For the Teacher

ORBITING THE SUN

What affects the time it takes for a planet (satellite) to orbit the sun? This time is defined as the period of revolution, or the orbital period. Let’s take a look at the data for the known planets in the solar system to answer this question.

**Planetary Physical Data**

<table>
<thead>
<tr>
<th>Planet</th>
<th>Mercury</th>
<th>Venus</th>
<th>Earth</th>
<th>Mars</th>
<th>Jupiter</th>
<th>Saturn</th>
<th>Uranus</th>
<th>Neptune</th>
<th>Pluto</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Distance from the Sun (AU)</td>
<td>0.39</td>
<td>0.72</td>
<td>1</td>
<td>1.52</td>
<td>5.20</td>
<td>9.54</td>
<td>19.19</td>
<td>30.06</td>
<td>39.48</td>
</tr>
<tr>
<td>Orbital Period (earth years)</td>
<td>0.24</td>
<td>0.62</td>
<td>1</td>
<td>1.88</td>
<td>11.86</td>
<td>29.46</td>
<td>84.01</td>
<td>164.79</td>
<td>248.54</td>
</tr>
<tr>
<td>Average Orbital Velocity (km/sec)</td>
<td>47.89</td>
<td>35.04</td>
<td>29.79</td>
<td>24.14</td>
<td>13.06</td>
<td>9.64</td>
<td>6.81</td>
<td>5.43</td>
<td>4.74</td>
</tr>
<tr>
<td>Mass of planet (Earth=1)</td>
<td>0.06</td>
<td>0.82</td>
<td>1</td>
<td>0.11</td>
<td>317.89</td>
<td>95.18</td>
<td>14.53</td>
<td>17.14</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Note: One (1) astronomical unit (AU) is equal to the distance between the sun and the earth (1.5 x 10⁸ km)

Questions

1. How much further is Pluto from the sun than it is from the earth?

   1 AU or 1.5 x 10⁸ km

2. Does the orbital period depend on the planet’s distance from the sun (orbital radius)? How?

   yes, the greater the orbital radius, the greater the orbital period

3. Does the orbital velocity depend on the planet’s orbital radius? How?

   yes, the greater the orbital radius, the lower the orbital velocity

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4. Does the orbital period depend on the planet's mass? How? 

   no

5. If a feather was placed in orbit around the sun at a velocity of 38 km/s, where would you expect the feather’s orbit to be located? What would you expect its orbital period to be? (no calculations here – just estimate)

   between Mercury and Venus

   answers between 0.5 and 0.6 years would be acceptable

In conclusion, at a specific radius (distance from the sun), a satellite (a planet, man-made satellite, rock, or feather) will have a specific ___period_____ and ______orbital velocity_____. The ___mass_____ of the satellite will not matter.