modeling the universe

The Scale of the Realms of the Universe
(Activity Worksheet)

As we move from one realm of the Universe to the next, look at the materials in front of you and pick the one that best represents the size of the previous realm.

Using a large classroom (10 meters square – or 10 meters in diameter):

1. **Sun and Earth:** Imagine that the Sun is the size of the classroom. How large would Earth be?

   a. How many times smaller is the diameter of Earth compared to the Sun?

      Guess: **Actual:**

   b. Which object is approximately the same amount smaller than the room?

      Guess: **Actual:**

   c. How could you include this realm in your model of the Universe?

2. **Solar System:** Now imagine that the Solar System out to the boundary between the Solar Wind and interstellar space (200 AU diameter) is the size of the classroom. How large would the Sun be? How large would Earth's orbit around it be? How big would Earth be?

   a. What is an AU?

   b. How many times smaller than the Solar System is Earth's Orbit?

      Guess: **Actual:**

   c. Which object is closet in size and shape to Earth's orbit compared to the size of the room?

      Guess: **Actual:**

d. Compared to the size of the room, how large would the Sun be? Which object best represents this?

Guess: **Actual:**

e. What object could represent Earth on this scale?

Guess: **Actual:**

f. How could you include this realm in your model of the Universe?

3. **Solar Neighborhood:** Zoom out to make the Sun's Neighborhood (65 light-year diameter) the size of the classroom. How large would the Solar System be?

a. How many times smaller than the Solar Neighborhood is the Solar System?

Guess: **Actual:**

b. Which object best represents the Solar System compared to the size of the room?

Guess: **Actual:**

c. How could you include this realm in your model of the Universe?

4. **Galaxy:** Zoom out to make the Milky Way Galaxy (160,000 light-years diameter) the size of the classroom. How large would the Solar Neighborhood be?

a. How many times smaller is the Solar Neighborhood compared to the Galaxy?

Guess: **Actual:**

b. Which object best represents the Solar Neighborhood compared to the size of the room?

Guess: **Actual:**

c. How could you include this realm in your model of the Universe?

5. **Local Group:** Zoom out to make the Local Group of galaxies (6.5 Million light-years diameter) the size of the classroom. How large would the Milky Way be?

   a. How many times smaller is the Milky Way Galaxy compared to the Local Group?

   Guess: **Actual:**

   b. Which object is about the same amount smaller than the size of the room?

   Guess: **Actual:**

   c. How could you include this realm in your model of the Universe?

6. **Local Supercluster:** Zoom out to make the Local Supercluster of galaxies (130 Million light-years diameter) the size of the classroom. How large is the Local Group? How big is the Milky Way?

   a. How many times smaller than the Local Supercluster is the Local Group?

   Guess: **Actual:**

   b. What object best represents the Local Group compared to the size of the room?

   Guess: **Actual:**

c. What object best represents the size of the Milky Way compared to the size of the room?

Guess: **Actual:**

d. How could you include this realm in your model of the Universe?

7. **Universe:** Zoom out to make the entire observable Universe (156 Billion light-years diameter) the size of the classroom. How big is the Local Supercluster? How big is the Local Group?

   a. How much smaller is the Local Supercluster than the Universe?

   Guess: **Actual:**

   b. Which object best represents the Local Supercluster compared to the size of the room?

   Guess: **Actual:**

   c. Which object would best represent the Local Group compared to the size of the room?

   Guess: **Actual:**

   d. How could you include this realm in your model of the Universe?

Note: 1 Astronomical Unit (AU) = 1.4960×10^{8} km
1 parsec (pc) = 206,265 AU = 3.262 light-years = 3.0857×10^{13} km
1 light-year (ly) = 9.460E x 10^{12} km = 63,230 AU

Parsecs are a unit used by astronomers. It comes from using parallax of nearby stars due to Earth's orbit around the Sun. 1 parsec is the distance away a star would be if it exhibits a **par**allax angle seen from Earth of 1 arc **sec**ond (1 arc second = 1/3600 of a degree).

A light-year is the distance that light travels in a year. It is a unit of distance, not time.