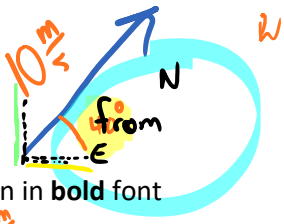
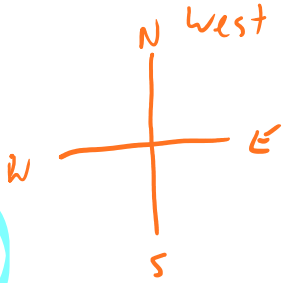
Vector Introduction

Tuesday, October 19, 2010 8:38 AM

Vectors are physical measurements that have direction as part of them. measured from North, South, East, West

Velocity (speed with direction) is a vector,
displacement (distance with a direction) is a vector.
Acceleration is a vector if any directional info is given.
Forces (any push or pull) are vectors,
momentum is a vector,
impulse is a vector,
gravitational field is a vector.
Current is a vector.





Vectors are symbolized with arrows
In text books vectors are often written in **bold** font

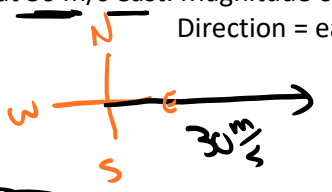
Vectors have 2 parts to them: magnitude (size with units) they also have a direction

16 m/s → W — E

Example: a cat travels at 30 m/s east. Magnitude of the velocity = 30 m/s
Direction = east

Draw it

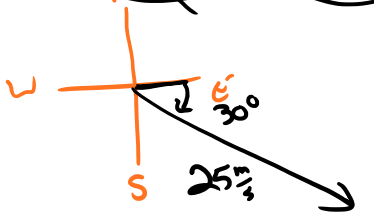
Compass bearings:

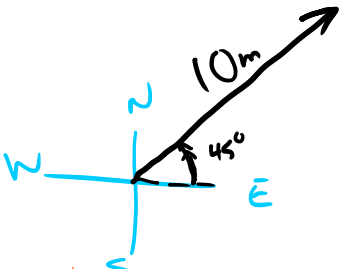


Draw 25 m/s at 30° South from E

80°

from N

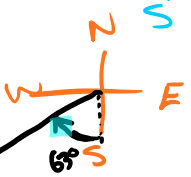




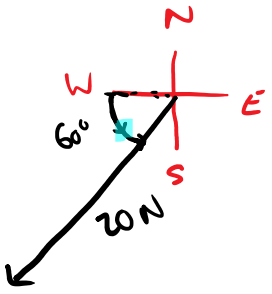
10 m at 45° N from E

13 m/s² at 53° W from S

20 N at 60° S from W



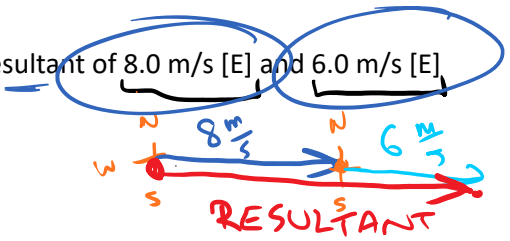
Start



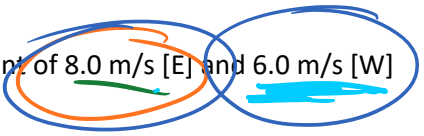
Adding vectors is done by drawing them in TIP TO TAIL fashion. The tip of one vector touches the tail of the next vector.

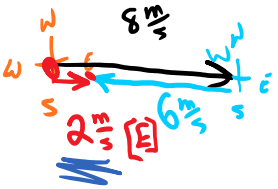
The result of adding vectors is given a name, it is called the RESULTANT. Resultant show up on diagrams. THEY ARE NOT tip-to-tail. Resultants are drawn from the starting point to the end point.

Find the resultant of 8.0 m/s [E] and 6.0 m/s [E]

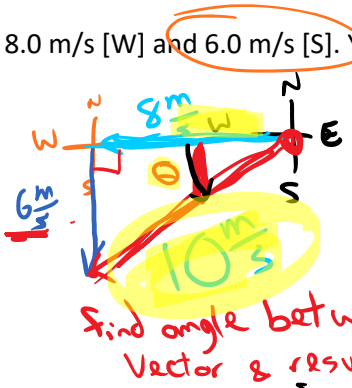


Find the resultant of 8.0 m/s [E] and 6.0 m/s [W]





Find the resultant of 8.0 m/s [W] and 6.0 m/s [S]. You must draw this.



Pythagoras

$a^2 + b^2 = c^2$

$8^2 + 6^2 = 100 = c^2$

$\sqrt{100} = c$

$10 = c$

$\frac{opp}{adj} = Tan\,\theta$

$\frac{6}{8} = Tan\,\theta$

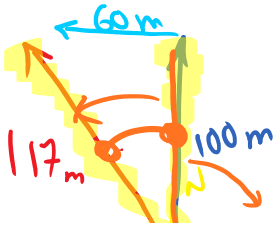
$Tan^{-1}\left(\frac{6}{8}\right) = 37°$

S from W

Direction is an angle at some N/E/S/W from N/E/S/W

The angle is ALWAYS between your first vector and your resultant

Find the resulting displacement of a cat carcass which is dragged by a wolverine 100 m [N] then hit by a bus and smeared 60 m [W].



$a^2 + b^2 = c^2$

$100^2 + 60^2 = 13600 = c^2$

$c = \sqrt{13600} = 117\ m$

$c = \sqrt{13600} = 117\text{ m}$

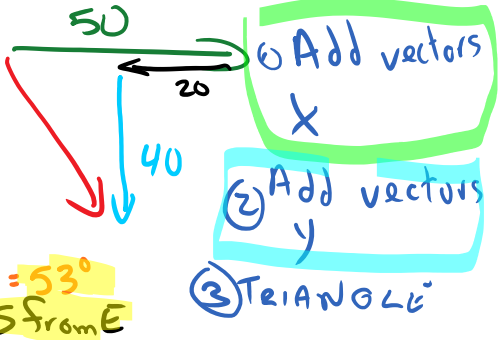
$\frac{opp}{adj} = \tan\theta \qquad \frac{60}{100} = \tan\theta$

$\tan^{-1}\left(\frac{60}{100}\right) = 30.1^\circ$ W from N

A cat is pulled by a force of 50 N [E] at the same time it is pushed by a force of 40 N [S] and punted with a force of 20 N [W]. Find the resultant.

$a^2 + b^2 = c^2$

$\tan\theta = \frac{40}{30} \qquad \theta = \tan^{-1}\left(\frac{40}{30}\right) = 53^\circ$ S from E



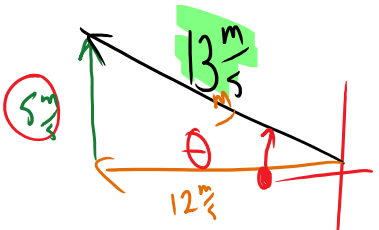
E

$\theta = \tan^{-1}\left(\frac{40}{30}\right)$

3 – n – ip to ta

Vectors may be added in any order, so add the parallel vectors together first!

Boys: find the resultant of 12 m/s [W] and 5.0 m/s [N].



$\theta = \tan^{-1}\left(\frac{5}{12}\right) = 23^\circ$ N from W

Girls: find the resultant of 5.0 m/s [N] and 12 m/s [W].

$\tan^{-1}\left(\frac{12}{5}\right)$