Discussion [0b10] [2_{10}] [0x2]: Number Representation

Conversion

Decimal	Binary	Hex
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

1. Convert the following binary numbers into decimal.

   11001 → _____

   1001001 → _____

2. Convert the following decimal numbers into binary.

   12 → _____

   64 → _____

   127 → _____

3. Convert the following binary numbers into hex.

   10011001 → _____

   1111011 → _____

   110000001111111111101110 → _____

Limits

1. What is the biggest number that can be represented with two decimal digits?

2. What is the biggest number that can be represented with three binary digits?

3. What is the biggest number that can be represented with four hexadecimal digits?

4. How many different numbers can you represent using three binary digits?

Boolean Logic

1. Fill out the truth tables for 

and 

below:

A	B	A and B

A	B	A or B

2. Consider the `Mystery` block on the right:

a. If Mystery outputs false, which of the following do we definitely know? (Hint: It may be helpful to draw out a truth table for Mystery to solve this problem)

☐ A must be true ☐ A must be false ☐ B must be true ☐ B must be false ☐ None of these

b. We want to rewrite this block in one line. Which expression could we report so that our block has exactly the same behavior as the block above?

3. Fill out the table below:

	Does the value of foo affect the output of this expression?	If you answered “no” to the previous question, what will this expression output?
		
		
		
		

Challenge Problems

1. The original Pokemon are numbered 1-150. We want to store a binary encoding for all original Pokemon where each Pokemon has a binary code equivalent to their decimal number.

   a. How many bits do we need to use?

   b. What is the encoding for Pikachu (#25)?

   c. Ternary utilizes base 3 instead of base 2. For example, 10 in ternary is equivalent to 3 in decimal. Imagine that we wanted to store a ternary encoding for all 150 Pokemon where each Pokemon has a ternary code equivalent to their decimal number. What is the ternary encoding for Pikachu (#25)?