## Skill Sheet 32-A        Comparing Sizes of Stars

In this skill sheet, you will explore the sizes of stars. In the process, you will get a better understanding of the scale of the universe as you develop your understanding of stars.

## 1. How big is the sun in our solar system?

The sun is our closest star. It is very big compared to the size of the planets in the solar system. How big is it?

1. The diameter of the sun is 1,390,000 kilometers.

   a  Write this number using scientific notation.

   b  Given the diameter, what is the *radius* of the sun?

   c  Find the volume of the sun using the following formula where **r** equals the radius. Write this value using scientific notation.

$$\text{volume of a sphere} = \frac{4}{3}\pi r^3$$

## 2. Solar size units

In this section, we will use the diameter of the sun to represent a unit of 1. We will call this unit the sun size unit.

$$\text{diameter of the sun} = 1{,}392{,}000 \text{ km} = 1 \text{ sun size unit} = 1 \text{ SSU}$$

We can compare the size of other objects to the sun using the sun size unit.

1. How many sun size units is the diameter of our solar system. The diameter of our solar system is about 12 billion kilometers (12,000,000,000).

2. The diameter of Uranus is 51,200 kilometers. How many sun size units is this diameter?

3. The diameter of the Milky Way galaxy is over 50,000 light years across. One light year is equivalent to $9.6 \times 10^{12}$ km. How many sun size units is this distance?

## 3. Comparing the sun to other stars

Using proportions, find the diameters of other stars in units of sun size units. The actual diameters of these stars are provided for you in the first column of Table 1. First, write these values in scientific notation in the second column. Then, convert these to diameters in terms of sun size units (SSU) in the third column of Table 1.

**Table 1:Comparing the sun to other stars**

| The solar system | Diameter in kilometers | Diameter in scientific notation (km) | Diameter of planet in SSU |
|---|---|---|---|
| Sun | 1,392,000 | $1.4 \times 10^6$ | 1 |
| Aldebaran | 50,112,000 | | |
| Rigel | 69,600,000 | | |
| Betelgeuse | 556,800,000 | | |
| Castor A | 2,784,000 | | |
| Canus Major (a white dwarf) | 13,920 | | |
| Neutron Star | 14 | | |
| Antares | 696,000,000 | | |

## 4. Comparing the diameters of the stars

Now, you will compare the sizes of the stars using common objects such as marbles.

1.  Use the information from Table 1, to list the stars in order from smallest diameter to largest diameter in Table 2.
2.  To compare the sizes of the stars in centimeters, let's assume that the scale is 1 cm = 1 SSU. Determine the scale size of each star, in centimeters, and record your answers in Table 2. The first three are done for you.
3.  In the third column of the table, list a common object that could be used to represent each star for comparison. The first three are done for you.

**Table 2:Comparing the sun to other stars**

| Star | Diameter (cm) | Common object |
|---|---|---|
| Neutron Star | .000001 | Width of a human hair |
| Canus Major | .01 | Poppy seed |
| Sun | 1 | Marble |
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