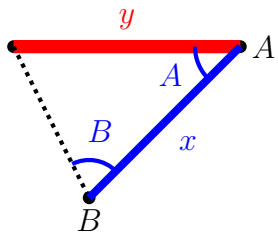
MAT 153. Measuring Project

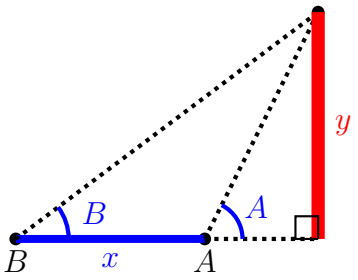
Measuring Distance with Law of Sines



Goal is to compute distance y without directly measuring length.

1. Starting at A, one end of the distance to be computed, pick a position B (at an angle between 45° and 120° from y) whose distance from A **can** be directly measured.
2. At point A measure the angle from y to B.
3. Measure the distance x from A to B.
4. At point B measure the angle formed by y.
5. Apply the formula $y = x\,\dfrac{\sin(B)}{\sin(A+B)}$.

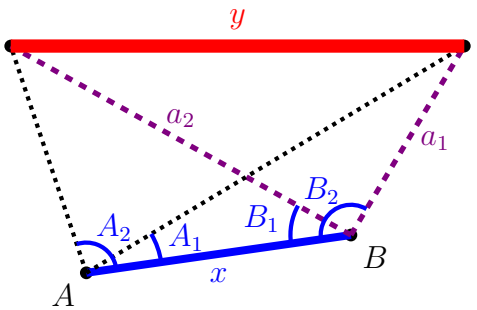
Measuring Elevation with Law of Sines



Goal is to compute elevation y without directly measuring height.

1. Starting at some point A "nearby" the height to measure, compute the angle of elevation A to the top.
2. Move further away, measuring the distance traversed, x.
3. Compute the angle of elevation B at the further position.
4. Apply the formula $y = x\,\dfrac{\sin A \sin B}{\sin(A-B)}$.

Distance Using Law of Cosines



Goal is to compute distance y without touching either side! Measure distance x and angles formed by y at either end.

- $a_1 = x\,\dfrac{\sin(A_1)}{\sin(A_1+B_2)}$
- $a_2 = x\,\dfrac{\sin(A_2)}{\sin(B_1+A_2)}$
- $y^2 = a_1^2 + a_2^2 - 2\,a_1 a_2 \cos(B_2 - B_1)$

Project Team: _____

Tools

- Tape measure to get distance.
- Phone to get angles.

I suggest using the free "Angle Finder – Spirit Level" app by JRSoftWorX
`https://www.jrsoftworx.com/`

Project 1. Measure distance across the pond

$x =$ ☐

$A =$ ☐ $B =$ ☐

$y =$ ☐

Project 2. Measure height of something tall

Measuring the height of ☐

$x =$ ☐

$A =$ ☐ $B =$ ☐

$y =$ ☐ Height $=$ ☐

(Note: the true height should be y plus the height of whomever was making the angle measurements)