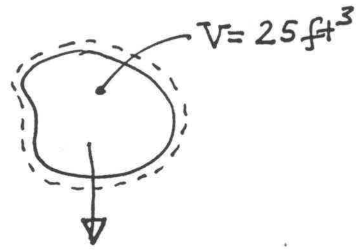
PROBLEM 1.8



$F_{grav} = 3.5\ lbf$
$g_{moon} = 5.47\ ft/s^2$
$g_{mars} = 12.86\ ft/s^2$

In general, $F_{grav} = m\,g$. So,

$$m = \frac{F_{grav}}{g} \qquad (*)$$

Since the mass is the same on mars as on the moon,

$$\left(\frac{F_{grav}}{g}\right)_{mars} = \left(\frac{F_{grav}}{g}\right)_{moon}$$

Accordingly

$$(F_{grav})_{mars} = \left(\frac{g_{mars}}{g_{moon}}\right)(F_{grav})_{moon}$$

$$= \left(\frac{12.86\ ft/s^2}{5.47\ ft/s^2}\right)(3.5\ lbf) = 8.23\ lbf \longleftarrow F_{grav,\,mars}$$

The density is $\rho = m/V$. Applying Eq. (*) with data on mars

$$m = \left(\frac{8.23\ lbf}{12.86\ ft/s^2}\right)\left|\frac{\overset{\text{rounded}}{32.2\ lb\cdot ft/s^2}}{1\ lbf}\right| = 20.61\ lb$$

Then

$$\rho = \frac{20.61\ lb}{25\ ft^3} = 0.824\ \frac{lb}{ft^3} \longleftarrow \rho$$

PROBLEM 1.9

Eq. 1.8 is used in both parts: $n = m/M$, where M is from Tables A-1.

(a) $m = Mn$, where $n = 20\ kmol$.

Air: $m = (28.97\ kg/kmol)(20\ kmol) = 579.4\ kg$
C: $m = (12.01\ kg/kmol)(20\ kmol) = 240.2\ kg$
H_2O: $m = (18.02\ kg/kmol)(20\ kmol) = 360.4\ kg$
CO_2: $m = (44.01\ kg/kmol)(20\ kmol) = 880.2\ kg$

(b) $n = m/M$, where $m = 50\ lb$.

H_2: $n = (50\ lb)/(2.016\ lb/lbmol) = 24.802\ lbmol$
N_2: $n = (50\ lb)/(28.01\ lb/lbmol) = 1.785\ lbmol$
NH_3: $n = (50\ lb)/(17.03\ lb/lbmol) = 2.936\ lbmol$
C_3H_8: $n = (50\ lb)/(44.09\ lb/lbmol) = 1.134\ lbmol$