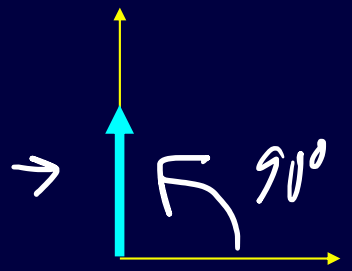
Vectors

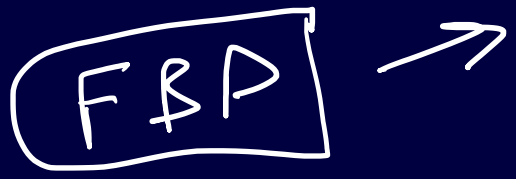
- There are two kinds of Physical quantities we will deal with:
  - Scalar (Only has a size)
    - Quantity that can be described with only one number.
      - This quantity is called magnitude.
    - Ex: time, speed (just a magnitude say 5 miles per hour)
  - Vector: (Has size and a direction)
    - Quantity that is described with two numbers
      - Magnitude
      - Direction
    - Ex: Position, velocity (magnitude say 5 miles per hour and direction say north)

Two ways to represent a vector

- First way: Analytical (mathematically)
  - **V** = (5m/s, north)
  - **V** = (5m/s, 90 degrees from the x-axis)

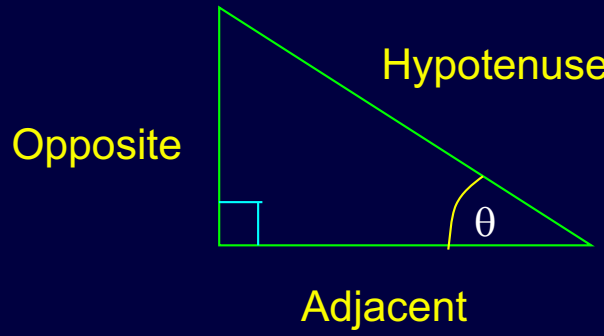


➡ Second way: Geometrically (Arrow method)
Arrow points in the direction vector does.
Length of arrow is it's magnitude.



Right Triangle Trigonometry

This is one of the more common things people are rusty with.



Sin θ = Opp./Hyp.
Cos θ = Adj./Hyp.
Tan θ = Opp./Adj.

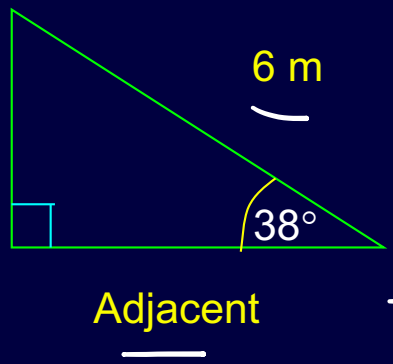
Student: Well my only question would have to be, how would you know which sin, cos, and tan to use for each problem?

Sin 38 = 0.615.
Cos 38 = 0.788.
Tan 38 = 0.781

Clicker Question 2:

What is the length of the adjacent side?

(a) 4.73 m
(b) 3.69 m
(c) 4.68 m
(d) 5.73 m
(e) Not enough information!



$\cos\theta = \frac{A}{H}$

$\cos 38 = \frac{A}{H}$

$A = H \cos 38$

$= 6\text{m} \cos 38$

$= 4.73\text{ m}$

Clicker Question 3:

$\tan\theta = \frac{O}{A}$

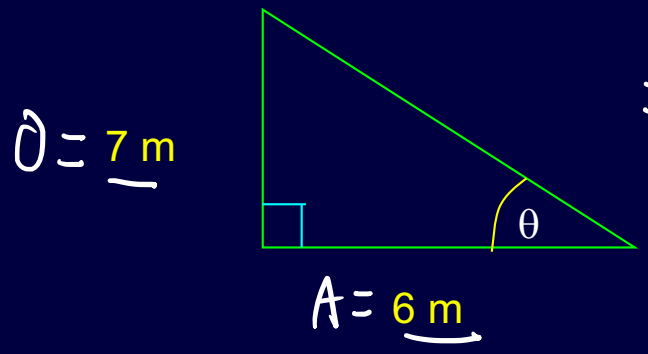
If the adjacent side below is 6m and the opposite side is 7m. What is the angle?

$\theta = \tan^{-1}\left[\frac{O}{A}\right]$

$= \tan^{-1}\left[\frac{7m}{6m}\right]$

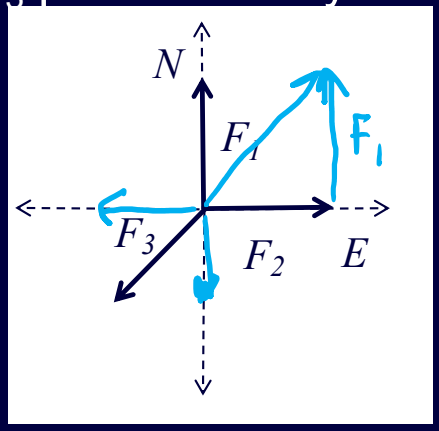
$= 49.4°$

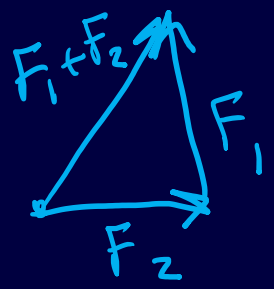
(a) 35°
(b) 51.3°
(c) 43°
(d) 49.4°
(e) 40.6°



Clicker Question 4:

Suppose three equal forces are pulling on an object in a plane, as in the picture below. The net force on the object will point closest to which direction? (These vectors are all in the x y axis) (F_3 points exactly SW)





(a) Northeast

(b) Southwest

(c) It will be zero

(d) Not enough information

Clicker Question 5:

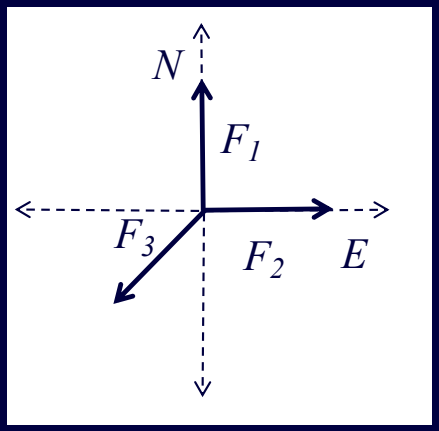
Suppose three equal forces of 10 N are pulling on an object in a plane, as in the picture below. What are the components of F_1 in the form (x,y)? Assume our usual xy-axis as shown.

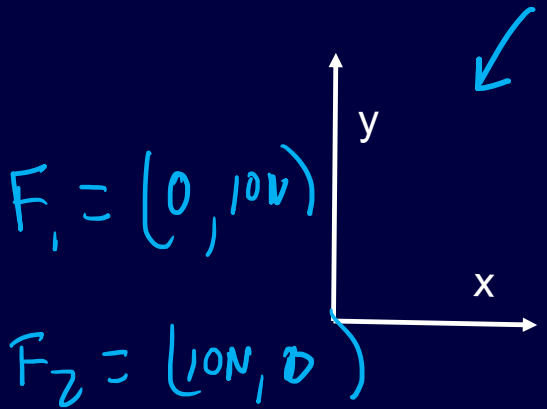
(a) (10 N, 0 N)

(b) (0 N, 10 N)

(c) (-10 N, 0 N)

(d) (0 N, -10 N)





Clicker Question 6:

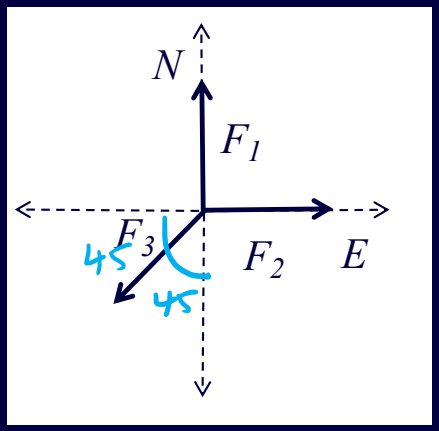
Suppose three equal forces of 10 N are pulling on an object in a plane, as in the picture below. What are the components of F_3 in the form (x,y)? Assume our usual xy-axis as shown.

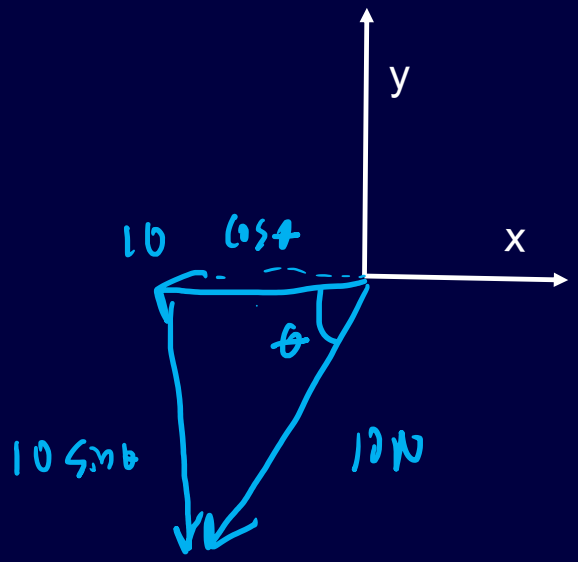
(a) (7.07 N, 7.07 N)

(b) (5 N, 5 N)

(c) (-7.07 N, -7.07 N)

(d) (-5 N, -5 N)





$\cos\theta = \frac{A}{H}$

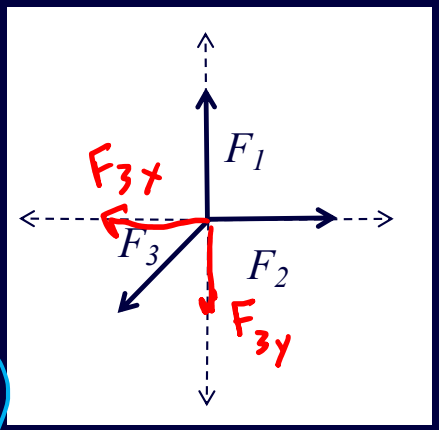
$A = H \cos\theta$

Sin 45 = 0.707.
Cos 45 = 0.707.
Tan 45 = 1.0

Clicker Question 7:

Suppose three equal forces of 10 N are pulling on an object in a plane, as in the picture below. What will be the resultant force?

(a) 4.14 N
(b) 7.07 N
(c) 2.92 N
(d) 3.41 N



$F_1 = (0, 10\,N)$

$F_2 = (10\,N, 0)$

$F_3 = (-7.07\,N, -7.07\,N)$

$F_{tot} = (2.92\,N, 2.92\,N)$