Problem 2 (Estimation Problem: 15 points)

Estimate the weight of the air (in pounds) in our classroom. The density of air is 1.20 kg/m^3.

Given:

Density of air = 1.20 kg/m^3

Find:

The weight of the volume of the air in this room
Steps:
a. Find the volume of the room
b. Assuming entire volume of room is filled with air, multiply volume by density of air to find mass in kg
c. Convert to lbs.

Estimating the volume of the classroom:

- Make use of the ceiling tiles which are 2' x 4' to determine the floor/ceiling area (this is a standard size that can help you determine room sizes in the future).
  Length of room L = (# of tile lengths * a tile length) = 9 lengths * 4 feet/length = 36 feet
  Width of room W = (# of tile widths * a tile width) = 15 widths * 2 feet/width = 30 feet

- The room is half again as tall as Dr. Saul who is 68 inches tall. So the room height H,
  H = 3/2 * 68 inches = 102 inches * 1 foot/12 inches = 8.5 feet (actual height 8 feet).

- Volume V = L * W * H = (36 feet) * (30 feet) * (8.5 feet) = 9,180 ft.^{3}

  Volume = 9,180 ft.^{3} * (12 inches/ft.)^3 * (2.54 cm/in)^3 * (1 m/ 100 cm)^3 = 260 m^3

Determine the mass of the air

- Density = mass/ volume => mass = density * volume
  m = (1.20 kg/m^3) * 260 m^3 = 312 kg

Unit conversion

- Weight = m * conversion = (312 kg) * (2.2 lb. / kg) = 700 lb (to 1 significant figure)