



the span



Question 1:

Answer 1:

# Question 2:





example





# linear dependence

# the span

**Question 1:** Geometrically, what is the span of a single vector?

**Answer 1:** It's a line.

**Question 2:** What is the span of two vectors?

**Answer 2:** It could be a plane, but in special cases, it could actually be a line. This will happen if one vector is just the scalar multiplication of the other:  $\vec{v}_2 = k\vec{v}_1$ . In that case, we can never "leave" the line.

## example

You expect two vectors  $\vec{v}_1 = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$ ,  $\vec{v}_2 = \begin{bmatrix} 2 \\ 4 \end{bmatrix}$  to span the entire 2D plane ( $\mathbb{R}^2$ ), but in fact, they only span a subspace of the plane – a single line. Can you see why?

This leads us to a very important concept in linear algebra: **linear dependence and independence**

linear independence