Lecture 1

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Vectors & Scalars

- Scaler
  - A quantity that has magnitude only
- Vectors are quantities that have both *magnitude* and *direction*
  - Magnitude
    - The size of the vector
    - Examples: 1, 2, 3, 4
  - Direction
    - The direction the vector is pointing
    - Examples: North, South, East, West
  - Examples: Velocity, force, displacement
  - Position vector
    - A vector that points from the origin to a point in space
    - Example: home is `<0, 0>` , lecture hall is `<-1, 3>` , and coffee shop is `<2, 2>`
      - The noted as `v->` from home to lecture hall is **X mph north**
      - `v^` = **north**
      - `|v->|` = **X**
      - To go from the lecture hall to the coffee shop, you would go **X MPH east**
      - To get the vector length, you would use the Pythagorean theorem (where vector length is the hypotenuse)
        - `√((x2-x1)^2 + (y2-y1)^2)`
        - `√((2-(-1))^2 + (2-3)^2) =`
        - `√(3^2 + (-1)^2) =`
        - `√(9 + 1) =`
        - **√(10)**
      - To get the vector displacement, you would subtract the two vectors
        - `<x2, y2> - <x1, y1> = <x2-x1, y2-y1>`
        - `2-(-1) = 3` and `2-3 = -1` and thus the vector displacement is **<3, -1>**

Units

- Dimensionless numbers
  - Numbers that have no units
    - Examples: 1, 2, 3, 4
  - Dimensional numbers
    - Numbers that have units
      - Examples: 100W, 10kg, 25V
  - Examples: The tempature in a room, the mass of an object
- Dimensional Scalers
  - Dimensionless number **x** unit
    - Examples: 1m, 2kg, 3s, 300,000m/s

Thing to Measure	Unit
Length	Meters (`m`)
Area	Square meters (`m^2`)
Volume	Cubic meters (`m^3`)
Time	Seconds (`s`)
Angle	Radians (`rad`), `1` degree = `π/180` radians
Mass	Kilograms (`kg`)
Speed	Meters per second (`m/s`)
Force	Newtons (`kg*m/s^2`)
Temperature	Fahrenheit (`F`), Celsius (`C`), Kelvin (`K`)

PollEV Answers

1. *No Right Answer*
2. *No Right Answer*