**Modelling the Solar System:**

**Name: Date; Period:**

**Purpose:**

Students will be able to make two scaled models of the solar system showing the relative distances of the planets to the sun and the relative sizes of the planets to each other.

**Materials:**

Pencil Ruler Meterstick

Drawing Compass Paper Paper Strips

First we are going to need some data. Carry out research using the internet and text books to fill out the data chart below.

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| --- | --- | --- | --- | --- | --- |
| Planet | Distance from Sun in Miles | Distance from sun in AU’s | How long does it take light to travel from the sun to the planet? | Diameter(miles) | Radius(miles) |
| Sun | N/A | N/A | N/A |  |  |
| Mercury |  |  |  |  |  |
| Venus |  |  |  |  |  |
| Earth |  |  |  |  |  |
| Mars |  |  |  |  |  |
| Jupiter |  |  |  |  |  |
| Saturn |  |  |  |  |  |
| Uranus |  |  |  |  |  |
| Neptune |  |  |  |  |  |
| Pluto(just for fun) |  |  |  |  |  |

1) Did you find any conflicting data when doing your research? Why might you find varying distances of the planets to the sun?

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With the data you found on the chart you are now going to need to calculate an appropriate scale in order to draw your model. Remember, the distances are astronomical so we are going to have to represent very large numbers with smaller ones.

2) When trying to determine our scale showing the relative distances of the planets, what would be the most appropriate unit? (Circle your answer)

Kilometers Miles AU’s Light Years

Now we have some calculations to do! To figure out the scale we are going to use we are going to need two pieces of information.

 1) How much room do we have to work with? In other words, how long is the sheet of paper we have to make our scale?

 2) How far is the farthest planetary body we are accounting for (Pluto – even though its not a planet we are going to use this distance)

The paper strips should all be at least 175 cm long. On the left side of your strip draw a vertical line 2cm from the edge and label it “SUN”. See below

SUN

Now we have to calculate our scale. Follow the steps below:

1) Determine the distance of Pluto in AU’s from the sun: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2) Divide the length of the paper (175cm) by the distance calculated above. Show your work and show you units!

3) Now chances are you came up with a decimal. We have to round this **down** to the nearest whole number. Why can’t we round this up? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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4) This number with be your scale. Fill in the blanks below.

From my calculations every \_\_\_\_\_\_ cm will equal \_\_\_\_\_\_\_\_\_\_.

Now using your newly found scale and position of the sun on your strip you need to complete your model of the solar system using your data in the chart. Like the sun you should draw a vertical line on the strip in the appropriate scale and label the line with the following:

 1) Planetary Body’s Name

 2) Distance from the sun in AU’s

 3) Distance from the sun marker on the tape in cm.

Do not worry about drawing the planet. We are going to make planets to scale later!!

Look at the example below: (not drawn to scale)

Planet x

1 AU

7cm

Planet Y

2 AU

14cm

SUN

At this point you should have a good idea about how far the planets are positioned away from each other. Now we are going to get an idea about just how big the planets are in relation to one another.

Fill in the chart below using various online resources:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Planet | Diameter | Radius | Rotational Period | Length ofYear | Tilt of Axis(Degree’s) |
| Sun |  |  | N/A | N/A | N/A |
| Mercury |  |  |  |  |  |
| Venus |  |  |  |  |  |
| Earth |  |  |  |  |  |
| Mars |  |  |  |  |  |
| Jupiter |  |  |  |  |  |
| Saturn |  |  |  |  |  |
| Uranus |  |  |  |  |  |
| Neptune |  |  |  |  |  |
| Pluto(just for fun) |  |  |  |  |  |

Is there a relationship between a planets distance to the sun and the length of time it takes to revolve around the sun? If so explain:

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What do you think would explain this phenomenon?

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Is there a relationship between the rotational period of a planet and its distance to the sun? What about its size and rotational period? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which planet rotates the fastest? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ How long is a day on this planet? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What planet has the longest day? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Now you are going to use some simple math and a drawing compass to create scaled models of each planet. First you are going to have to make an appropriate scale for our models.

Circle the 2 planets you think will be most beneficial to consider when creating our scale.

Saturn Mars Jupiter Earth Neptune Mercury

What is your rational for picking these two?

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If you are going to be using 8.5in X 11in sheets of paper to make your models, how are you going to find an appropriate scale?

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Take the diameter of Jupiter and divide it by the width of the paper. Show your calculations below.

How many miles will every inch equal? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Round this down to the nearest thousandth to find your scale and label this number below:  **Do not forget your units**

ONE INCH = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Now complete the calculations in the chart below.

|  |  |  |  |
| --- | --- | --- | --- |
| Planet | Diameter | Radius | Model Radius in Inches |
| Mercury |  |  |  |
| Venus |  |  |  |
| Earth |  |  |  |
| Mars |  |  |  |
| Jupiter |  |  |  |
| Saturn |  |  |  |
| Uranus |  |  |  |
| Neptune |  |  |  |
| Pluto(just for fun) |  |  |  |

With your calculations, draw the appropriate size circle using a drawing compass. For planets that are large enough, you may cut them out and label them. If the planets are too small to label, cut an area containing your drawn planet that is big enough to label however will be small enough to add to your plotted distance strip. See below

Mars

Diameter: ???

Day: X hrs

Year: X earth years

Axial Tilt: X degrees

In addition to labeling your diagram you should also add color to the planet to resemble how it actually looks.

Calculate what the diameter of a circle would be to make a model of the sun using the same scale you used on your planets. Show your work below.

What information will you need to figure this out?

**Putting it all together:**

Glue your planets on your distance model as shown below in order to correspond with the lines drawn on your tape. Make sure not to hide any of the information on your models.

**Conclusion:** Does your model change any perceptions you had regarding the arrangement of the solar system of the size of the planets? What did you learn from doing this project?

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Astronomical Distance Cheat Sheet

1 Kilometer = .6 miles

ex) 10 km = 6 miles

1 Astronomical Unit = 93,000,000 miles

(Average distance from the Sun to the earth)

The speed of light = 186,000 miles/sec

1 light year = distance light travels in one year

Time it takes for light to travel to a planet is determined by dividing the distance of the planet from the sun (in miles) by the speed of light 🡪see below

Distance from sun

186,000 mi/s

Remember: Radius = ½ the diameter