

**Sizes and Distances in the Universe****Example:**

Using a scale in which a quarter represents Earth, what would the distance from Earth to the moon be?

diameter of quarter = 1 inch

diameter of Earth = 8,000 miles

distance from Earth to Moon = 240,000 miles

$$\frac{\text{diameter of quarter}}{\text{diameter of Earth}} = \frac{\text{scale distance (d)}}{\text{distance from Earth to Moon}}$$

**Solve:****Helpful Measurements:**

$1 = 10^0$

$10 = 10^1$

$100 = 10^2$

$1000 = 10^3$

diameter of a penny = 0.75 inch

diameter of Earth = 8,000 miles

diameter of Sun = 861,000 miles

1 mile = 5,280 feet

distance from Earth to Sun = 93 million miles

diameter of a basketball = 12 inches

distance from Neptune to Sun = 2.79 billion miles

1 light year = 6 trillion miles

distance of nearest star Proxima Centauri = 4.2 light years

distance of Sun from the center of the Milky Way = 30,000 light years

length of football field = 100 yards = 300 feet

distance to the Andromeda galaxy =  $2.2 \times 10^6$  light years

distance of farthest known galaxy = 13 billion light years

Milky Way galaxy = 100,000 light years across

Name \_\_\_\_\_

Problems:

*If Earth were the size of a penny...*

1. How large would the Sun be?
2. How far away would the Sun be?

*If the Sun were the size of a basketball...*

3. How far away would Neptune be from the Sun? (answer in feet)
4. How far away would the nearest star, Proxima Centauri, be from the Sun? (answer in miles)
5. How far would it be to the center of the Milky Way? (answer in miles)
6. About how many trips to the Moon does this distance equal?

*If the Milky Way were the size of a football field...*

7. How far away would the Andromeda galaxy be? (answer in miles)
8. How far would it be to the farthest known galaxy? (answer in miles)

Questions

1. What is the value of using exponents?
2. Why is it impossible for scientists to measure stellar distances that are accurate to within a few feet? Why is it not critical to attain such accuracy when dealing with astronomical distances?