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Domain: Exploring Computer Science
Date Range: January 20, 2025 – January 24, 2025

2 - Convert base ten into binary and binary into base ten.

2- Explain why binary numbers are important in computer science and how computers communicate differently than humans.

3- Use binary digits to encode and decode messages.

Student Friendly Outcome:

I CAN convert base ten into binary and binary into base ten.

I CAN explain why binary numbers are important in computer science and how computers communicate differently than humans.

I CAN use binary digits to encode and decode messages.

Monday	Tuesday	Wednesday	Thursday	Friday
Dr. Martin Luther King Jr. Day observed	Weather Day	Weather Day	Journal entry CS Unplugged: Count the Dots— Binary Numbers Count the Dots-Working with Binary cont. CS Unplugged: Count the Dots Sending Secret Messages	

Instructional Lesson # 5. Days 9-10

Topic Description: This lesson introduces the binary number system and how to count in binary. Students will learn how to convert between binary and decimal numbers in the context of topics that are important to computer science and human communication.

Objectives

The student will be able to
- Convert base ten into binary and binary into base ten.
- Explain why binary numbers are important in computer science and how computers communicate differently than humans.
- Use binary digits to encode and decode messages.
- Compare problems in different contexts.

Outline of the Lesson

Segment	Reason/Purpose
Day 1 Journal entry (10 minutes) CS Unplugged: Count the Dots— Binary Numbers (30 minutes) CS Unplugged: Count the Dots— Working with Binary (10 minutes) Journal entry (5 minutes)	Access previous knowledge. Become familiar with base then and base 2. Understanding Base 2. Connecting Base 2 to value representation. Connecting base 2 to how computers store information. How base 2 is used to code information
Day 2 Count the Dots-Working with Binary cont. (20 min) CS Unplugged: Count the Dots Sending Secret Messages (20 minutes) Journal entry (15 minutes)	How reiteration may be used to compress information into a small "space," memory. If all files are only zeros and ones, what is the function of the extension of the file? How the binary number system relates to The Candy Bar Problem. Students find similarities to seemingly different problems.

Student Activities

Day 1
- Complete journal entry.
- Complete count the dots activities.
- Complete journal entry.

Day 2
- ● Complete Count the Dots Binary Number
- ● Complete the Sending Secret Messages activity
- ● Complete journal entry

Teaching and Learning Strategies

Day 1
- ● Journal Entry**:** *How high can you count using your hands only?*
- ● Count the Dots Activities
  - ○ Teacher gives instructions for the Count the Dots activities and circulates while students participate in the Count the Dots activities.
    - ▪ Start with the introductory activity on p. 4 of the activity. This activity can be downloaded from http://exploringcs.org/curriculum. Download and unzip CSUnplugged files, then open. Note there are many additional resources listed that you may wish to explore.
    - ▪ It will be helpful to read through the entire activity in advance, so that you can revise questions, add your own questions, and think about how you might want to structure each part of the activity. The goal is for students to be actively involved in some way and for all students to be able to represent numbers and count in binary. What follows is the minimal suggestion.
    - ▪ Have 5 students come to the front of the room and demonstrate as you follow the instructions and ask the questions. (Each student should receive a large card with one of the numbers of dots—1, 2, 4, 8, 16.) Complete the Binary Numbers activity on p. 5.
  - ○ Teacher gives instructions for the Working with Binary activity activities and circulates while students participate in the Working with Binary activity on p. 7.
    - ▪ Have 5 students come to the front of the room and try counting as you call out the numbers. (Each student should receive a large card with one of the numbers of dots— 1, 2, 4, 8, 16.)
    - ▪ Have different groups of 5 students at a time come to the front and have the other students provide counting and representation challenges. You could also have a competition with multiple teams of students each trying to get the answer. There are many other possibilities. Be creative!!
- ● Journal Entry: *How do you think technology influenced the choice of using a binary system?*
  - ○ Discussion of *Why are binary numbers important in computer science?*

Day 2

- ● Sending Secret Messages
  - ○ Teacher gives instructions for the Complete the Sending Secret Messages activity on p. 8 of the CS Unplugged: Count the Dots activity. (Solution is on p. 13.)
- ● Journal Entry**:** *How does the binary number system relate to The Candy Bar Problem? If all computer files are just a bunch of zeros and ones, what is the purpose of their extensions such as*

.txt, . jpeg, .mp3?

Resources

- Bell, Tim, Ian Witten and Mike Fellows. Computer Science Unplugged. Canterbury, New Zealand: 2002.
- Computer Science Unplugged Activity 1: Count the Dots—Binary Numbers, pp. 3–13
- Binary number cards for each student from Count the Dots—Binary Numbers, pp. 3–13
- Large binary number cards for the demonstrations

Teacher Reflection Notes