

The Mass of the Sun

For any of the planets, the orbit radius and length of a “year” can be used to estimate the mass of the Sun. In this exercise, you’ll do this for each of the planets and check that you get consistent answers. For simplicity, we assume the orbits are circles.

Fill out the following list. (You can use a spreadsheet or some other computer program if you prefer.) List the units (for example 10^9m) in the headings. Use SI units! You’ll find the data listed in Appendix D of your textbook.

<i>Planet</i>	<i>Orbit Radius</i> (_____)	<i>Orbit Period</i> (Years)	<i>Orbit Period</i> (Seconds)	<i>Solar Mass</i> (_____)
Mercury	_____	_____	_____	_____
Venus	_____	_____	_____	_____
Earth	_____	_____	_____	_____
Mars	_____	_____	_____	_____
Jupiter	_____	_____	_____	_____
Saturn	_____	_____	_____	_____
Uranus	_____	_____	_____	_____
Neptune	_____	_____	_____	_____
Pluto	_____	_____	_____	_____
<i>Average</i>				_____
<i>Accepted Value</i> (check the appendix of your textbook)				

Continue onto the back of this sheet and answer a few questions.

Questions

1) What are the major assumptions you've made in determining the mass of the Sun this way?

2) Suppose you know the mass of the Earth from laboratory experiments. (In fact, that *is* how we determine the mass of the Earth.) How would you use this information to get a better value for the mass of the Sun?

3) The Moon is $3.84 \cdot 10^8$ m from the Earth. Use this to estimate the mass of the Earth, and compare to the accepted value.