

Math Magic: Extending our Solar System Model

Issue #13: Reading Tables & Charts

(grades 6-12)

An Index of All Math Magic Activities

REVIEW OF OUR LAST SCALE MODEL OF THE RELATIVE SIZES OF PLANETS & SUN

In the [last issue](#) of Math Magic, we made a scale model of the earth, the other planets, and the sun by shrinking them all proportionally. We shrunk 4000 miles to equal one millimeter (mm) or about the thickness of a dime. Earth with a diameter of 8000 miles was about the thickness of two dimes. Jupiter, the largest planet in our solar system was about the size of a ping pong ball. Our sun was reduced to the size of a soccer ball. Shrinking the planets down like this (proportionately) allows us to see them better.

EXTENDING THE SIZE MODEL OF OUR PLANETS AND SUN TO THE DISTANCE MODEL

Now let us shrink the distances between the sun and the planets to the same scale of 1mm = 4000 miles to better visualize the distances between them. [The chart below](#), a spreadsheet, scales down the actual distances of the planets from the sun from miles (in column 2) to meters (column 3) to yards (column 4). I chose the yard (a little shorter than a meter) as a measurement because Americans are generally more familiar with yard measurement as it appears on a football field. Since a football field is 100 yards long we will have to use 7+ football fields touching end to end to represent all the planets' distances from the

Table Showing actual distances scaled down to meters in column 3 and then to yards in column 4.

THE PLANETS IN OUR SOLAR SYSTEM	ACTUAL DISTANCE IN MILES OF EACH PLANET TO THE SUN	DIVIDE COL. B BY 4000 TO GET MM, DIVIDE AGAIN BY 1000 TO GET M	MULTIPLY COL. B BY 3.28 TO GET FEET, DIVIDE AGAIN BY 3 TO GET YARDS
MERCURY	36,000,000	9.000	9.8
VENUS	67,000,000	16.750	18.3
EARTH	93,000,000	23.250	25.4
MARS	141,600,000	35.400	38.7
JUPITER	483,600,000	120.900	132.2
SATURN	886,700,000	221.675	242.4
URANUS	1,784,000,000	446.000	487.6
NEPTUNE	2,794,400,000	698.600	763.8

Our sun when we use the scale of 1mm = 4000 miles

SCALED DOWN PLANETS ON ACTUAL SIZED FOOTBALL FIELDS COMPLETES THE MODEL

The distances are so great it's hard to imagine or visualize. Using the scale of 1 mm = 4000 miles for the size and distance scale model, **the sun is reduced to the size of a soccer ball, is at the zero yard line.** Mercury, reduced to the size of a 1mm

- <-- the sun at the 0 yard line
- <-- Mercury 10 yards = 36 million mi. away
- <-- Venus 18 yards = 67 million mi. away
- <-- earth 25 yards = 93 million mi. away
- <-- Mars 39 yards = 142 million mi. away from the sun

NOTE: The yellow dot at the zero yard line represents the sun but should be the size of a soccer ball if following our scale. It's not.

<-- Jupiter 132 yards = 36 million mi. away

SIDE NOTE: There are 25.4mm in an inch: 36 in per yd, so there are 8,114.4 mm in yd. Multiply that by 4000 mi per each mm = 32,118 mi. for each yard on the model. ≈ the circumference around the earth!

<-- Saturn 242 yards = 887 million mi. away



<-- Uranus 486 yards = 1 billion, 784 million miles away from the sun

<-- FOOTBALL FIELDS PLACED END TO END TO VISUALIZE YARDS



Neptune 764 yards = 2 billion, 794 million, 440 thousand miles from the sun.

grain of sand, is on the ten yard line. Venus, here the size of a 2mm pebble, is 18 yards away from the sun. Earth, the same size pebble as Venus, is 25 yards away from the sun. Notice that Jupiter, reduced to the size of a ping pong ball, is more than a football field away, on the 32nd yard line of another football field next to it. Neptune, scaled down to a large marble, is seven football fields and 64 yards away from its sun.