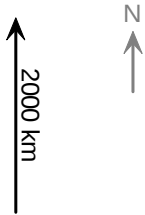


Scalars

Scalars are things which just have a value – for instance ‘5’ is a scalar quantity – all it has is a value of ‘5’, it doesn’t have any other *characteristics or properties*.

Vectors

Vectors have both a magnitude value *and* a direction. An everyday example of a vector quantity is if you are describing the movement of a ship or plane. You might say something like, “the plane travelled 2000 km north.” You could represent this movement on a diagram by an arrow, like this:

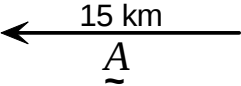


This is a vector quantity because it has a magnitude (2000 km) as well as a direction (north). There are two main ways to talk about a vector:

In this case, we can describe this vector as $\overrightarrow{AB}$ or $\underline{\tilde{AB}}$. The arrow above the AB or the tilde sign below the AB tells us that it’s a vector.	If we just name the whole vector using one letter, then we can describe it using the letter with a tilde sign underneath it to tell us it’s a vector, like this: $\underline{\tilde{A}}$.

Vectors

Vector magnitudes



To talk just about the magnitude of this vector, but not the direction, what you can do is write the vector letter down and put a pair of vertical lines around it:

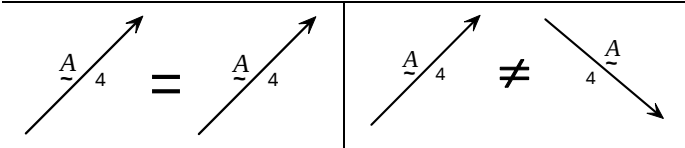
$$|\underline{A}| = 15\text{ km}$$

When we talk about the *entire* vector, then it would look something like this:

$$\underline{\tilde{A}} = 15\text{ km west}$$

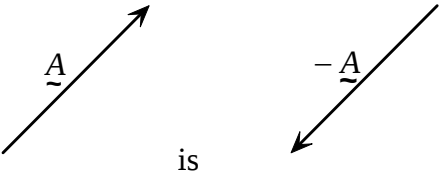
Equal vectors

For *vectors* to be equal, they have to have the same magnitude *and* the same direction:



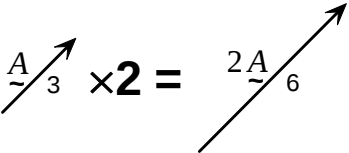
Taking the negative of a vector

If you put a negative sign in front of a vector, you reverse its direction. It keeps the same magnitude however. So the negative of:



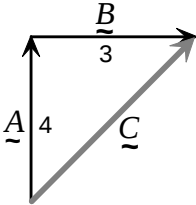
Multiplying a vector by a scalar

If you want to change the magnitude but not the direction of a vector, you can multiply it by a scalar. Any scalar larger than 1 will make the vector longer, any scalar smaller than 1 will make it shorter. For instance:



Adding vectors

To add two vectors together, start by drawing the first one. Then, beginning at the arrowhead of the first vector, start drawing your second vector. The answer is the vector from the *start* of your first vector to the *end* of your second vector.



Subtracting Vectors

Do an addition but reverse the vector being subtracted first:

