SCIENCE 10
BIG BANG THEORY

DETERMINING DISTANCES IN SPACE

DISTANCES TO STARS

Distance is measured in 2 ways:

1. _____ (AU)

2. _____ (LY)

ASTRONOMICAL UNIT (AU)

The _____ between earth and the sun is 150 million km
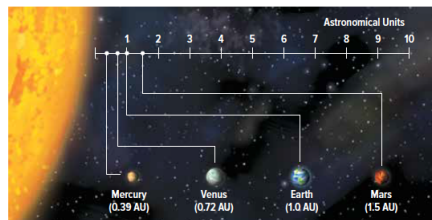
Distance to Planets:

  Sun = 1 AU

  Jupiter = 4 AU (at it's closest to Earth)

  Pluto = 38 AU (at it's closest to Earth)

AU become meaningless for really great distances between stars and galaxies

Figure 4.26: Using the AU to measure distances in the solar system is simpler and more convenient than using kilometres.
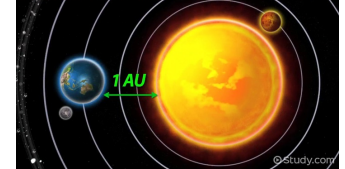
LIGHT YEAR (LY)

Unit of distance equal to the _____ light travels in _____ (~9.46x10^{12}km in one year)
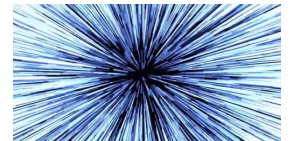
Ex. time for light to travel to the earth from:

  Moon = _____

  Sun = _____

  Alpha Centauri = _____

  Betelgeuse, the red supergiant in Orion = _____

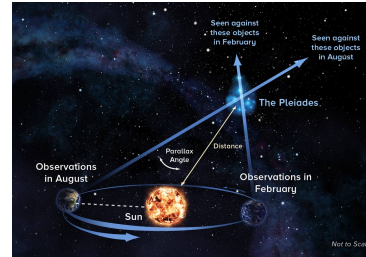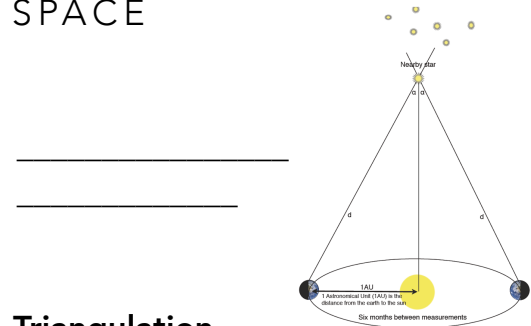 Polaris (North Star) = _____

How far is the nearest star?

_____(red dwarf) _____ ly away

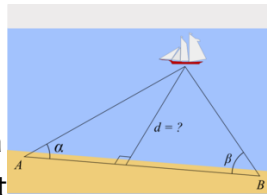# HOW DO WE MEASURE DISTANCES IN SPACE

_____

_____

Triangulation

Uses simple geometry to measure distance to something that cannot be physically reached

Measure _____ and length of a _____ to get distance to object

TRIANGULATION EXAMPLE

Imagine you're standing on the shore of a lake and see a small island but you can't get there

STEPS TO SOLVE

1) Measure a _____along the shore (the longer the more accurate), say 120m

2) Measure _____
i) At 1 end of the line, use a protractor and measure angle A between baseline and specific point on the island, like top of a tree say, 65°
ii) Move to other end of the baseline, measure angle B btw baseline and the same point used last time (top of tree), say 75°

3) Create a _____
    Use angles and baseline to make scale drawing on a piece of paper (1 cm = _____)

4) Draw a _____ line
    On scale drawing make perpendicular line between baseline and tree, measure distance of the line, calculate actual distance using scale of drawing

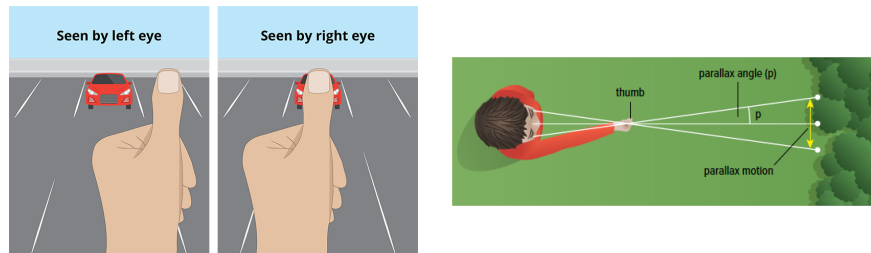# TRIANGULATION EXAMPLE

If the scale is 1 cm = 20 m

Scale distance was 8.2 cm between the tree and the baseline

Actual distance

PARALLAX

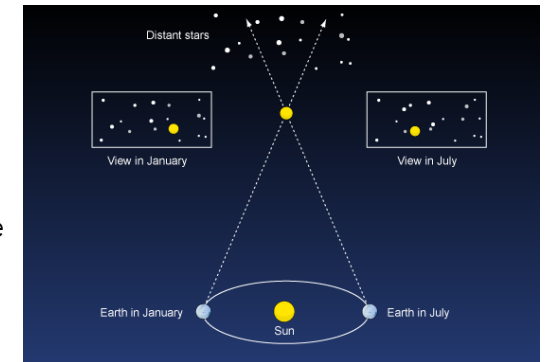The appearance of something _____ against an un-moving background due to a change in
_____

Same thing happens with stars view from earth

PARALLAX

When you look at a star, it _____ to **shift** against background of other stars from _____
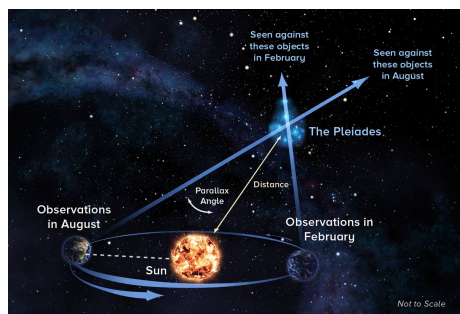_____ _____.

Two people at different locations on Earth can measure angles of sight from a baseline & calculate the distance to star using **triangulation**

PARALLAX

Astronomers use width of Earth's _____ as as baseline
Take a year for Earth to orbit the sun, so take measurement form each end of baseline 6 months apart (when Earth reaches farthest points on either side of the sun)

YOUR MISSION

Handouts:

Using Triangulation to Determine Distance

Astronomical Distance units