

Astronomical distances and space travel

The purpose of this lab is to estimate the size of the solar system and the distance to the nearest star by developing a simple scale model. We will be using the hall on either side of the 2nd or 3rd floor to do this activity. Hopefully after you have completed this lab you will have a better understanding of the vast distances in the universe and difficulties involved for humans to travel to other stellar systems or for aliens to visit our planet.

Use the following distances for doing this experiment:

1 AU = 150,000,000 km. 1 year = 3×10^7 sec.

What does an AU represent? _____

Size of solar system (Distance from Sun to Pluto) = 40 AU = _____ km.

Earth-Moon distance = 400,000 km = _____ AU

1 light-year = 1×10^{13} km = 10,000,000,000,000 km

Distance to nearest star (Alpha Centauri) = 4.3 L-yrs = _____ km

Part 1: Sattgast Hall as a scale model of the Solar System

Measure the distance for the length of the hall. In order to develop an accurate scale model we will represent this length as the size of the solar system.

- Length of hall = _____ m = Size of solar system on this scale = 40 AU.
- Next determine the scale length for Earth-Sun distance (1 AU) = _____
- Determine the fraction Earth-Moon distance to the size of the solar system = (Earth-Moon distance in km)/(Size of Solar System in km) = _____
- Use the result found in c combined with a to find the Earth-moon scale length = _____
- Place a piece masking tape at the lake side of the hall to represent the Sun and a piece at the other end to represent Pluto's location.
- Place small pieces of tape at the appropriate spots as determined in b and d above to represent the Earth and Moon's location on the hall's floor.
- Question: At 20,000 miles/hour it took 3 days for the Apollo astronauts to travel to the Moon. Estimate how many days or years it would take to travel to Pluto as this same speed?

Part 2: Sattgast Hall as a scale model of the distance to the closest star with Solar System

Use the distance you measured for the length of the hall in part I. In order to develop an accurate scale model we will represent this length as the distance from the Sun to the nearest star.

- Length of hall = _____ m = Distance from Sun to Alpha Centauri on this scale.
- Determine the fraction for the size of the Solar System to the distance to the nearest star = (Size of Solar System in km) / (distance to Alpha Centauri in km) = _____
- Use the result found in b combined with a to find the Solar System scale length = _____
- Place a piece masking tape at the lake side of the hall to represent the Sun and a piece at the other end to represent Alpha Centauri's location.
- Place a small piece of tape to represent Pluto's location on the hall's floor.
- Place a small piece of tape to represent Earth's location on the hall's floor if you can.
- Question: Traveling at 20,000 miles/hour (10 km/sec), estimate how long would it take to travel to the nearest star as this speed? _____