Weight Encyclopedia Article

Weight

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Weight

Weight is the attractive force on a object due to the Earth's gravitational field.

The surface of the Earth is relatively smooth (compared to its size), and so the weight of an object varies little from one point to another. If you weight 150 lbs (668 N) in New York, you will weight the same in London. But because gravity diminishes as one travels from the center of the earth, you will weight slightly less atop Mount Everest, 8,848 m in elevation--about 0.3% less, or 149.6 lbs (666 N).

But on other planetary bodies, one's weight would vary considerably, because these bodies have different masses and different sizes. If a person weighs 150 pounds on Earth, they will weight about 57 pounds on the surface of Mars, and only about 25 pounds on the surface of our Moon, or about 1/6th their weight on Earth. (The person's mass, however, stays the same!)

Yet, it is possible to experience *weightlessness* in certain situations. One is free fall. Neglecting wind resistance, you experience no weight when free falling. A bathroom scale beneath your feed would fall as exactly the same acceleration as you (because objects fall at a rate independent of their mass), and would register zero on its scale.

Another place to experience weightlessness is in space, orbiting the earth. There *is* gravity acting on the space shuttle, say, when it is orbiting the earth. In fact, this gravitational attraction is not much less than on the surface of the earth, since the orbit is only about 200 mi (320 km) above the Earth's surface. But the shuttle and its inhabitants experience weightlessness because the shuttle is *orbiting* the earth. It is dropping to earth like any other object, but at the same time it is moving forward fast enough to follow the curvature of the earth. Hence it never reaches the surface of the Earth. It is in a state of free fall and therefore weightless.

Astronauts and equipment in orbit experience weightlessness. The consequences of this prolonged weightlessness are not yet fully known. Some equipment has to be redesigned in order to work in space. Man evolved in the gravitational field of the Earth, with subtle but real consequences for his biological makeup. Prolonged weightlessness can cause weak muscles, fatigue, vertigo, anemia, and deteriorating bones.