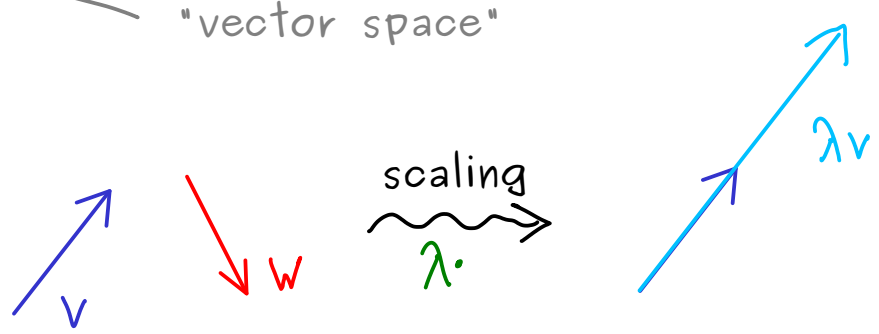
Linear Algebra – Part 2

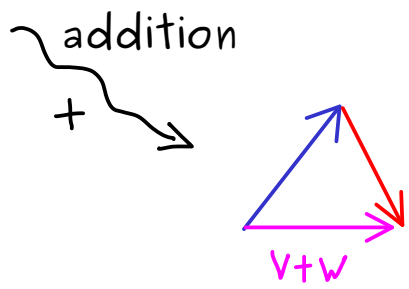
Vectors in $\mathbb{R}^2$

What are vectors?

"vector space"

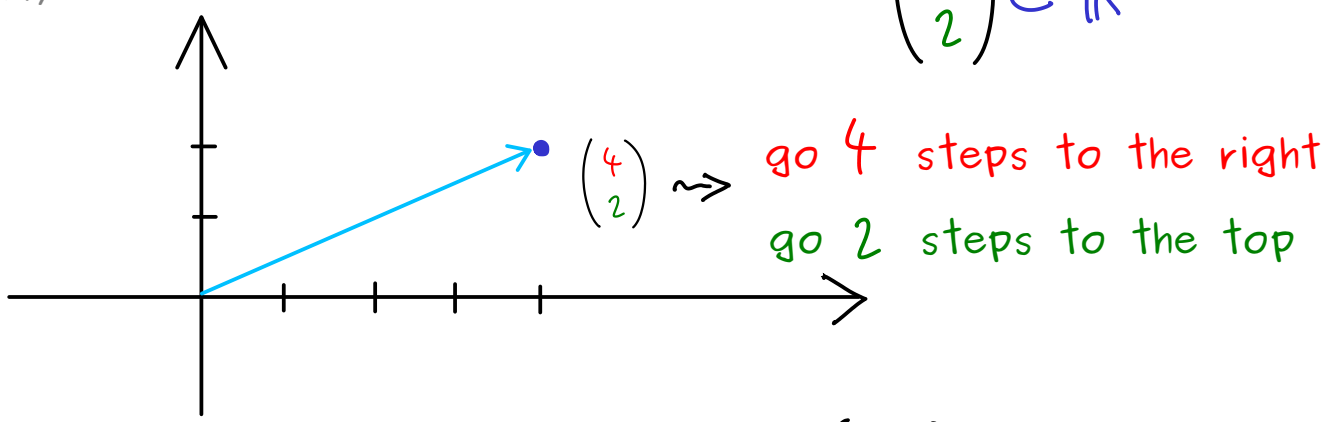
Calculation rules visualised:





Definition: $\mathbb{R}^2 = \mathbb{R} \times \mathbb{R}$, elements written in column form: $\begin{pmatrix} 4 \\ 2 \end{pmatrix} \in \mathbb{R}^2$

(Cartesian product)



Scaling: $\lambda \in \mathbb{R}$, $v = \begin{pmatrix} v_1 \\ v_2 \end{pmatrix} \in \mathbb{R}^2$: $\lambda \cdot v := \begin{pmatrix} \lambda v_1 \\ \lambda v_2 \end{pmatrix}$

Addition: $v = \begin{pmatrix} v_1 \\ v_2 \end{pmatrix}, w = \begin{pmatrix} w_1 \\ w_2 \end{pmatrix} \in \mathbb{R}^2$: $v + w := \begin{pmatrix} v_1 + w_1 \\ v_2 + w_2 \end{pmatrix}$

$\mathbb{R}^2$ together with the two operations $(\cdot, +)$ is called the vector space $\mathbb{R}^2$