KEPLER'S LAWS WORKSHEET

TASK 1: INVESTIGATE KEPLER'S 3RD LAW

Plot a graph that shows **orbital period** squared (T^2) on the y-axis and **semi-major axis** cubed (a^3) on the x-axis for each planet in the Solar System (values are given in the planetary data table). You will find it easier to plot the graph if you use logarithmic scales on both axes.

Consider:

- What do you notice about the data points?
- Can you plot a line of best fit?
- What does your graph tell you about the relationship between the orbital period and the semi-major axis?

TASK 2: APPLY KEPLER'S 3RD LAW

Apply Kepler's 3rd Law to find the mass of the Sun. Rearrange the equation to make M the subject.

$$T^2 = \frac{4\pi^2}{GM} a^3$$

T = orbital period
a = semi-major axis
G = gravitational constant (G = 6.67 x 10^{-11} m^3 $kg^{-1}s^{-2}$)
M = mass of the Sun

$M =$

Work out the value of M based on the orbital period and semi-major axis of each of the 8 planets in the Solar System (data is given in the planetary data table).

- Make sure you are using standard units.
- Express your value of M to 3 significant figures, using scientific notation (e.g., 3.5 x 10^8 instead of 349,620,438).

	Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune
Calculated value of M (kg)								

TASK 3: EVALUATE YOUR RESULTS

What do you notice about the values you calculated for M. Are they similar or the same? What might cause any differences?

Look up the true value of the mass of the Sun. How close is your answer? Where could you have introduced errors into your results?