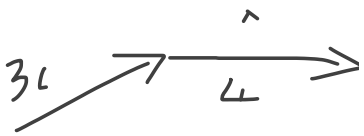
6.1 - Introduction – GEOMETRIC Vectors

Tuesday, October 28, 2025 7:11 PM



Vector a quantity with magnitude (length/size) AND direction.

Scalar a quantity with magnitude only.

Displacement, acceleration, velocity, force, field, …

distance, speed, time, temperature, mass

1. Which of these physical quantities is a vector and which is a scalar?

a. the mass of the moon

b. the acceleration of a drag racer

c. the velocity of a wave at the beach

d. the speed of light

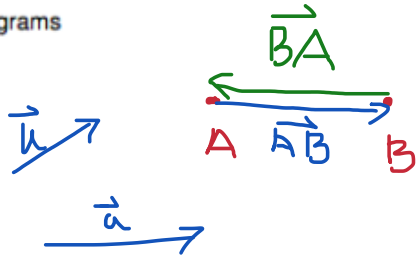
e. the force of gravity

f. the magnetic field of the earth

g. the area of a rectangle

h. the temperature of a swimming pool

Diagrams



Notation

Notation

vectors – use letters with an arrow on top
ex. $\vec{u}$, $\vec{x}$, $\vec{AB}$

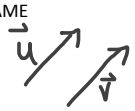
scalars – use just letters (no arrow) or numbers
ex. x, 5 …

magnitude – use absolute value around the vector name.
ex. $|\vec{x}|$ $|\vec{AB}|$ ~~$|\vec{x}| = 5$~~ $|5| = 5$

Equal vectors

$\vec{u} = \vec{v}$

If and only if MAGNITUDE and DIRECTION are The SAME



Opposite Vectors RULE

magnitude

$|\vec{a}| = |\vec{b}|$ $\vec{a} = -\vec{b}$

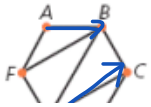
2. ABCDEF is a regular hexagon. Give an example of vectors which are

a. equal $\vec{AB} = \vec{ED}$

b. parallel but having different magnitudes $\vec{AF} \parallel \vec{BE}$

c. equal in magnitude but opposite in direction

d. equal in magnitude but not equal vectors



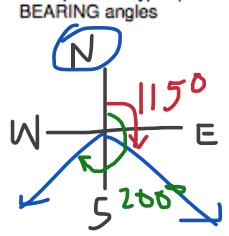
$\vec{AB} = -\vec{DE}$ $\vec{AB}$ $\vec{AF}$

e. different in both magnitude and direction

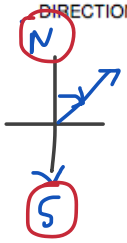
$\vec{AB}$ $\vec{EC}$

3. Angles can be quoted in different ways. Use the first two ways that follow for word problems, and the last one for non-word problem type question.

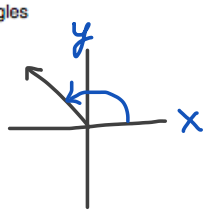
BEARING angles



DIRECTION angles



MATH angles

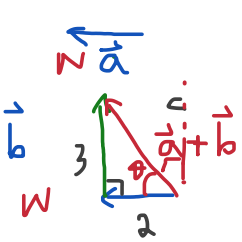


4. A student travels to school by bus, first riding 2 km west, then changing buses and riding a further 3 km north. Find the resultant vector.

head + tail to head

tail

$\vec{a} + \vec{b}$



$|\vec{R}| = \sqrt{3^2 + 2^2}$

$= \sqrt{13}$

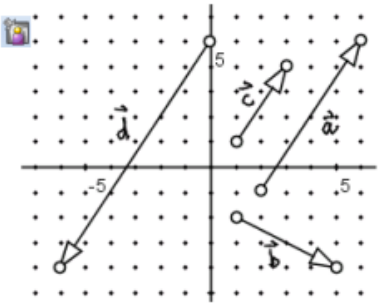
$\doteq 3.61$

$\tan\theta = \frac{3}{2}$

$\theta = \tan^{-1}\left(\frac{3}{2}\right)$

$\doteq 56°$

$\vec{R} = 3.61 \text{ km } [N34°W]$



5. Determine the magnitude and direction of each of the vectors in the given diagram.

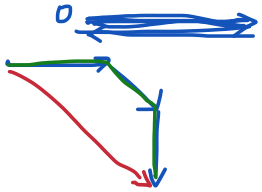
6. Examine the vectors in the diagram. Express $\vec{d}$ and $\vec{c}$ each as a scalar multiple of $\vec{a}$

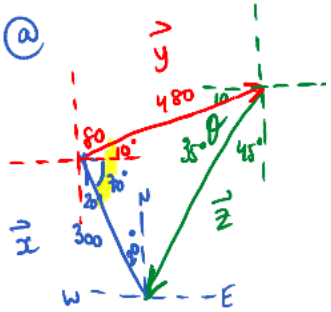
Multiply negative --> Change direction to opposite

7. A search and rescue aircraft, travelling at a speed of 240km/h, starts out at a heading of $N20°W$. After travelling for one hour and fifteen minutes, it turns to a heading of $N80°E$ and continues for another 2 hours before returning to base.

a. Determine the displacement vector for each leg of the trip.

b. Find the total distance the aircraft travelled and how long it took.





$D = VT$

$= (240 \text{ km/h})(1.25 \text{ h})$

$= 300 \text{ km}$

$D = (240)(2)$

$= 480\ km$