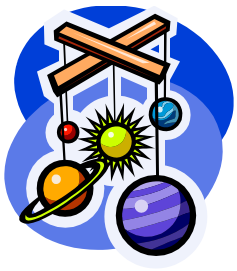
Name _____ Date _____ Block _____

# Solar System Lab



**Problem:** Create a model of the solar system to scale.

**Materials:**

Chalk
Calculator
Meter stick
Lab Worksheet

**Question**:

Why is it necessary to use scale distances when dealing with large distances like those between the planets in the solar system?

_____

_____

**Procedure:**

1. Convert the various AU (*Astronomical Unit; an AU is the average distance from Earth 150,000,000 km*) distances to centimeters by multiplying by a scale factor of 10 centimeters per AU and complete the chart.

2. Measure & draw a line on the sidewalk 4.5m long.

3. Using the calculated distances, mark the planet on the sidewalk and write the planet's name.

4. When your model is done, please show the teacher for a grade.

| Planet | Distance to Sun (km) | Distance to sun (AU) | Scale Distance (1 AU = 10 cm) (*To find scale, multiply the distance to the sun by 10*) |
|---|---|---|---|
| 1. Mercury | $5.97 \times 10^7$ | 0.39 | |
| 2. Venus | $1.08 \times 10^8$ | 0.72 | |
| 3. Earth | $1.50 \times 10^8$ | 1.00 | |
| 4. Mars | $2.27 \times 10^8$ | 1.52 | |
| Asteroid Belt *(This is where the Dwarf Planet Ceres is located)* | $4.14 \times 10^8$ | 2.76 | |
| 5. Jupiter | $7.78 \times 10^8$ | 5.20 | |
| 6. Saturn | $1.43 \times 10^9$ | 9.54 | |
| 7. Uranus | $2.87 \times 10^9$ | 19.19 | |
| 8. Neptune | $4.50 \times 10^9$ | 30.07 | |
| *Dwarf Planet Pluto* | $5.91 \times 10^9$ | 39.5 | |
| *Dwarf Planet Sedna* *(This does not go on your scale model, we don't have enough string)* | $1.35 \times 10^{10}$ | 90 | |

When you are finished with your scale model, please show it to your teacher. The teacher will fill out the rubric below:

**Labels: (3 – 0) _____ Accurate: (3 – 0) _____ Participation: (3 – 0) _____**

**Analyze your Data**

1. Explain how a scale distance is determined.

   _____

   _____

2. How much string would be required to construct a model with a scale distance of 1 AU = 2m?

   _____

3. The rocket ship *HMS Science Queen* goes 700,000 kilometers an hour (this is as fast as the new Solar Probe Plus), which means it can travel 16,800,000 km or $1.68 \times 10^7$ in a 24 hr period (day). Remember 1 AU is 150,000,000. It will take our space ship 8.92 days to go 1 AU. Fill in the chart below to find out how long out our journey through the solar system would take.

| Planet | AU from Earth | Time |
|---|---|---|
| Sun | 1.0 | |
| Mercury | 0.6 | |
| Venus | 0.3 | |
| Earth | 0.0 | None, we launch from this planet |
| Mars | 0.5 | |
| Asteroid Belt | 1.8 | |
| Jupiter | 4.0 | |
| Saturn | 7.83 | |
| Uranus | 18.0 | |
| Neptune | 29.0 | |
| Pluto | 38.0 | |
| Sedna | 89 | |

4. If we wanted to go to our nearest neighbor, Alpha Centauri which is 4.35 light years away, how long would it take to get there on our rocket ship? (*1 light year is 9,500,000,000,000 kilometers.)*

   _____

5. How fast does our rocket ship need to go if we wanted to visit Pluto is less than a year? _____

6. What is the minimum speed our ship would need to travel if we wanted to travel to Pluto in 18 hours?

   _____

7. The Science Princess Becky wanted to build models of the planets to scale. She isn't sure which scale she should use. Fill out the chart below, and determine what would be the best scale for the Princess to use.

| **Planet** | **Diameter in km** | **Scaled Diameter 600km = 1 cm** ***(BTW 600km is approx. the distance between Phoenix& San Diego)*** | **Scaled Diameter 4000 km = 1cm** ***(Approx. Distance between Phoenix & NY)*** |
|---|---|---|---|
| Sun | 1,400,000 | | |
| Mercury | 4,800 | | |
| Venus | 12,105 | | |
| Earth | 13,000 | | |
| Mars | 6,900 | | |
| Jupiter | 140,000 | | |
| Saturn | 120,000 | | |
| Neptune | 53,000 | | |
| Uranus | 50,000 | | |
| Pluto | 2,274 | | |
| Sedna | 1,800 | | |

*What is the best scale for her to use?* _____
*Explain your answer:*

Duke the Great Dane is being sent to all the planets. He weighs 84 kg (185 lbs.). What does he weigh on the other planets? What is your weight on other planets? Convert your weight in pounds to kg – 1lb = 2.2kg. (If you don't feel comfortable using your weight, use the figure 105lbs).

| **Planet** | **Gravitation Factor Relative to Earth** *(Times the weight by this number!)* | **Duke's Weight** 84kg (185lbs) | **Your Weight** _____lbs x 2.2 = _____kg |
|---|---|---|---|
| Sun | 27.9 | | |
| Mercury | 0.38 | | |
| Venus | 0.91 | | |
| Earth | 1 | 84kg | |
| Moon | 0.17 | | |
| Mars | 0.38 | | |
| Jupiter | 2.54 | | |
| Saturn | 1.08 | | |
| Uranus | .91 | | |
| Neptune | 1.19 | | |
| Pluto | .06 | | |

**Conclusion**

3 - 5 sentences about what you have learned about distances in space and scale models.