

Using Scratch to Convert Base-10 Numbers to Binary Numbers

Bruce E. Nuxoll
Clearwater Valley Jr./Sr. High School

Target Age Group:

This assignment is appropriate for an intro-level high school programming class, much like CS 112. The age group could range from Freshman through Senior, depending on when they choose to take an introductory computer science programming course.

Objectives:

Students will use Scratch to program a code to convert base-10 numbers into binary numbers.

Students will demonstrate an understanding of base-10 to binary conversions using computations, not referencing a list.

Students will demonstrate an understanding of the possible values of 8-bits.

Description:

8-bit computing uses binary data storage and requires an understanding of the binary system. Because of this, it is important for the computer scientist to understand how to convert the common base-10 numbers into binary numbers.

Your task:

1. Create code using Scratch that allows a user to input a valid base-10 number when prompted by a sprite of your choice. The sprite needs to let the user know what the program is designed to do and then prompt the user to enter a number they would like converted to binary code.
2. The largest number the user should enter must be no larger than what can be stored in 8 bits. Your sprite needs to inform the user if the value they enter can't be stored in 8 bits and then ask for a different number.

3. When a valid number is entered, the sprite needs to switch costumes and inform the user of the binary number with the same value as the user entered number. This number should be displayed on the screen for five seconds.
4. The sprite needs to ask the user if they are done converting base-10 numbers.
5. If the user chooses to enter another number, the same process should result as described above.
6. If the user chooses to quit, the sprite should thank them for using the base-10 to binary number converter program and leave the screen.
7. Make sure the sprite returns to the original position when the program is ran more than once!

Assessment:

This assignment will be assessed on two components

- A. The correct conversion of appropriate base-10 numbers into binary numbers that can be stored in 8 bits. 80 pts.
- B. The inclusion of all the components listed in the task. 20 pts.

Questions for Reflection:

(Prior to this assignment, I would ask students rank their understanding of the binary number system on a scale of 1 to 10, with 1 having no understanding and 10 having a mastery of binary numbers)

1. What rank did you give your level of understanding prior to completing this task?

2. What problem(s) did you encounter when creating the computational component of your code?

3. Did creating the code for conversion from base-10 to binary numbers enhance your understanding of the binary system? Explain:

4. Which component(s) of this task could be modified to make it better for enhancing an understanding of the binary numbering system?

Idaho Computer Science Standards addressed:

6-8.DA.04

K-12 CS Standards (Data and Analysis) Encode and decode information using encryption/decryption schemes. (e.g. Morse code, Unicode, binary, symbols, student-created codes, simple ciphers). (Grades 6-8)

Core Practices: Developing and Using Abstractions

ISTE Standards: Technology operations and concepts

9-10.AP.11

K-12 CS Standards (Algorithms and Programming) Illustrate how mathematical and statistical functions, sets, and logic are used in computation. (Grades 9-10)

Core Practices: Creating Computational Artifacts

ISTE Standards: Research and information fluency ° Critical thinking,