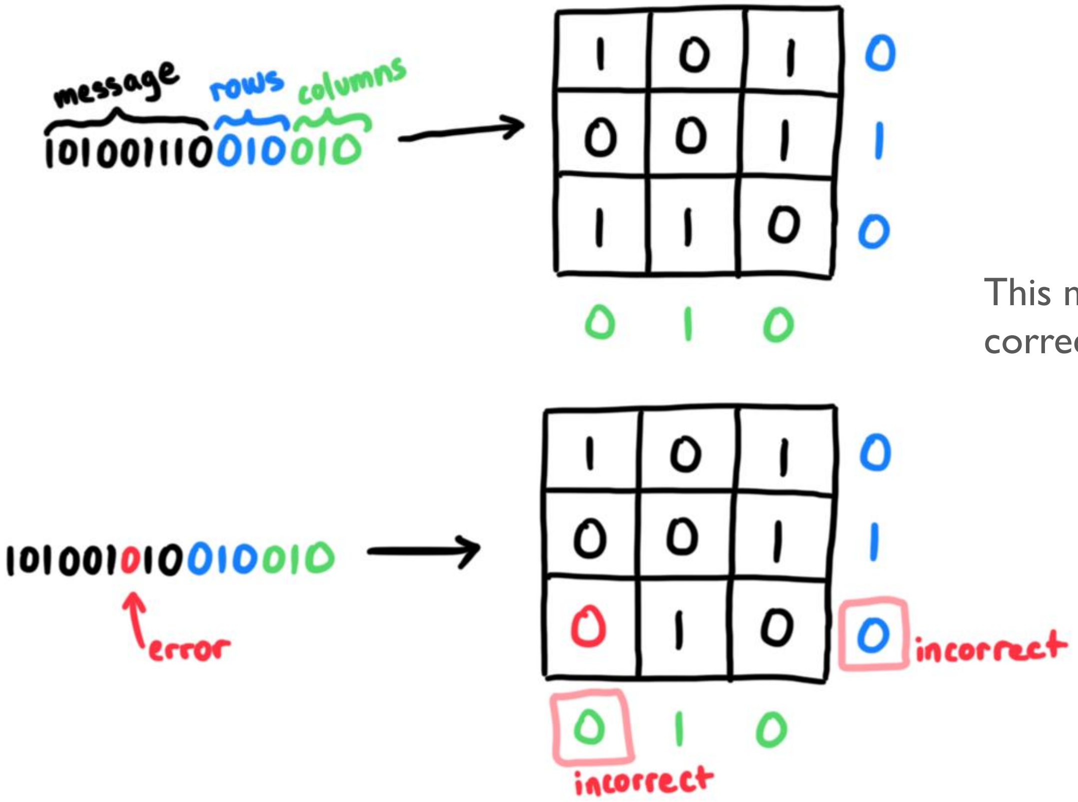
2-dimensional parity check



This method can detect and correct a single error.

… what if there's more than 1 error?

All the binary error detection and correction methods we've been learning about assume that only one transmission error has occurred - which is an unrealistic assumption to make (sorry).

Hamming codes can have varying levels of error detection and correction capability, depending on the specific code you use.

But first we need to learn about modular arithmetic, finite fields, and vector :)

Modular arithmetic

x mod y → "what's the remainder when x is divided by y?"

ex. 11 mod 3 = 2, because 11 = 3(3) + 2

what's 12 mod 4?

13 mod 2?

Finite fields

$\mathbb{Z} = \{\ldots, -2, -1, 0, 1, 2, \ldots\}$ "integers"

(you might know these as "whole numbers" or "counting numbers")

$\mathbb{Z}^+ = \{0, 1, 2, 3, \ldots\}$ "positive integers"

$$\left.\begin{aligned} \mathbb{Z}_2 &= \{0, 1\} \\ \mathbb{Z}_6 &= \{0, 1, 2, 3, 4, 5\} \end{aligned}\right\} \text{"finite fields"}$$

to say that a number's in a set, we use the "$\in$" symbol. for example:

$$10 \in \mathbb{Z}^+$$

we can also say that a number's <u>not</u> in a set like this:

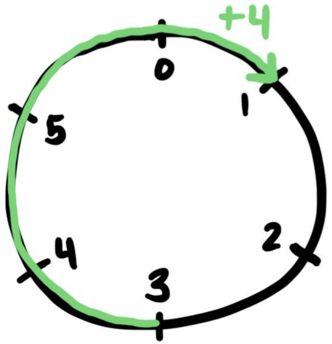
$$5 \notin \mathbb{Z}_2$$

Finite fields

finite fields are <u>closed under addition</u>.

this means that in $\mathbb{Z}_6$, for example, the sum of any two numbers is also in $\mathbb{Z}_6$.

in $\mathbb{Z}_6$, $3+4=1$



(these are also called "clock number systems")

what's $5+2$ in $\mathbb{Z}_6$?

what about what about $1+1$, in $\mathbb{Z}_2$?