

SCALING THE SOLAR SYSTEM TO THE BIG BEACH BALL SUN

To get an "intuitive" sense of the relative sizes of the sun and planets, and their separations, you are to scale down the solar system so that the sun can be represented by a (large ... 1m diameter) beach ball. Define the sun's diameter as 100 cm. and use a *scaling factor* given by

$$\Delta_{\text{scale}} = \frac{\text{Scaled Size}}{\text{True Size}} = \frac{77.00 \text{ cm}}{1,400,000 \text{ km}} = 5.5 \times 10^{-5} \frac{\text{cm}}{\text{km}} \quad \left(= 5.5 \begin{matrix} \boxed{\times 10^x} \\ \boxed{\text{EE}} \end{matrix} \begin{matrix} \boxed{(-)} \\ \boxed{5} \end{matrix} \right) \quad \text{Use the scientific notation key for your calculator!}$$

since (True Size) × Δ_{scale} = (Scaled Size). For the solar system objects and the star nearest Sol (Proxima Centauri) **calculate their scaled diameters and scaled distances to fill in the table below.** Also name a common object that approximates the size of each solar system body.³³

| NAME | DIAMETER | | | DISTANCE FROM SOL | | | | | |
|---------------------|------------|--------------|---|-------------------------|--|----------|----------|----------|-----------------|
| | TRUE km | SCALED cm | REPRESENTATIVE SPHERICAL OBJECT | TRUE km | SCALED: (TRUE × Δ _{scale}) cm | m | yards | miles | Earth diam's |
| SOL | 1,400,000 | 77.0 | BIG Beach Ball | | | | | | |
| MERCURY | 4,800 | 0.26 | Peppercorn | 58 × 10 ⁶ | 3190 | 31.9 | 35 | | |
| VENUS | 12,000 | 0.66 | Blueberry | 108 × 10 ⁶ | 5940 | 59.4 | 66 | | |
| EARTH | 12,800 | 0.70 | Blueberry | 150 × 10 ⁶ | 8250 | 82.5 | 92 | | |
| MARS | 6,800 | 0.37 | Small Pea | 228 × 10 ⁶ | 12540 | 125.4 | 139 | | |
| JUPITER | 140,000 | 7.70 | Grapefruit | 778 × 10 ⁶ | 42790 | 427.9 | 475 | 0.27 | |
| SATURN | 120,000 | 6.60 | Grapefruit | 1427 × 10 ⁶ | 78485 | 784.9 | 872 | 0.50 | |
| URANUS | 51,000 | 2.81 | Golf Ball | 2871 × 10 ⁶ | 157905 | 1579.1 | 1755 | 1.00 | |
| NEPTUNE | 49,600 | 2.73 | Golf Ball | 4497 × 10 ⁶ | 247335 | 2473.4 | 2748 | 1.56 | |
| PROXIMA CENTAURI | 200,000 | 11.0 | Spaghetti Squash (inch larger than a softball) | 4.03 × 10 ¹³ | 2.21.E+09 | 2.21E+07 | 2.46E+07 | 1.40E+04 | 1.73 |

The Following conversion factors will be helpful

1 meter = 1.11 yards

and 1 yard = 5.68 × 10⁻⁴ miles

The diameter of the Earth is 7926 miles

and 1 ly = 5.88 × 10¹² miles (about 6 trillion miles ... a *l o n g* way!)