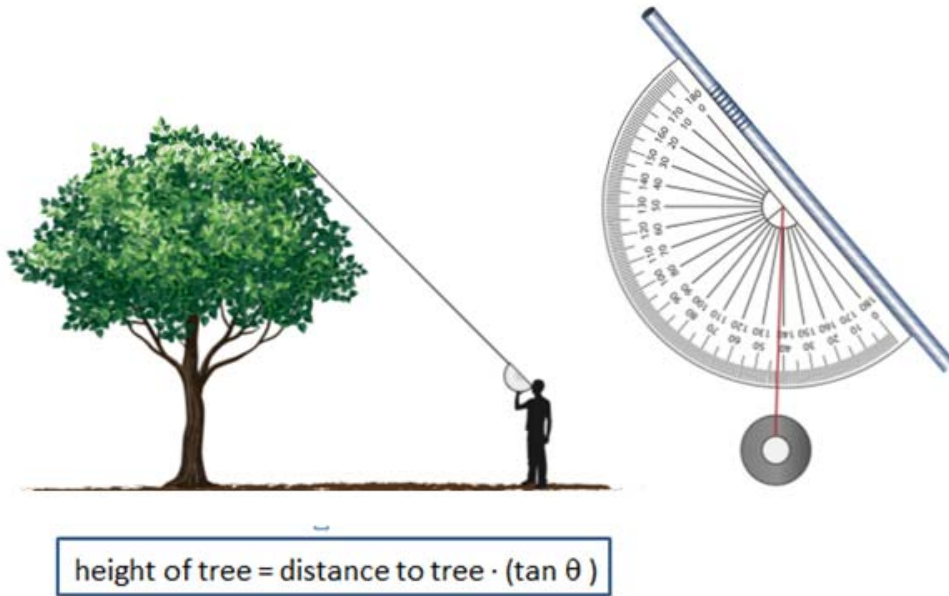# #12 How tall is that tree?

height of tree = distance to tree · (tan θ)

#13 Sun and Moon Sizes

The sun and moon appear to be the same size from Earth.

Problem - What is the *real* size of the sun?

Sun: 150 million km from Earth
Moon: 384,000 km from Earth
Moon diameter: 3475 km

#14 Calculating Parallax for the Moon
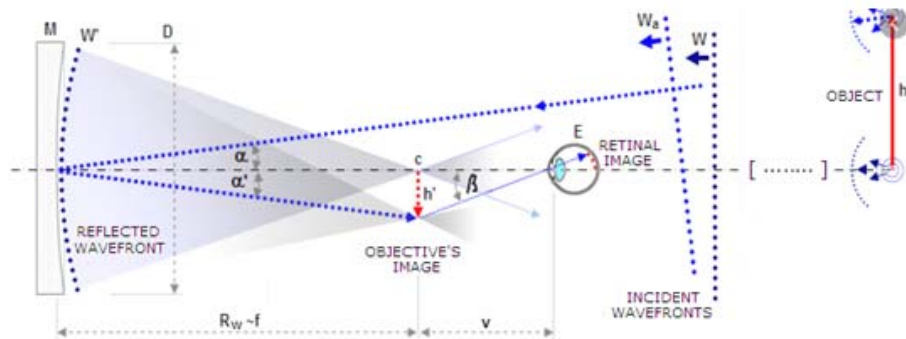
Problem 1 – What is the diameter of the moon?

Moon: 31 arc minutes
Distance to moon: 384,000 km

#14 Calculating Telescope Optics

Problem 2 – Your telescope can see details down to 2 arc seconds. Can you see astronauts walking on the moon? What is the furthest you can see details as small as a person? *Assume average person height of 1.6 meters.*

#14 Calculating Stellar Parallax

Problem 3 – Find the distance to the following stars given their parallax angles:
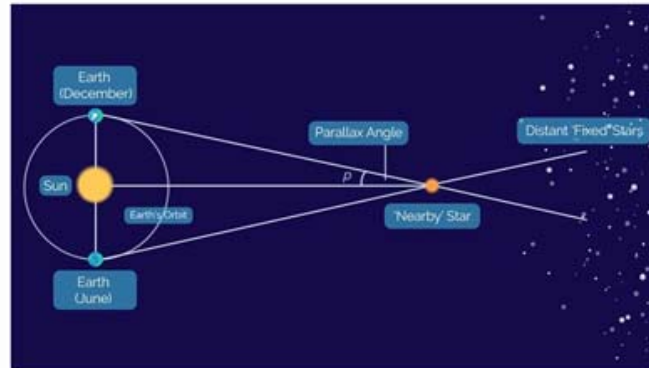
Proxima Centauri:
0.77 arc seconds

Vega: 0.129 arc seconds

Arcturus: 0.089 arc seconds

1 parsec = 206265 AU
1 parsec = 3.26 LY (light years)

#15 How would you figure out the size of the Earth?

Scientific American

1. Set up a vertical stick.

2. At noon, mark the end of the stick's shadow on the ground.

3. Stretch a piece of string between the top of the stick and the end of its shadow.

4. Use a protractor to measure the angle between the string and the stick in degrees.

5. Look up the distance between your city and the equator.

Circumference of the Earth = 360 x (distance between your city and the equator) / (angle of shadow that you measured)