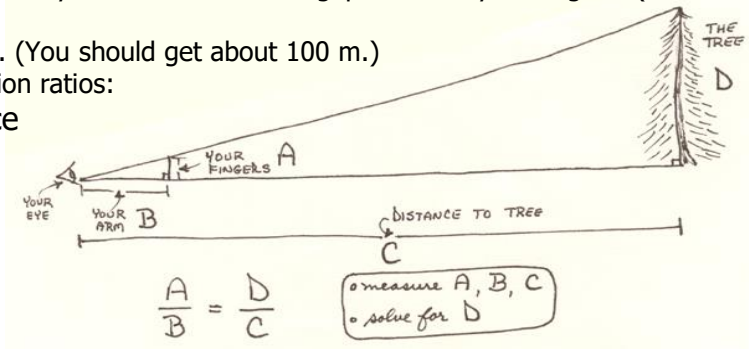# TRIANGULATION

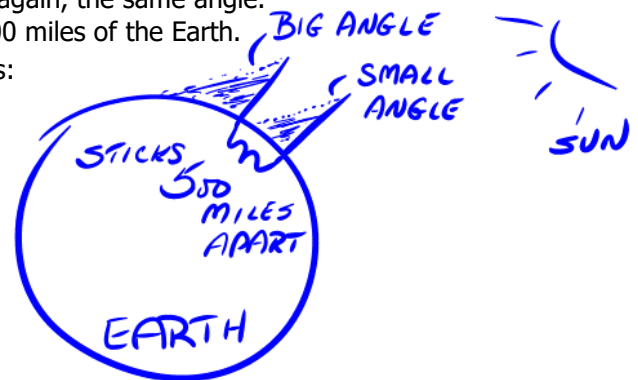1. **You** Triangulate a Tree *circa 2000 AD*
- Pretend that you are Bickart (sorry). Pretend that you are going to estimate the height of a tree.
- Hold your arm outstretched to its full length. Measure from your eye to the tip of your thumb. (You should get about 50 cm.)
- Close one eye.
- Open your forefinger and thumb to the size of the tree you see. Measure the gap between your fingers. (You should get about 10 cm.)
- Pretend you just paced off the distance to the tree. (You should get about 100 m.)
- Calculate the height of the tree. Use the triangulation ratios:

  fingers / arm = **tree height** / tree distance

2. **Eratosthenes** Triangulates the Size of the Earth *circa 235 BC*
- Pretend that you are Eratosthenes. You are going to estimate the circumference of the Earth.
- Hold a stick up straight at exactly 12 noon. Measure the angle from the top of the stick to the length of the shadow.
- Now drive 500 miles north.
- Hold your stick up straight at exactly 12 noon, again. Measure again, the same angle.
- Subtract the angles. This gives you the angle that goes with 500 miles of the Earth.
- Calculate the diameter of the Earth. Use the triangulation ratios:

  angle / 360° = 500 miles / **Earth's Circumference**

3. **Aristarchus** Triangulates the Size of the Sun & Moon *circa 240 BC*
- Pretend that you are Aristarchus. You are going to estimate the diameter of the Sun.
- Hold your arm outstretched to its full length. Measure from your eye to the tip of your thumb. (You should get about 50 cm.)
- Close one eye.
- Open your forefinger and thumb to the size of the Sun. Measure the gap between your fingers. (You should get about 1/2 cm.)
- Calculate the size of the Sun. Use the triangulation ratios:

  fingers / arm = **Sun's Diameter** / Sun's Distance (now known to be 93 million miles)

- Do the same for the Moon. Guess what! Your fingers are once again 1/2 cm apart! Try it again if you do not believe it. Yes, both the Sun and the Moon are the same size in the sky. In degrees of arc measure, they are both about 1/2 of a degree! [Otherwise the Moon could never perfectly cover the Sun in a Solar Eclipse.]