6.1 Notes

Tuesday, March 21, 2017 7:47 AM

Section 6.1 – Vectors

Q: What is the difference between velocity and speed??

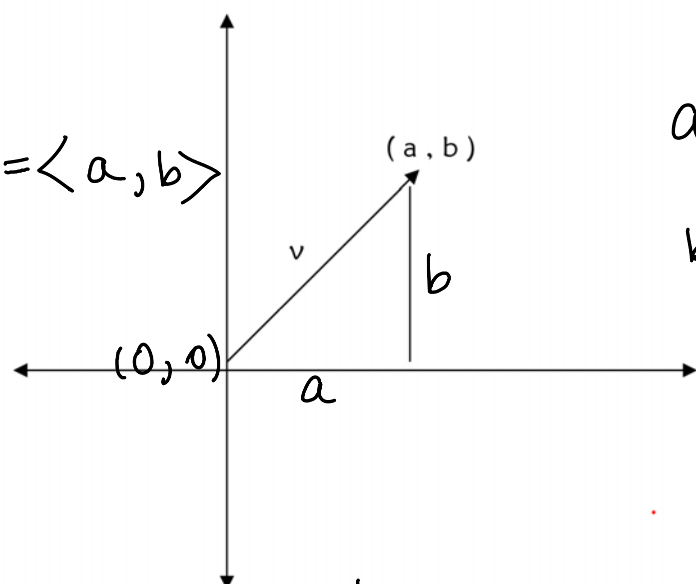
velocity has magnitude and direction. Speed is just magnitude (value).

SCALARS are just numbers (magnitude)

VECTORS are magnitude and direction represented w/ arrow

VECTORS IN A RECTANGULAR COORDINATE SYSTEM

$V = \langle a, b \rangle$



a = horizontal component

b = vertical component

NOTE: (a, b) denotes a point, while <a, b> denotes a vector.

<a, b> is called component form of a vector.

The MAGNITUDE of a vector is the length of the directed line segment.

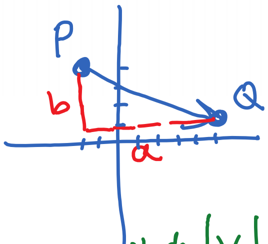
It is denoted: $|v|$

$a^2 + b^2 = v^2$

The magnitude of a vector, $v = \langle a, b \rangle$, is $\sqrt{a^2 + b^2}$.

(Pythagorean Thm)

Example: Find the component form and magnitude of vector $\overrightarrow{PQ}$ if P = (-2, 4) and Q = (5, 1).



$\langle a, b \rangle$

$\langle 5-(-2), 1-4 \rangle$ ← Head-Minus-Tail Rule

$\langle 7, -3 \rangle$

magnitude: $|v| = \sqrt{7^2+(-3)^2} = \boxed{\sqrt{58}}$

Try it: Find the component form and magnitude of vector $\overrightarrow{RS}$ if R = (4, 3) and S = (-1, 6).

$\langle -5, 3 \rangle$ mag $= \sqrt{34}$

Two vectors have the **SAME DIRECTION** if they are parallel and pointing the same way

Two vectors have **OPPOSITE DIRECTION** if they are parallal and pointing opposite ways

Two vectors are **EQUAL**, u=v, if they have same magnitude and direction.

VECTORS DO NOT HAVE TO COINCIDE (LIE ON TOP OF EACH OTHER) TO BE EQUAL.

Example: Show that $\overrightarrow{AB}$ and $\overrightarrow{CD}$ are equivalent vectors if A = (-4, 2), B = (-1, 6), C = (0, 0), and D = (3, 4).

show that component forms are equal!

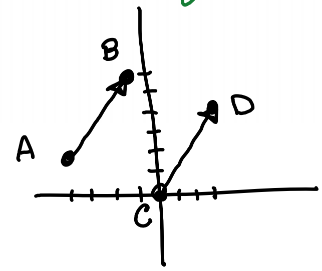
$\overrightarrow{AB} = \langle 3, 4 \rangle$

(3, 4).

Show that component forms are equal!

$\overrightarrow{AB} = \langle 3, 4 \rangle$

$\overrightarrow{CD} = \langle 3, 4 \rangle$



Try it: Show that EF and GH are equivalent vectors if E = (-3, 4), F = (-5, 2), G = (0, 0), and H = (-2, -2).

Adding and Subtracting Vectors

Example: Given: u = <2, -4> and v = <3, -5>

Find: a) u + v $= \langle 2+3, -4+-5 \rangle = \langle 5, -9 \rangle$

b) u – v $= \langle 2-3, -4-(-5) \rangle = \langle -1, 1 \rangle$

c) 3u $= 3\langle 2, -4 \rangle = \langle 6, -12 \rangle$

d) 2u + 4v $= 2\langle 2, -4 \rangle + 4\langle 3, -5 \rangle$

$= \langle 4, -8 \rangle + \langle 12, -20 \rangle$

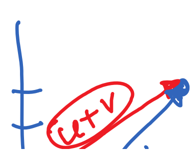
$= \langle 16, -28 \rangle$

Try it: Given: u = <1, -1> and v = <3, 4>, find a, b, c, and d from above example.

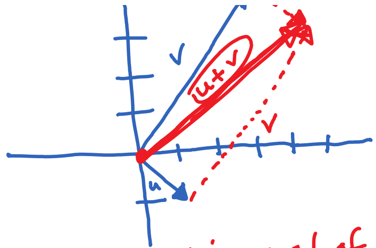
u + v

Parallelogram method

tip to tail method

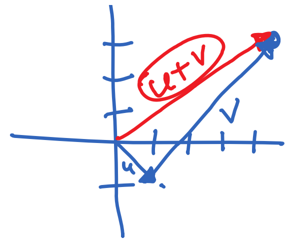


$u+v = \langle 4, 3 \rangle$



u+v is diagonal of parallelogram

$u+v = \langle 4,3 \rangle$

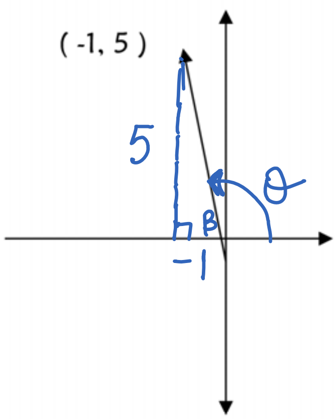


$u+v = \langle 4,3 \rangle$

Direction Angle of the Vector

The position angle between the x – axis and a position vector is called the direction angle, denoted θ.

Example: Find the direction angle of the vector: $v = \langle -1,5 \rangle$



$\tan\beta = \frac{5}{-1}$

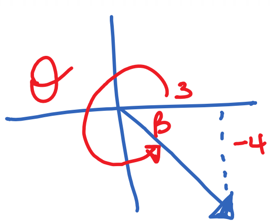
$\beta = \tan^{-1}\left(\frac{5}{+1}\right)$

$\beta = 78.69°$

$\theta = 180 - 78.69$

$\boxed{\theta = 101.31°}$

Try one: Find the direction angle of the vector: $u = \langle 3,-4 \rangle$.



$\beta = \tan^{-1}\left(\frac{4}{3}\right) = 53.13°$

$\theta = 360 - \beta = \boxed{306.87°}$

OR $\boxed{-53.13°}$