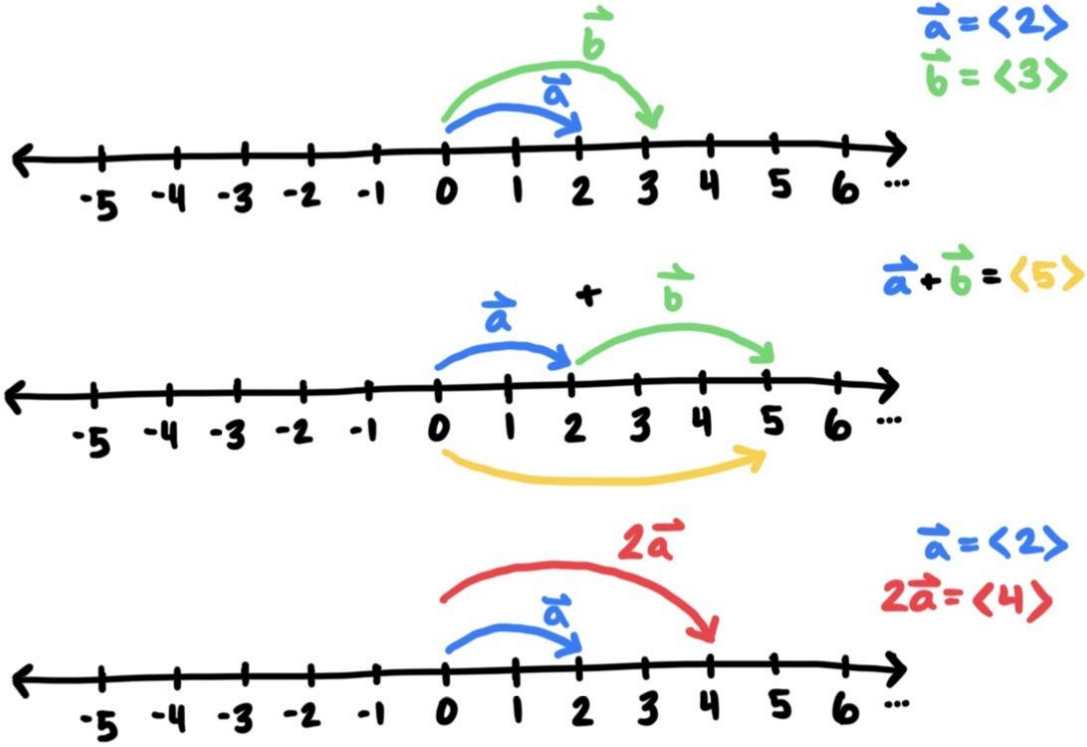
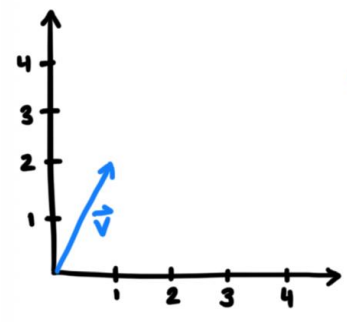
What's a vector?

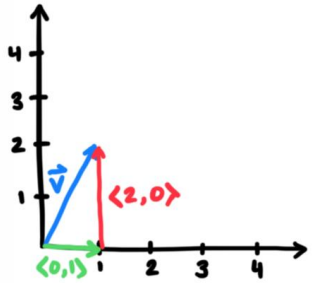


What's a vector?



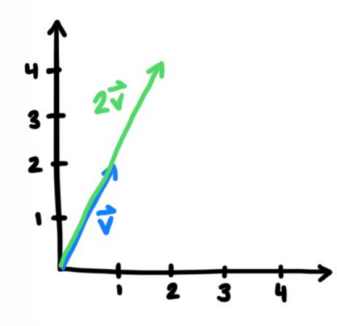
$\vec{v} = \langle 1, 2 \rangle$

1 and 2 are components



$\vec{v} = \langle 1,0 \rangle + \langle 0,2 \rangle = \langle 1,2 \rangle$

add corresponding components



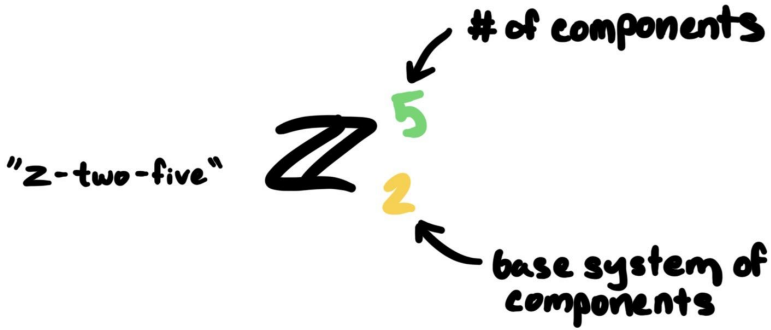
$2\vec{v} = 2 \cdot \vec{v} = 2 \cdot \langle 1,2 \rangle = \langle 2,4 \rangle$

distribute multiplication to components

What's a vector space?

A **vector space** describes a certain "type" of vector, based on 2 aspects of the vector:

- The number of **components** it has, called the **degree**
- The number base system the components are within, called the **order**



(note: in general, any space $\mathbb{Z}_2^n$ is called a Hamming space, and we'll use them a bunch when we learn about Hamming codes later)

("is within")

$\langle 1,1,1,0,0 \rangle \in \mathbb{Z}_2^5$

What're some vectors within $\mathbb{Z}_4^3$?

And why do we care about vector spaces?

A binary message can be represented by a vector, for example,

$1011010 \longrightarrow \langle 1,0,1,1,0,1,0 \rangle$ which is within $\mathbb{Z}_2^7$

So when we start learning about Hamming codes, we'll be talking about vector spaces and subspaces.