Acadiana Sky

How Much Would You Weigh on Other Planets?

Originally developed for the Lafayette Science Museum, Lafayette, LA

The Law of Gravity gives us a way to calculate any person's weight on any planet in the solar system. The equation is

$$\text{Weight on another planet} = \text{W x } \frac{\text{M}}{\text{R}^2}$$

where W = the person's weight on Earth,
M = the mass of the other planet,
and R = the radius of the other planet.

R^2 simply means to multiply the radius of the planet times itself (in other words, R x R). Both M and R must be expressed in terms of Earth; in other words, for a planet 5 times as massive as Earth and twice as big across, M = 5 and R = 2.

Example: Find the weight of a 150-pound astronaut who lands on Mars.

In this example, W = 150 pounds,
M (the mass of Mars) = 0.11 Earth masses,
and R (the radius of Mars) = 0.53 Earth radii.

$$\text{Weight on Mars} = \text{W x } \frac{\text{M}}{\text{R}^2} = 150 \text{ x } \frac{0.11}{(0.53)^2} = 150 \text{ x } 0.39$$

= **59 lbs** (to the nearest pound)

The table on the next page gives values that are needed to calculate weight on other planets.

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Planetary and Lunar Masses and Radii in Terms of the Earth's

Planet	Mass	Radius	Planet	Mass	Radius
Mercury	0.0553	0.383	Jupiter	317.8334	11.209
Venus	0.8150	0.949	Saturn	95.1592	9.449
Earth	1.0000	1.000	Uranus	14.4998	4.007
Moon	0.0123	0.272	Neptune	17.2040	3.882
Mars	0.1074	0.533			

These values are derived from those in the book, Astronomy: through Space and Time, by Sune Engelbrektson.

In addition to using these values to calculate weights on other planets, add up all the masses of the 7 planets besides Jupiter, and then compare the answer with Jupiter's mass; the result may be surprising. Do not include the mass of the moon in that calculation.

Use the values in this table to calculate weight on other planets in the space below.

$$\text{Weight on another planet} = \text{W x } \frac{\text{M}}{\text{R}^2}$$