 2 | 1 |
| Binary | 1  | 1 | 1 | 1 | 1 |

11111 = \_\_\_\_\_

|        |    |   |   |   |   |
|--------|----|---|---|---|---|
| Denary | 16 | 8 | 4 | 2 | 1 |
| Binary | 1  | 1 | 1 | 0 | 0 |

11100 = \_\_\_\_\_

## From your secret admirer!

Have students complete Activity 2, also linked above, where they represent letters using binary code. Then, discuss with students how you could write out the word L-O-V-E in binary.

After students are comfortable with representing letters in binary, and creating words using multiple binary codes (also completed in Activity 2), allow them to build a system to send secret messages in binary. In this system the value 0 is represented by pink, and the value 1 is represented by blue.

If time, have groups partner up and try to decode the secret binary message being sent.

**Sample codes shown on the next page, as well as a solution for writing L-O-V-E in binary.**

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## Expressing L-O-V-E in binary:

Determine the place each letter holds within the alphabet. Then, determine the binary code which represents that value.

L = 12      01100

O = 15      01111

V = 22      10110

E = 5      00101

So, LOVE in binary is:

01100 01111 10110 00101

## Sample Code:

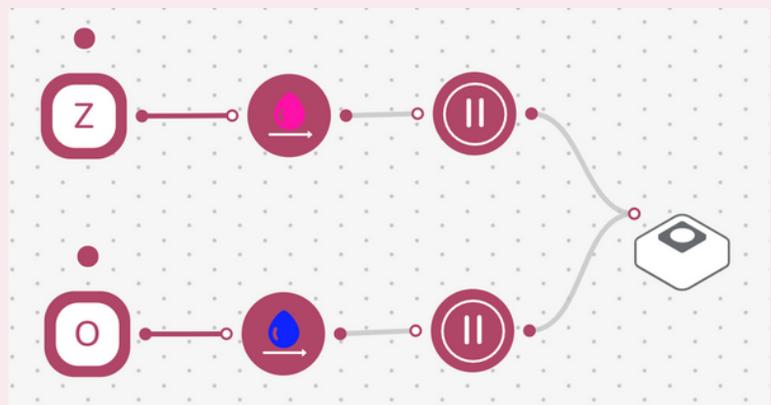
Students will communicate the binary code using Pink for 0 and Blue for 1. The Key Press labeled Z represents 0. The Key Press labeled O represents 1. Students should pause about 5 seconds in between letters to ensure the word is effectively communicated.

**Input:** Key Press

**Output:** RGB LED

**Behaviors:** Color (Colors),  
Hold (Time)

Note: Set the Hold block to 500 milliseconds to ensure the color is seen and noted.



# Valentine's Day: Blockly Extension

## Sample Code:

Students will communicate the binary code using the micro:bit buttons. The A button represents 0, and the B button represents 1. These values will display on the micro:bit. After entering the code for each letter, the binary code representing that letter will be printed to the console.

At the start of the system, students should press the 's' key to activate the binaryCode variable. When they have entered in all 5 binary digits, they will press the 'space' key to display the binary code on the console.

Prior to communicating the binary code for the next letter, students should press the 'd' key to reset the binaryCode variable. The process of displaying and resetting will repeat until each letter has been represented and displayed.

