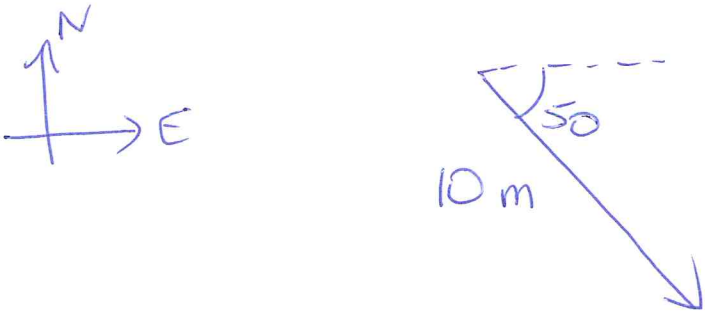
Vector Components

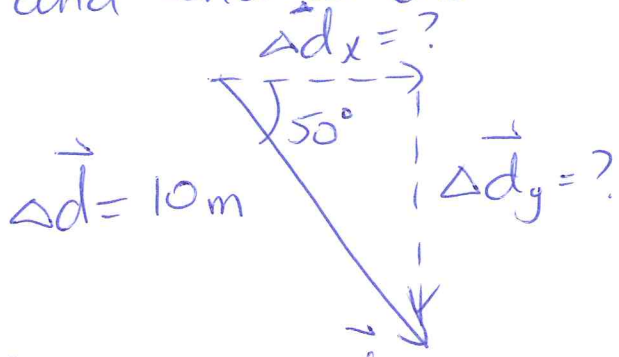
We like to work with vectors that are in the x and y plane. We don't like oblique vectors.

So... we "break" oblique vectors into 2 x and y vectors.

Example: Break $\vec{\Delta d} = 10\text{ m } [E\,50°\,S]$ into components.



First draw the 2 vectors that add up to 10 m [E 50° S]. Remember vector addition: add "tail-to-tip" and then "start at start" and "end at end" to find the SUM (answer)



Use trig. to solve

SOH CAH TOA

$\underline{x}$ $\cos 50° = \dfrac{d_x}{10}$

$\vec{\Delta d_x} = 6.4\text{ m } [E]$

$\underline{y}$ $\sin 50° = \dfrac{\Delta d_y}{10}$

$\Delta d_y = 7.7\text{ m } [S]$

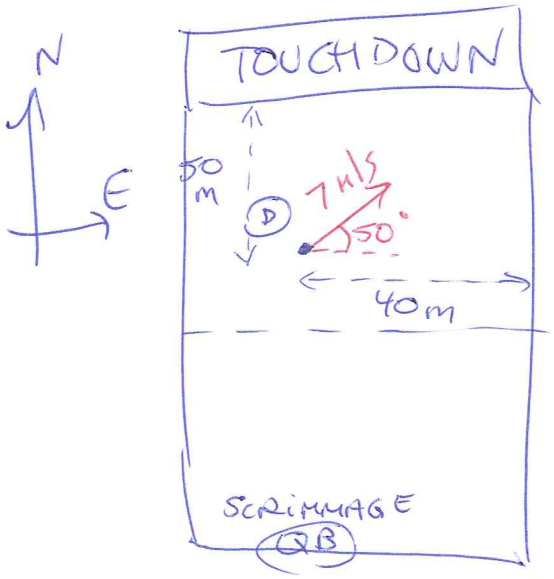
So...

$$\vec{\Delta d} = \vec{\Delta d_x} + \vec{\Delta d_y}$$

$$10\text{ m } [E 50^\circ S] = 6.4\text{m } [E] + 7.7\text{m } [S]$$

↑ x component ↑ y component

Vector Component Question

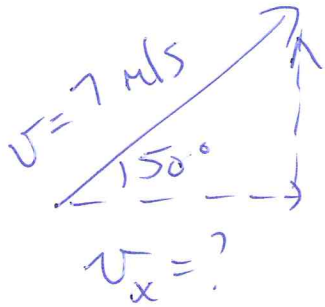


(QB)

The tigercat quarterback throws a long bomb to a mostly wide open receiver (•). The receiver is 40m from the sideline and 50 m from the end zone for a touchdown. He needs to avoid one Argo defensive player (D) and so runs 7 m/s at an angle [E 50° N].

a) How fast is he running [east]? [North]?

* This is vector components!



x
COH

$\cos 50° = \frac{V_x}{7}$

$V_x = 4.50$ [E]

$V_x = 4.5$ m/s [E]

y
SOH

$\sin 50° = \frac{V_y}{7}$

$V_y = 5.36$ [N]

$V_y = 5.4$ m/s [N]

b) Does the Tigercat get a touchdown OR does he get run out of bounds?

* This question is really asking which he does 1ST - run out of bounds or reach the endzone. Calculate time for each!

sideline → (x)

$\Delta d_x = 40\text{ m}$ (see diagram)

$v_x = 4.50\text{ m/s}$

$t = ?$

$v = \frac{\Delta d}{t}$

$t = \frac{\Delta d}{v}$

$t = \frac{40}{4.50}$

$t = 8.9\text{ s}$

touchdown → (y)

$\Delta d_y = 50\text{ m}$ (see diagram)

$v_y = 5.36\text{ m/s}$

* use extra sig dig in middle steps

$t = ?$

$v = \frac{\Delta d}{t}$

$t = \frac{\Delta d}{v}$

$t = \frac{50}{5.36}$

$t = 9.3\text{ s}$

∴ he runs out of bounds First (8.9s) ∴ NO TOUCHDOWN (4)