Lesson Plan for Activity: Binary Numbers/Binary Name Chains

Subject: Binary Numbers **Length of Lesson**: 1 hour

Concept or Skill Focus: Learn how to count in binary and represent words and numbers in binary

Objectives/Outcomes:

- Learn how to count in binary
- Learn how to represent words and numbers using just 0 and 1

Materials

- Binary Numbers Activity
- Laminated sheets of 1, 2, 4, 8, and 16 dotted cards (as shown in Binary Numbers page 2)
- Different colored beads (I used pony beads)
- String or cord (I used hemp cord)
- Key rings with chain, or mini carabiner clip hook (optional)
- Initial Cut-Out Strips (below)
- ASCII Alphabet in Binary Sheets (as answer keys, or if students get stuck) (below)

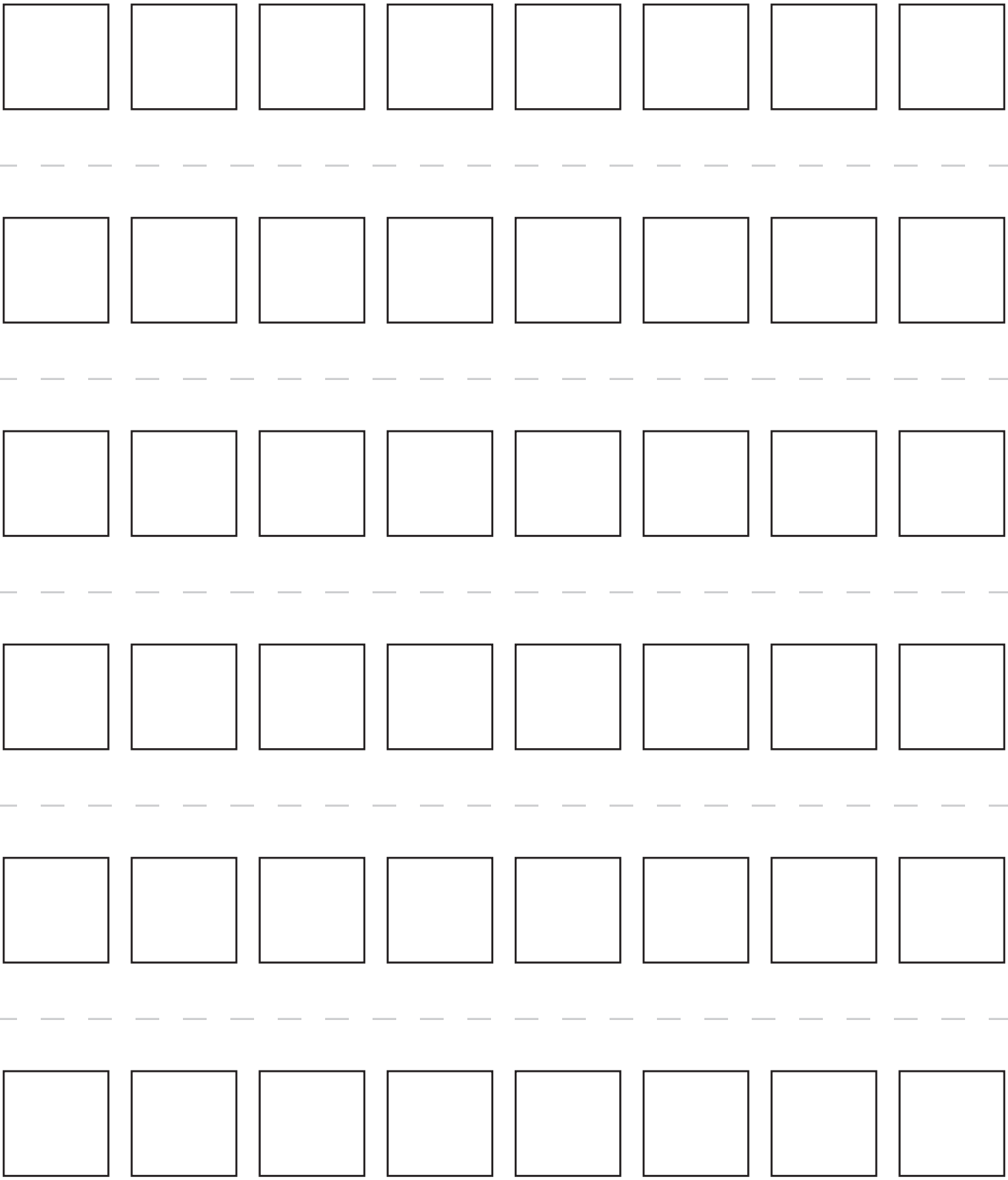
Activities and Time Line (Introduction, Middle, Conclusion)

1. Write the numbers 0, 1, 2, 3, 4, … 10 in a column on a whiteboard, and have students convert the base-10 numbers to base-2 numbers using counting strategies. For example, 0_{10} is 0_2, 1_{10} is 1_2, since you cannot use the digits 2, 3, 4, 5, 6, 7, 8, and 9, the next available counting number is 10, so therefore, 2_{10} is 10_2, and 3_{10} is 11_2. Since you cannot use the digits 12, 13, 14, 15, 16, 17, 18, 19, 20, … 99 (because these numbers contain digits that are not just 0, or 1), that means 4_{10} is 100_2, and so on.
2. Choose five children to hold the demonstration cards at the front of the class in the order: 16-dots 8-bots 4-dots 2-dots 1-dot. Observe the powers of 2. Practice converting base-10 numbers to base-2numbers using the Discussion questions on page 4 of the Binary Numbers document.
3. Practice using some of the other worksheets (if needed).
4. In ASCII, letters are assigned to numbers and those numbers are encoded in binary. As it happens, numbers are assigned sequentially so letters that differ by one spot in the alphabet are also next to each numerically. The capital letter A has the ASCII code decimal 65, capital B has the ASCII code decimal 66, …, capital Z has the ASCII code decimal 90.

Letter	ASCII	Binary
A	65	0100 0001
B	66	0100 0010

5. Have students write their names in a column on the left-hand side of the Initial Cut-Out Strips and determine the ASCII code for each letter of their name. Students can then convert the decimal value to binary using the powers of two rules they learned in step #2.
6. Have students choose two different color beads: one color for all zeros, and a second color for all ones. Some students may choose to have a third color they can use as a separator between each letter.
7. Thread each bead on a 36” string in the correct order of the binary number. They can choose to make a necklace, keychain, or backpack clip.

Initial Cut-Out Strips



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ASCII Alphabet in Binary

Letter	Binary
A	01000001
B	01000010
C	01000011
D	01000100
E	01000101
F	01000110
G	01000111
H	01001000
I	01001001
J	01001010
K	01001011
L	01001100
M	01001101
N	01001110
O	01001111
P	01010000
Q	01010001
R	01010010
S	01010011
T	01010100
U	01010101
V	01010110
W	01010111
X	01011000
Y	01011001
Z	01011010

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