

# Discussion [0b10] [2<sub>10</sub>] [0x2]: Number Representation

## Conversion

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 → \_\_\_\_\_

11000000111111111101110 → \_\_\_\_\_

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

## 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:

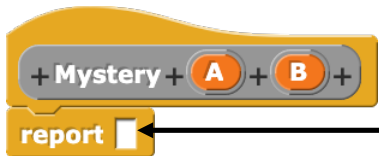
- a. If Mystery outputs false, which of the following do we definitely know? (Hint: It may be helpful to draw out a truth table for Mystery to solve this problem)





```

+ Mystery + A + B +
if not B
  report A
else
  report B
  
```

- 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?



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3. Fill out the table below:

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

## Challenge Problems

- 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.
  - How many bits do we need to use?
  - What is the encoding for Pikachu (#25)?
  - 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)?