Gravitational – Force, Field Strength, and Orbital Examples

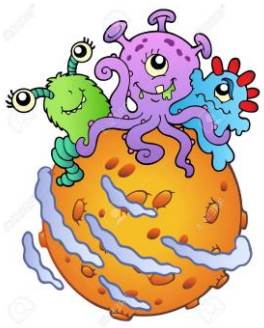
Force

1. Calculate the gravitational *force* of attraction acting on a person of mass **80 kg** as a result of the presence of another person of mass **40 kg** at a distance of **2 m**.

Gravitational field strength

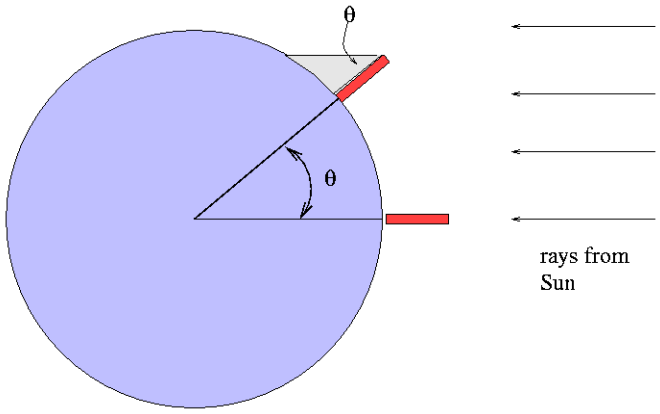
1. Calculate the *gravitational field strength* on the surface of the moon.

2. Determine the *gravitational field strength* on the surface of planet Zorb, if the you are able to measure that a 3kg mass has a weight of 400N. Is it easier to Jump on earth or planet zorb?



The Radius of the earth has been known for thousands of years. The Greek astronomer Eratosthenes made the earliest good quantitative measurement in the late third century BC. By comparing the shadows cast simultaneously by objects at Alexandria and at Syene, he was able to determine their difference in latitude. Since he also knew the distance along the surface of the Earth between these two cities, he was able to calculate the circumference of the Earth, and thus its diameter.

Arc length = Radius x Angle in radians



Question on next page.

3.

Knowing the radius of the earth and observing that things near the earth's surface accelerate at 9.8m/s^2. Determine the **mass** of the earth!

4.

Treating the Earth as a perfect sphere, show that the *Gravitational Field Strength* at the Earth's surface is around 9.8 N/kg

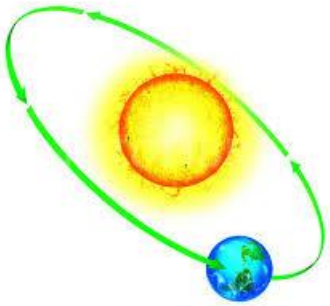
Circular Obits

5.

You want to get a satellite into orbit 4.4 x10^5 m above earth (so you can shoot lasers at Walmart). Determine how fast you will have to the satellite going to have a successful orbit at that height.

6.

Planet Koko Orbits a star and has a period of 187 earth days. If the mass of the star is 1.50 $x10^{30}$ and the mass of planet Koko is 3.0 $x10^{24}$, determine how far apart planet Koko and the star must be…. (distance between their centre's) .



7. A 5000 kg satellite is orbiting at a speed of 2000 m/s around Mars, which has a mass of 6.37 x 10^{23} kg. Find:

   a.The orbital radius at which it **must** be orbiting at.
   b height the satellite is above Mar's surface.