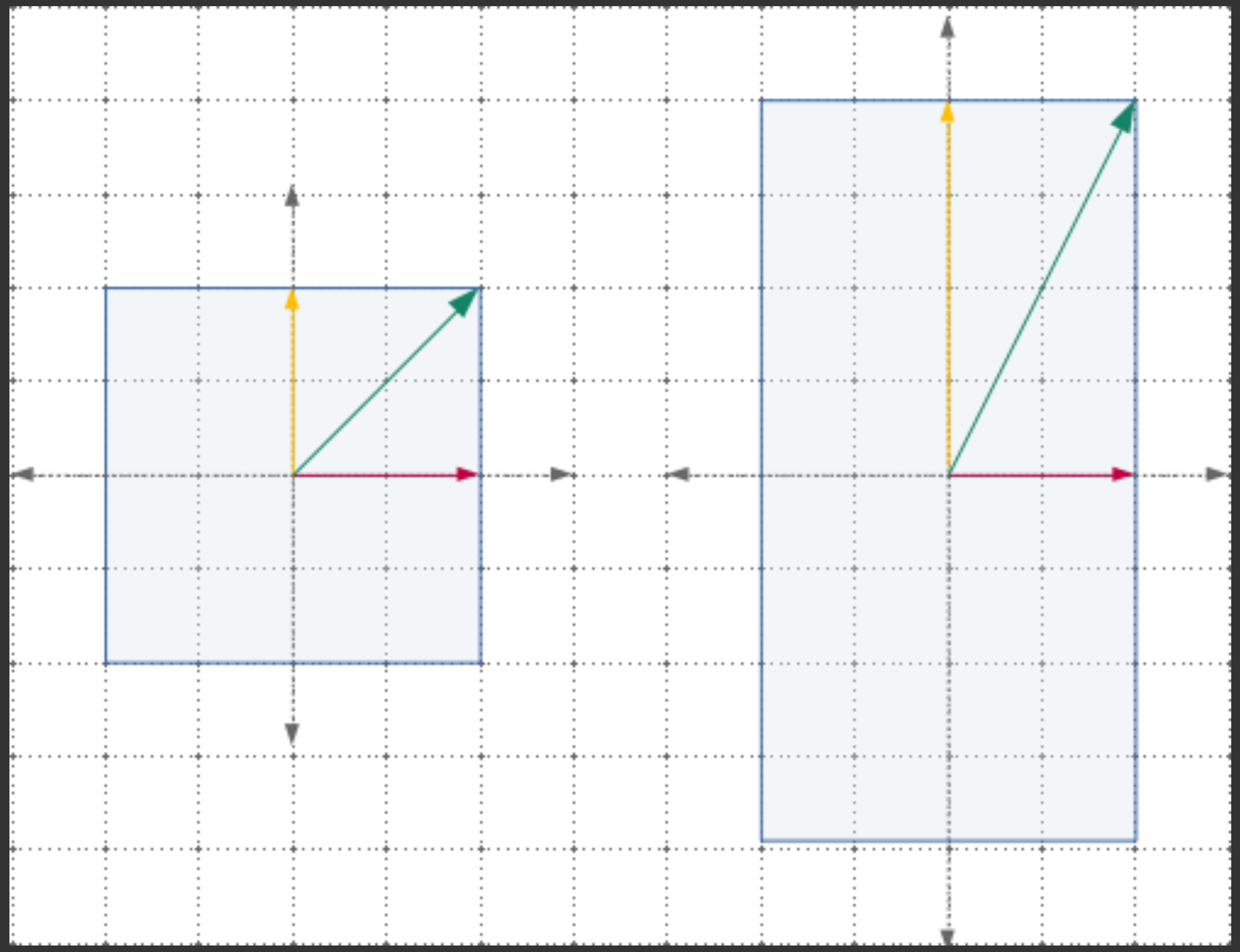
eigenvectors and eigenvalues: intuitively

example

Applying a vertical scaling of +2 to every vector of a square, will transform the square into a rectangle.

- The horizontal vector remains unchanged (same direction, same length).
- The vertical vector has same direction, but doubled in length.
- The diagonal vector has changed its angle (direction) as well as length.



After vertical scaling of +2, every vector's direction has changed, except the horizontal and vertical ones.

These two vectors are special and are the characteristic of this particular transform. They are called eigenvectors

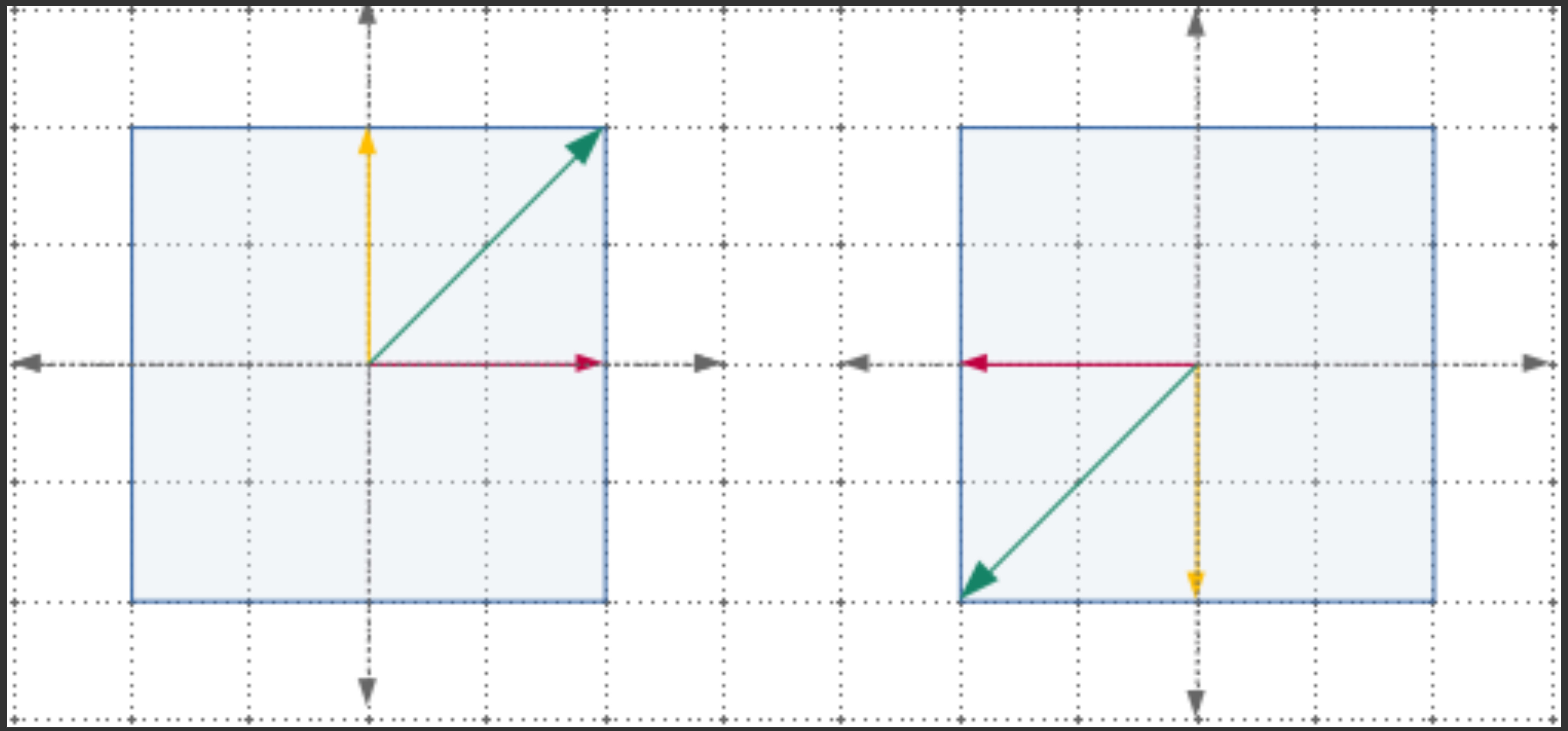
The eigenvalue is how much the eigenvectors are transformed (**stretched or squished**).

- The horizontal vector's length remains same, thus have an eigenvalue of +1.
- The vertical vectors' length doubled, thus have an eigenvalue of +2.

eigenvectors and eigenvalues: intuitively

another example

In 180 degree rotation of square, all vectors are still laying on the same span, but their direction is reversed. Hence, all vectors are eigenvectors, having an eigenvalue of -1.



Note: In case of 3d rotation transformation of cube, the eigenvector gives the axis of rotation.