- # Lat's & Dep's
    - **First, The Math (oh boy!)**
        - **Trigonometry**
            - Sine
                - Soh ...
                    - it's a ratio
                    - ... means "how small opp. is compared to hypotnuse"
                    - ... if Sin = 0.70 ... it means opp. is only 70% as big as hypotenuse
                    - kinda simple, really
            - Cosine
                - Cah
                    - also a ratio
                    - ... means "how small adj. is compared to hypotenuse"
                    - ... if Cos = 0.50 ... it means adj. is 50% the size of hypotenuse
            - Tangent
                - Toa
                    - we don't need to worry about Tan today
        - **Unknown Distance**
            - a2 + b2 = c2
            - fairly basic I hope
        - **That's it for the "math"**

- **Then the Surveying Part (better, maybe)**
  - **vectors**
    - Your record bearing (direction) and distance (magnitude)
    - from this we want change in N-S (latitudes) and E-W (departures
    - can you see the link to Sin & Cos?
    - video
    - important :angles are 'off the N-S' line
    - important: '+' and '-' values are possible

- **A closed traverse example**
  - 1) POC = 0, 0 = Stn A
  - 2) brg = 060 & HD = 45.0m ... = Stn. B
    - lat = cos(60) * HD = (0.5) * 45m = +22.5m
    - dep = sin(60) * HD = (0.87) * 45m = +39.0m
  - 3) brg = 180 & HD = 50.0m ... = Stn. C
    - lat = -50.0m
    - dep = 0
    - hope that was obvious
    -
  - 4) brg = 250 & HD = 30.0m ... = Stn. D

  - 5) brg = 340 & HD = 50.0m = Stn. A

- calculate the Lat's & Dep's for all Stn's (including the last Stn A)
- Did we return to 0, 0 or not?
  - tally all lat's
  - tally all dep's
  - how far off are we?
    - lat = ?
    - dep = ?
    - straight line = ?
    - % error?

- **Summary**
  - **Sin & Cos are simple ratios**
    - "how small is one side compared to the hypotenuse"
    - we "traverse the hypotenuse"
    - so we use Sin & Cos to determine lat & dep

  - **A closed traverse**
    - we return to where we started ... at least physically
    - due to errors in measurements, our plot will not 'return exactly'
    - we can do a hand plot and estimate the error (but our plot has errors!)
    - we can use lat's & dep's
      - to determine error (this lecture)
      - to correct the error (next lecture)