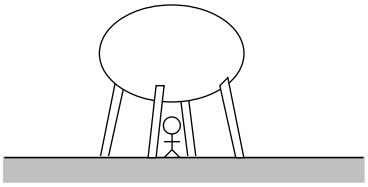
Chapter 8 Problem 36 [†]



Given
$r = 15\ m$
$m = 4.0 \times 10^6\ kg$

Solution
Find the fraction that your weight is reduced under the water tower.

Your weight due to earth's gravity is

$$F_e = mg = m(9.80\ m/s^2)$$

The force exerted on you by the water tower is

$$F_w = (6.672 \times 10^{-11}\ Nm^2/kg^2)\frac{4.0 \times 10^6\ kg)m}{15\ m^2}$$

$$F_w = m(1.19 \times 10^{-6}\ m/s^2)$$

The fraction that the water tower exerts compared to the earth is

$$\frac{F_w}{F_e} = \frac{m(1.19 \times 10^{-6})}{m(9.80)} = 1.21 \times 10^{-7}$$

[†]Problem from Essential University Physics, Wolfson