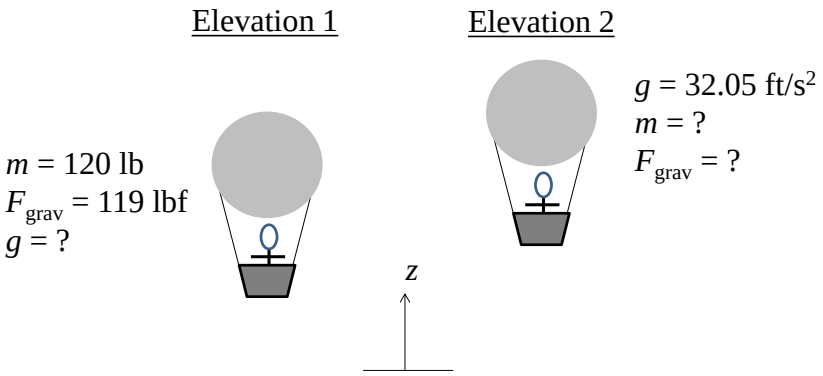
1.12 At a certain elevation, the pilot of a balloon has a mass of 120 lb and a weight of 119 lbf. What is the local acceleration of gravity, in ft/s^2, at that elevation? If the balloon drifts to another elevation where g = 32.05 ft/s^2, what is her weight, in lbf, and mass, in lb?

KNOWN: A pilot of a balloon has a known mass and weight at a certain elevation.

FIND: Determine the local acceleration of gravity at the certain elevation and the pilot's weight and mass at another elevation with known acceleration of gravity.

SCHEMATIC AND GIVEN DATA:



ENGINEERING MODEL:
1. Local gravitational acceleration varies with elevation.

ANALYSIS: Weight refers to the force of gravity: $F_{grav} = mg$. Thus, when her mass is 120 lb and weight is 119 lbf, we have

$$g = \frac{F_{grav}}{m} = \frac{119\,\text{lbf}}{120\,\text{lb}}\left|\frac{32.174\,\frac{\text{lb}\cdot\text{ft}}{\text{s}^2}}{1\,\text{lbf}}\right| = \underline{\mathbf{31.906\ ft/s^2}}$$

Since mass does not change with location, at the subsequent elevation, $\underline{\boldsymbol{m = 120\ \text{lb}}}$. When her mass is 120 lb and g = 32.05 ft/s^2, we have

$$F_{grav} = mg = (120\,\text{lb})\left(32.05\,\frac{\text{ft}}{\text{s}^2}\right)\left|\frac{1\,\text{lbf}}{32.174\,\frac{\text{lb}\cdot\text{ft}}{\text{s}^2}}\right| = \underline{\mathbf{119.54\ lbf}}$$

COMMENT: Her mass remains constant, but weight depends on the local acceleration of gravity.