Vectors $x \in V, y \in V$ $\quad x+y \in V \quad \alpha x \in V$

$a \cdot b = 1$

Vector:

- $\begin{pmatrix} 5 \\ 4 \\ 7 \\ 12 \end{pmatrix}$ "bag 'o' numbers" $\quad \mathbb{R}^n = \mathbb{R} \times \mathbb{R} \times \mathbb{R} \ldots \mathbb{R}^4$

$A = \{1, 2, 3\}$

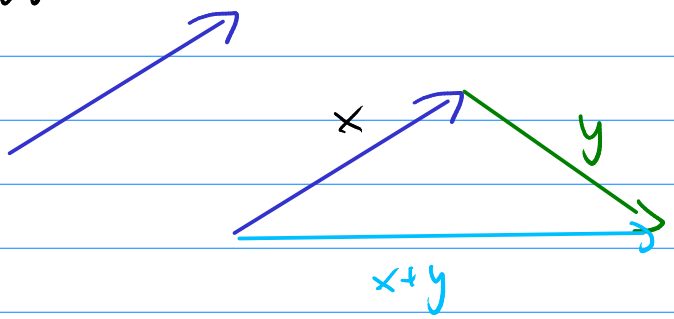
$B = \{a, b, c\}$

$C = \{ \text{cat}, \text{person} \}$

$A \times B \times C \ni (2, c, \text{person})$

$\in$

- arrows



- images
- shapes
- text

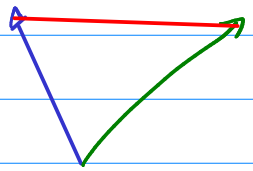
Convention: Vector spaces are non-empty.

Smallest vector space: $\{0\}$

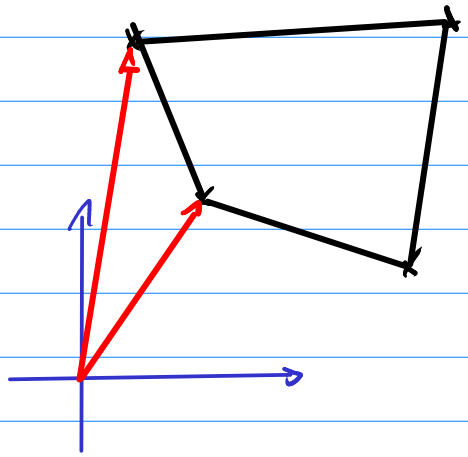
linear comb. $\alpha_1 x_1 + \alpha_2 x_2 + \alpha_3 x_3 + \dots + \alpha_n x_n$

affine comb. and $\alpha_1 + \dots \alpha_n = 1$

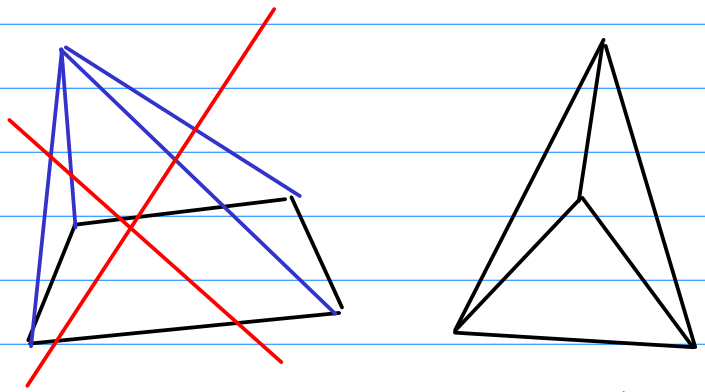
convex comb. and $\alpha_1, \dots, \alpha_n \geq 0$



Q: What can happen with conv. comb. of 4 vectors in the plane?



Q: Conv. comb of 4 vectors in $\mathbb{R}^3$?



"Tetrahedron"