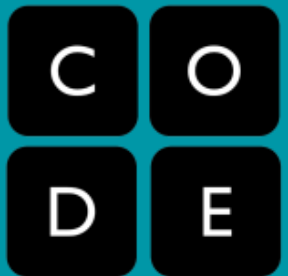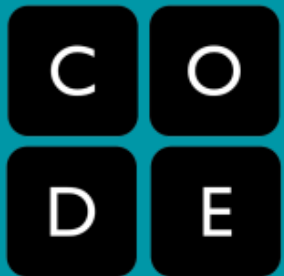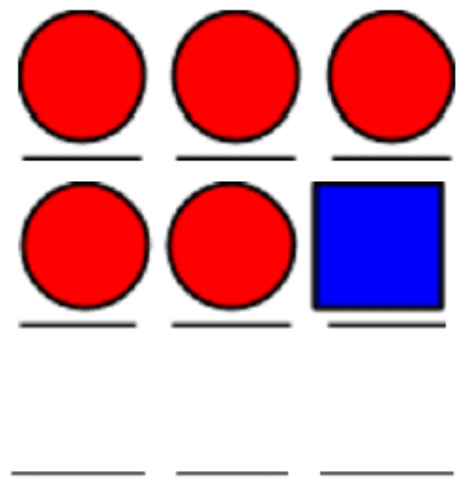# Binary Numbers

Unit 1 Lesson 5 (U1.5)

In the previous lesson you created 27 different 3-place patterns out of circles, triangles and squares, and tried to define a system of rules to generate all of the patterns.

What if you only had a circle and square? With only a circle and square, how many 3-place patterns are there? Let's start some for you below, you make the rest in your INB.

How many are there?

Why might we want to create a number system that includes only two symbols?

How large of numbers do you think this system can represent? How could we go higher?

From Circle-Triangle-Square to Binary (Presentation)

From Circle-Triangle-Square to Binary (Video) (9:25 mins)

The number system we have just been introduced to is called the binary number system and can be constructed entirely from **bits**. This is the number system implemented in almost every computer. While it may look different from our familiar number system, as we'll see in today's lesson, it can be used in the same way and shares many properties.

Make the Flippy Do

Flippy Do

Fold along the bold line. Cut on the dotted lines

Name:_____

1. Write in the powers of 2	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
2. Write in the whole number equivalents	128	64	32	16	8	4	2	1
3. Write a row of 0s	0	0	0	0	0	0	1	1

4. Write a "1" on the **back** of each flap.
(Careful about upside-down)

Flip it up!

5. Cut on dotted lines

Binary Odometer (5 mins)
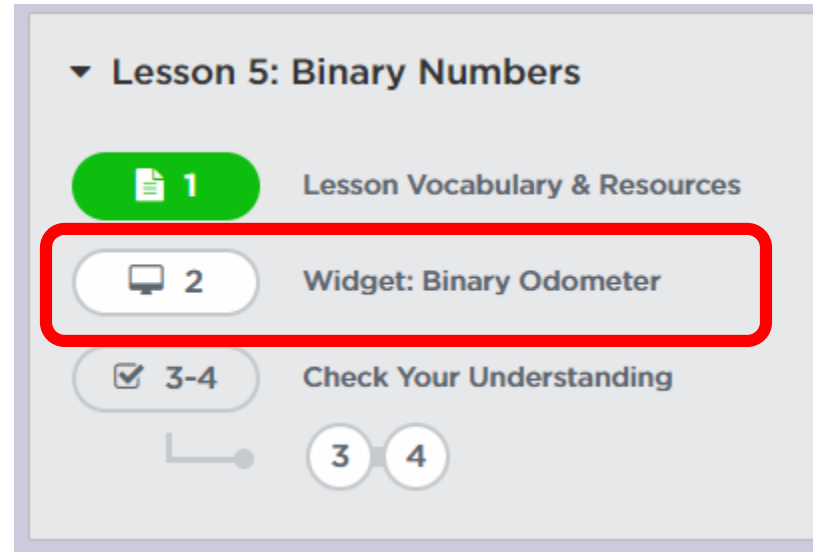
What's the largest number you can make in binary with the binary odometer?
BINARY: 1111111111 --> DECIMAL: 1023
What happens when the odometer run out of numbers?
Overflow! The binary odometer rolls back over to all zeros but the other numbers keep going up.

Binary Practice (15 mins)

Complete the Binary Practice using your Flippy Do.

If you finish early, try the
[Binary Game AppLab App - App](#).

Activity Guide - Binary Practice

Directions
Using your Flippy Do or the binary odometer widget fill in the following charts and answer the following questions.

All 4-bit numbers
It's useful and handy to have a sense of the sixteen 4-bit numbers. Fill in all of the 4-bit numbers in the table below along with their decimal equivalents, in order. We've started the first three for you.

| Binary: 4-bit number	Decimal	Binary: 4-bit number	Decimal
0000	0		
0001	1		
0010	2		

8-bit numbers with exactly one 1
The table below contains *every* 8-bit number that has exactly one 1 in it. Write down the decimal equivalent next to each one. Do you notice a pattern?

Binary: 8-bit number	Decimal	Binary: 8-bit number	Decimal

[Binary Practice Answer Key](#)

What was your favorite part about today's activity?

Check Your Understanding
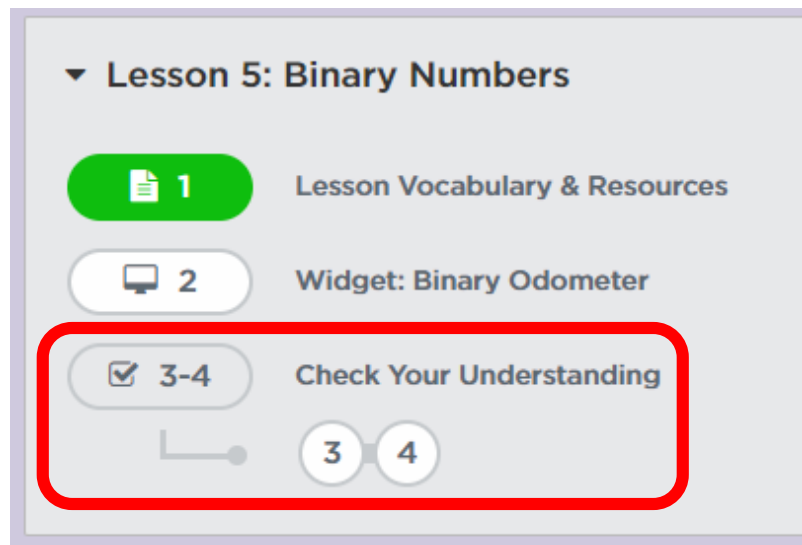
Prompt:
Explain why this joke is funny:

**"There are 10 kinds of people in the world,
those who understand binary and those who don't."**