220A Solutions

Assignment 1

1-17(a). Begin by writing down the ft^2 and then multiply by unity.

$$1\ ft^2 = 1\ ft^2 \cdot 1$$

The trick is to choose the "1" carefully. 1 = 24 hr/day, but that gets us nowhere. Since we are after yd^2, choose 1 = 1 yd/3 ft, thus

$$1\ ft^2 = 1\ ft^2 \cdot (1\ yd/3\ ft)^2 = 0.111\ yd^2.$$

Notice that we multiplied by 1^2. Also, if we had chosen 1 = 3 ft/1 yd, we would have had to divide by 1^2. The units tell us what to do.

(b). $m^2 = m^2 \cdot 1 = m^2 \cdot (100\ cm/1\ m)^2 \cdot (1\ in/2.54\ cm)^2 \cdot (1\ ft/12\ in)^2 =$

$$= 10.76\ ft^2$$

1-36. $$v = At^3 - Bt$$

Since all terms must have the same units, At^3 and Bt must have the same units as v which are [v] = L/T. Thus, $[At^3] = L/T$ and [Bt] = L/T. Since $[At^3] = [A] \cdot T^3 = L/T$, then $[A] = L/T/T^3 = L/T^4$. Similarly, since [Bt] = $[B] \cdot T = L/T$, then $[B] = L/T^2$.

1-41. Write down 1.00 year and multiply by unity.

$$1.00\ year = 1.00\ year \cdot (365\tfrac{1}{4}\ days/year)(24\ hr/day)(3600\ s/hr) =$$
$$= 3.16 \times 10^7\ s.$$

1-42. The author is asking how many acres are in $10^4\ m^2$.

$$10^4\ m^2 = 10^4\ m^2 \cdot (10.76\ ft^2/\ 1\ m^2)(1\ acre/4 \times 10^4\ ft^2) = 2.69\ acres.$$