Phys 102 Astronomy

Name Key

SCALING THE SOLAR SYSTEM TO THE ONE-METER-DIAMETER 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

$$\Delta_{scale} = \frac{\text{Scaled Size}}{\text{True Size}} = \frac{100.00\ \text{cm}}{1{,}400{,}000\ \text{km}} == 7.14\times10^{-5}\ \tfrac{\text{cm}}{\text{km}} \quad (= 7.14\ \text{Exp}\ \boxed{\text{EE}}\ \boxed{+/-}\ 5)$$

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.

NAME	DIAMETER			DISTANCE FROM SOL					
	TRUE	SCALED	REPRESENTATIVE	TRUE	SCALED: (TRUE × Δ_{scale})				
	km	cm	OBJECT	km	cm	m	yards	miles	Earth diam's
SOL	1,400,000	100.0	BIG Beach Ball						
MERCURY	4,800	0.34	Cake "sprinkle"	58×10^6	4141	41.4	46		
VENUS	12,000	0.86	Pea	108×10^6	7714	77	86		
EARTH	12,800	0.91	Blueberry	150×10^6	10714	107	119		
MARS	6,800	0.49	Earring Stud	228×10^6	16286	163	181		
JUPITER	140,000	10.00	Big Orange	778×10^6	55571	556	617	0.35	
SATURN	120,000	8.57	Big Plum	1427×10^6	101929	1019	1133	0.64	
URANUS	51,000	3.64	Ping-Pong Ball	2871×10^6	205071	2051	2279	1.29	
NEPTUNE	49,600	3.54	Ping-Pong Ball	4497×10^6	321214	3212	3569	2.03	
PLUTO	2200	0.16	Cake "Sprinkle"	5914×10^6	422429	4224	4694	2.67	
PROXIMA CENTAURI	$\approx R_{Sol}$	≈ 100.0	Slightly Smaller Beach Ball	4.03×10^{13}	2.88E+09	2.88E+07	3.20E+07	1.82E+04	2.30

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 = 5.88×10^{12} miles (about 6 trillion miles … a *l o n g* way!)