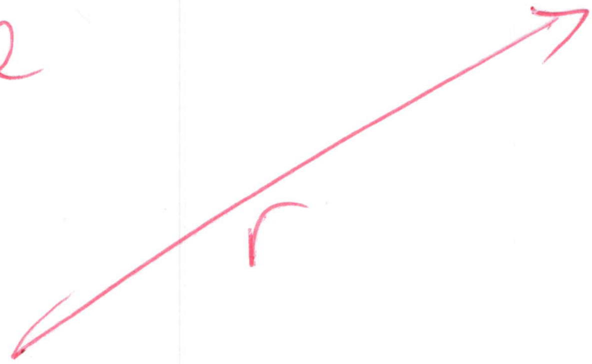
But what makes a vector a vector?

- what operations can we do on ~~of~~ vectors, and what then define what they are

∴ we can think of vector as an object that moves us about in space



- It can be a physical space or space of data.

in data science, we think of vector as **list of attributes** of object

Eg take house, with attributes

120 Sqm
2 beds
1 Bathroom
$150K.

This can then be written as a list (120, 2, 1, 150 000) or as a vector

$$\begin{bmatrix} 120 \\ 2 \\ 1 \\ 150 \end{bmatrix}$$

So in physics its thought of as something that moves us about in space,

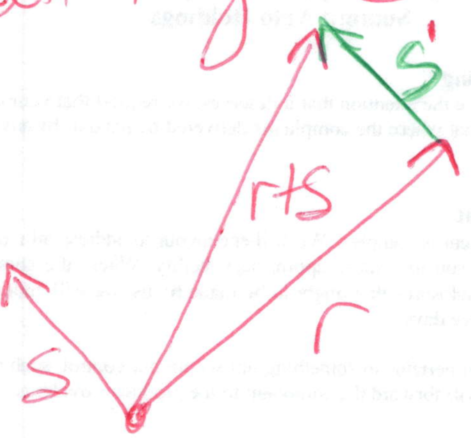
In DS, its thought of as attribute of object!

or description of attributes of object

Vector → based on 2 (two) rule

⇒ ① addition

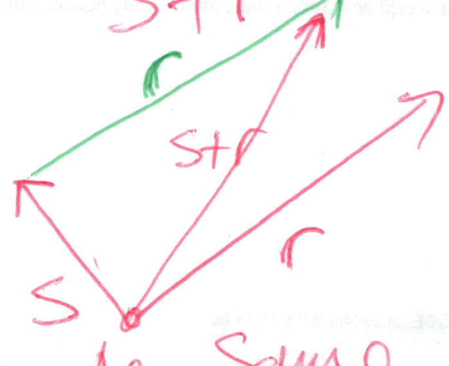
② multiplication by Scalar number.



- we have two vectors s and r and we need to add to r,

⇒ we put s at end (tail of R) and we draw diagonal to end of s', and that = sum r+s

we can also s+r



and gives us the same answer!

$r + s = s + r$

Same Thing (Commutative Rule)

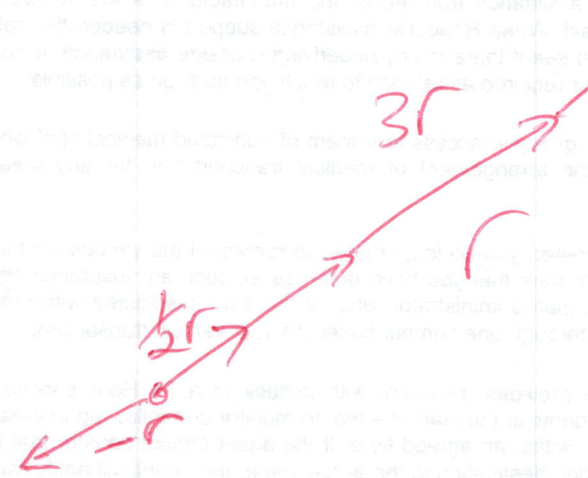
Next things to do scalar multiplication (ar)

"three r's"

$3 \times r$

where $a = 3$.

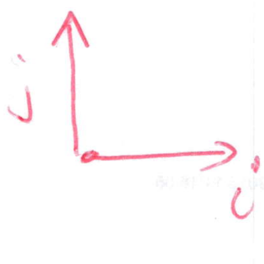
or $\frac{1}{2} r$



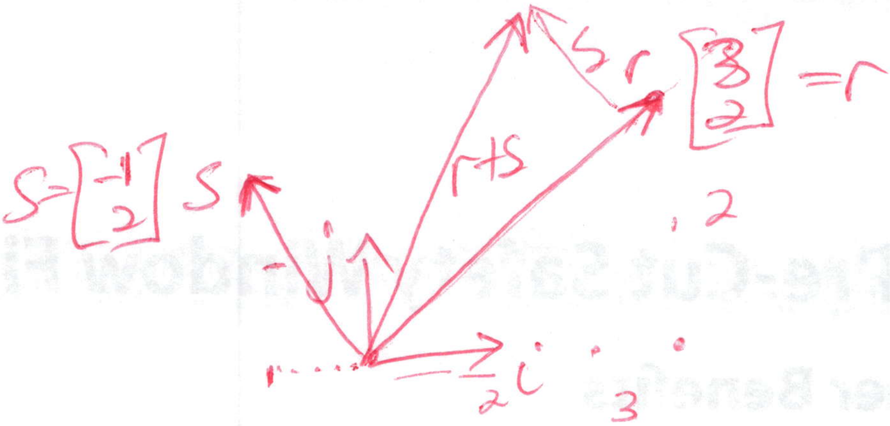
or minus r, $-r$, we go back other wa

Now lets define a Coordinate System

of length 1



vector i, j



Lets now have vector r $\begin{bmatrix} 3 \\ 2 \end{bmatrix}$

that mean 3 of i
2 of j

Scaler number 3 of i
and Scaler number 2 of j

Lets say we have anather vectors S

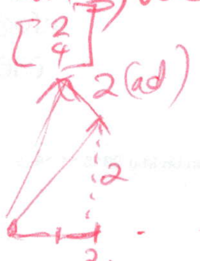
$$S = \begin{bmatrix} -1 \\ 2 \end{bmatrix} \begin{matrix} \to i \\ \to j \end{matrix}$$

$$r + S = \begin{bmatrix} 3 \\ 2 \end{bmatrix} + \begin{bmatrix} -1 \\ 2 \end{bmatrix} = \begin{bmatrix} 2 \\ 4 \end{bmatrix}$$

on diagram we go back 2 for i and add 2 for j

$\checkmark$ associative

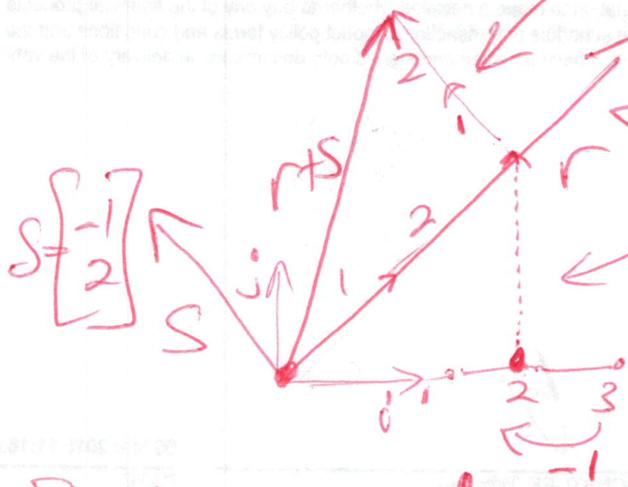
$r + S = S + r$



Ogai

add 2S to give (4)

$\begin{bmatrix} 3 \\ 2 \end{bmatrix}$ r - less 1



scalar multip. $2\hat{i}$

we stepped $\underline{1 \text{ Back}}$ because of S(-1)

$$\begin{bmatrix} 3 \\ 2 \end{bmatrix} + \begin{bmatrix} -1 \\ 2 \end{bmatrix} \begin{array}{l} -\hat{i} \\ -\hat{j} \end{array}$$

$3 - 1 = \underline{2}$

~~2+4~~

$$\xrightarrow{\quad} \quad \overset{(r+s)}{\begin{bmatrix} 2 \\ 4 \end{bmatrix}}$$

$2 + 2 = \underline{4}$ (S)

hels

look at scalar multiplication:

$\hat{i}$ and $\hat{j}$ } Basis vectors that define the coordinate system.

But don't have to work with vectors geometrically, can use list