The universal law of gravity: the mutual attraction between any two objects possessing mass. Satellite motion: the centripetal force required to maintain a circular orbit is provided by the force of gravity. Friction which acts against the motion is produced by the rubbing of two surfaces or an object plowing its way through some fluid.

1. The gravitational attraction between the 4 kg and 6 kg objects separated by 3.0 m is given by:

\[ F = \frac{G M_1 M_2}{R^2} \]

where \( G = 6.67 \times 10^{-11} \) so, \( F = 6.67 \times 10^{-11} \times (4) (6) / (3)^2 = 1.78 \times 10^{-10} \) N

17. The circular motion of the satellite has a radius = radius of earth + altitude = 6.38 x 10⁶ + 1000,000 m.  

\[ F = \frac{G M_1 M_2}{R^2} = \frac{M_2 v^2}{R} \]  

so the velocity \( v = \sqrt{\frac{G M_1}{R}} \)  

= \( \sqrt{6.67 \times 10^{-11} \times 5.98 \times 10^{24} / 7.38 \times 10^6} \) do not forget to take the square root.  

= 7352 m/s = 7.35 \times 10^3 \text{ m/s}

23. At a constant velocity there should be no change in the apparent weight. So the person should still weigh 160 lb.

24. The force provided by the scale supports the person's weight and also must provide extra force now to accelerate him upward. So apparent weight = 128 lbs + ma  

but m is 128 lb/32 ft/s² = 4 slugs.  

Apparent weight = 128 + 4 * 6 = 152 lbs  

If he moves upward with an acceleration of 10 ft/s², the apparent wt = 128 + 4 * 10 = 168 lb

28. Friction tries to prevent objects from moving. Draw all the forces including friction.

42. The centripetal force allowing the car to turn in a circle is provided by the friction between its tires and the road surface. From page 139 table 7.1 the coefficient of friction is 1.20 so.

\[ \frac{Mv^2}{R} = \mu F_N \]

\[ V = \sqrt{1.2 \times 32 \times 150} = 75.9 \text{ ft/s}^2 \]