Introduction to Vectors

A **scalar** is a quantity having ***magnitude*** only.

Examples:

A **vector** refers to a quantity that has both ***magnitude*** and ***direction***.

Examples:

We will begin this course by representing vectors ***geometrically***. They are represented as a line segment with direction (a ***directed line segment).***

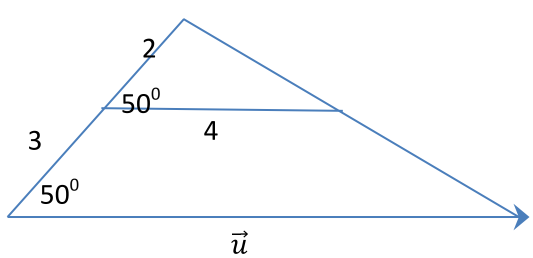
How do we express:

The magnitude of a vector?

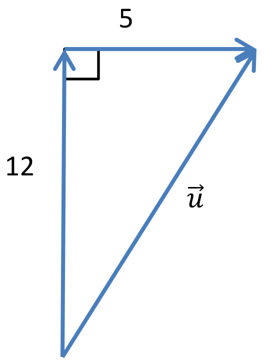
The direction of a vector?

Examples: Find $|\vec{u}|$ in each of the following.

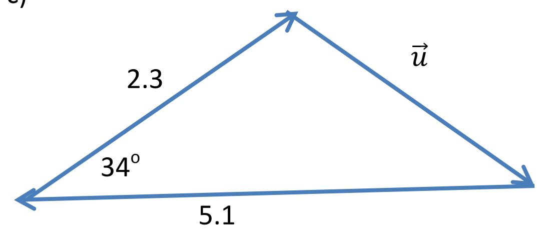
a)



b)



c)



Equality of Vectors

Two vectors, $\vec{u}$ and $\vec{v}$ are equal if and only if:

1)

2)

We can then say that:

The Negative of a Vector

The negative of a vector is a vector with the **same magnitude** but **opposite direction**.

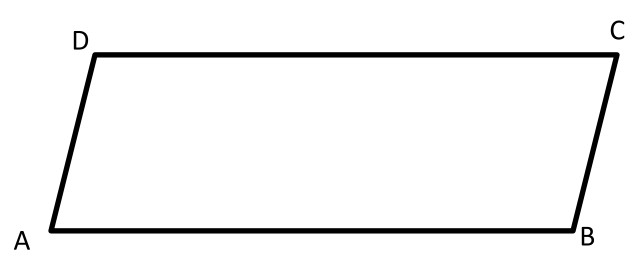
We can say that the negative of $\overrightarrow{AB}$

The Zero Vector

The zero vector has a magnitude of zero. Its direction is undefined.

Example: In parallelogram ABCD, find a vector equal to:

a) $\overrightarrow{AB}$ b) $\overrightarrow{DA}$ c) $-\overrightarrow{CD}$



Find vectors equal to the negative of:

d) $\overrightarrow{AB}$ e) $\overrightarrow{CB}$

Scalar Multiplication

Recall that a scalar quantity can be any real number.

A vector $\vec{v}$ can be multiplied by a scalar, k, to produce a new vector $k\vec{v}$ such that:

1)

2)

Example: Given M is the midpoint of $\overrightarrow{AB}$, express each vector below as a scalar multiply of another. (Label the diagram first)

a) $\overrightarrow{AB} =$

b) $\overrightarrow{BM} =$

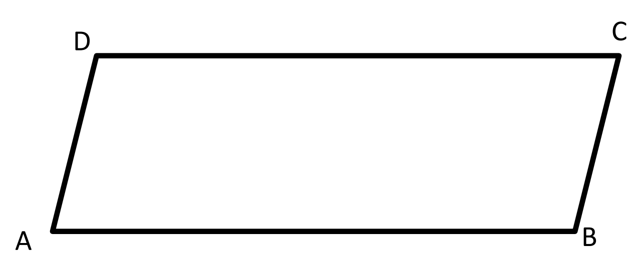
Example ABCD is a parallelogram with X and Y as midpoints of AB and AD, respectively. If $\vec{u} = \overrightarrow{BX}$ and $\vec{v} = \overrightarrow{AY}$ express the following in terms of $\vec{u}$ and $\vec{v}$.

a) $\overrightarrow{AD}$

b) $\overrightarrow{XA}$

c) $\overrightarrow{CD}$

d) $\overrightarrow{CB}$



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