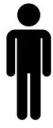


CHAPTER 2

OVERFLOW ROUNDING



20 MIN



INDIV



CLASS

- ✓ 3 students **present their search results** regarding the topic they chose
- ✓ 5 min max per student

HOW TO
ENCODE
NEGATIVE NUMBERS
IN BINARY ?

HOW TO
MULTIPLY
2
BINARY NUMBERS ?

HOW TO
ENCODE
FLOAT NUMBERS
IN BINARY ?



5 MIN



ALL CLASS

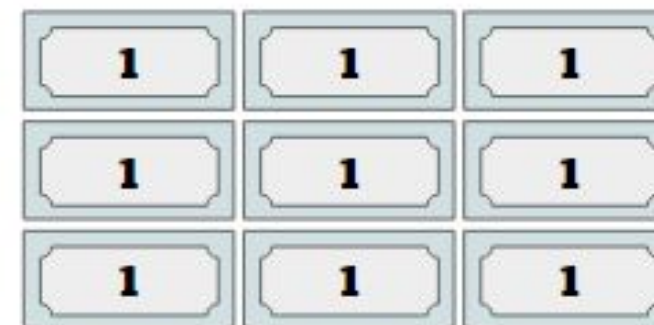
- ✓ You are a cashier in a grocery store
- ✓ You have:
 - 9 \$100 bills
 - 9 \$10 bills
 - 9 \$1 bills



What's the largest amount of change that you can give someone?

What's the least?

What would you do if someone needed 2000 riels in change?



A system has **limits**

999 \$

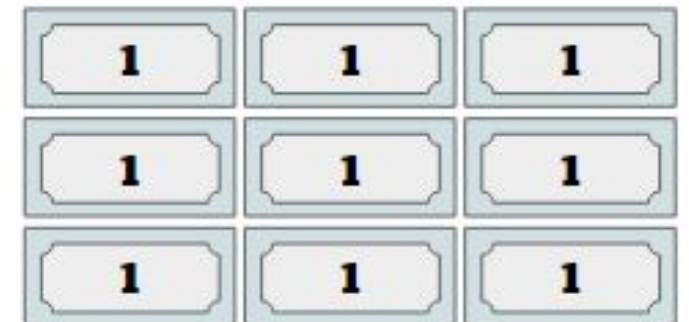
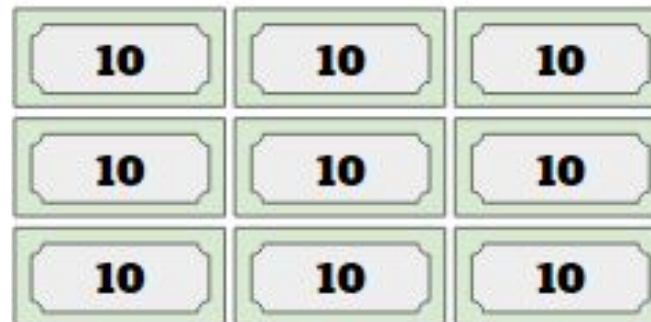
1 \$

What's the largest amount of change that you can give someone?

What's the least?

What would you do if someone needed 2000 riels in change?

We cannot





10 MIN



INDIV

Explore the odometer

- ✓ Go to the link
<https://studio.code.org/s/odometer/next>
- ✓ Set the **LARGEST** number
- ✓ Add 1 to the value

What happens ?



An **odometer** measures the distance travelled by a car



What is an overflow ?

An overflow happens when the Number System get a number **outside** of its **ability** to handle

Binary:

1 1 1 1 1 1 1 1 1 1

+1

➔ Overflow !



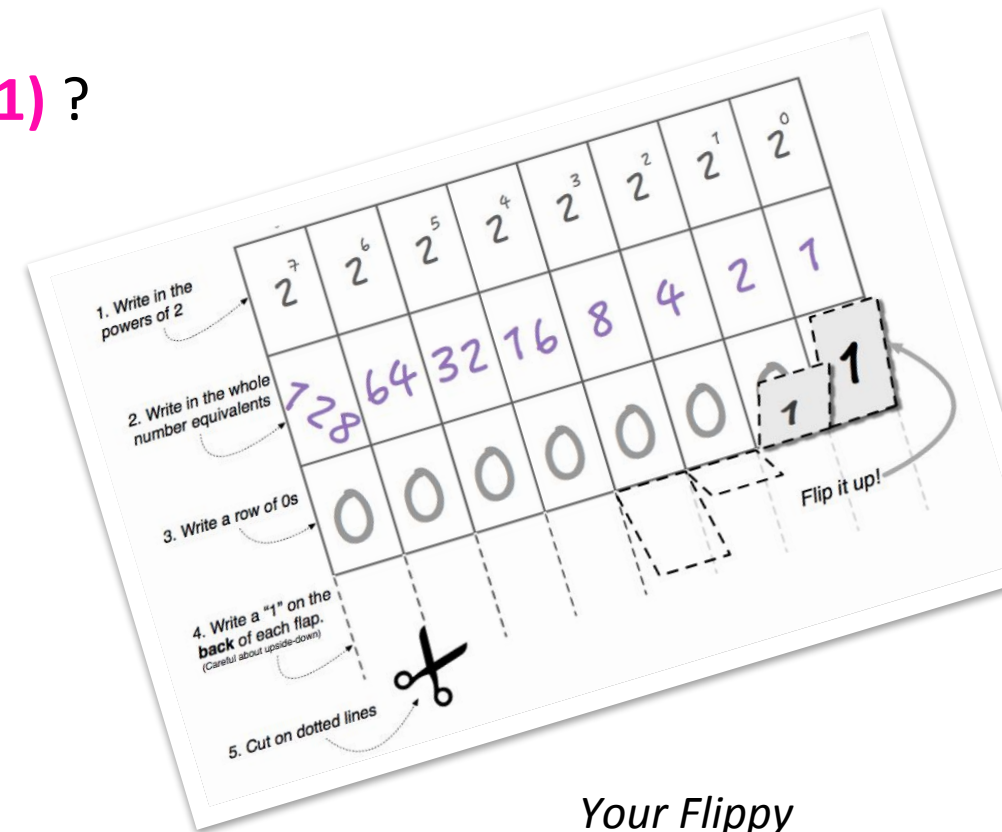
5MIN



TEAM 2

Explore your Flippy

- ✓ What is the **max** number you can make ?
- ✓ What happens if you want to represent **(max +1)** ?
- ✓ What adaptation could you make to the Flippy
Do to represent **(max +1)** ?

*Your Flippy*



5MIN



TEAM 2



- ✓ You manage a **candy shop**
- ✓ Here are the prices of 4 of the candies you will be selling
- ✓ You need to put a **binary number** into your shop's computer system to represent the price for each candy
- ✓ You system manage **only 4 bits**

<u>Candy</u>	<u>Decimal Price</u>	<u>Binary Price</u>
Gummy Bears	\$1.76/lb	? ? ? ?
Chocolate	\$4.16/lb	? ? ? ?
Licorice	\$7.52/lb	? ? ? ?
Mints	\$0.48/lb	? ? ? ?

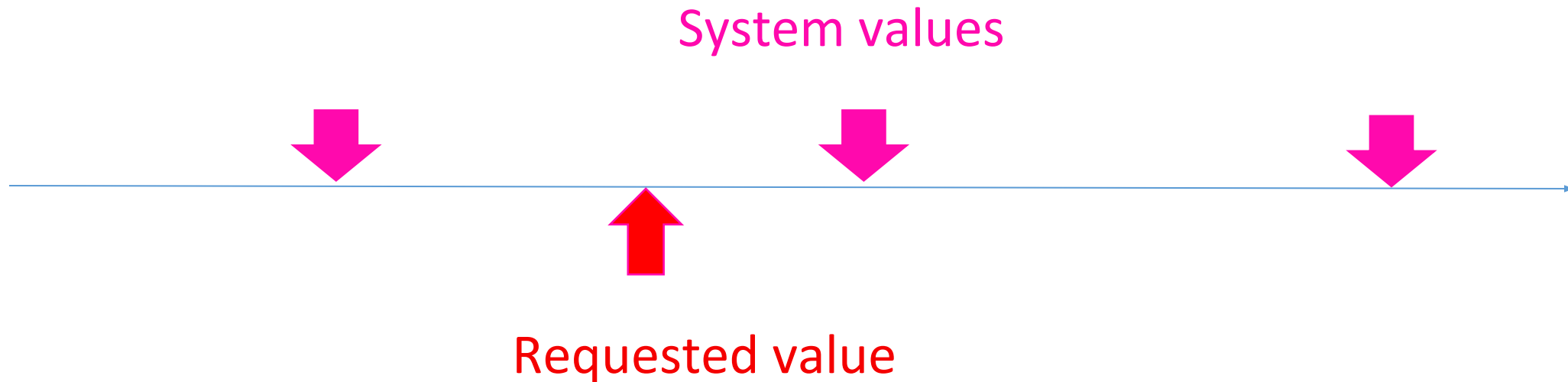
Different strategies to **handle the lost value** !

<u>Candy</u>	<u>Price</u>	<u>Pure Rounding</u>	<u>Shop Pays</u>	<u>Customer Pays</u>
Gummy Bears	\$1.76/lb	0010	0001	0010
Chocolate	\$4.16/lb	0100	0100	0101
Licorice	\$7.52/lb	1000	0111	1000
Mints	\$0.48/lb	0000	0000	0001



What is an rounding ?

An **rounding** happens when the Number System **is not accurate enough** to represent a number





Converting a number
From a number system to another number system
Can cause



OVERFLOW

The system is too small



ROUNDING

The system is not accurate enough



= loose of information



- ✓ Watch this video

https://www.youtube.com/watch?v=5tJPXYA0Ne_c

- ✓ Understand the **reason** why ARIANE 5 crashed in the sky in 1996