Math 310 - Dr. Miller - Homework #29: Dimension Analysis

1. Convert as indicated:
   (a) \$6.75 per hour to cents per minute
   (b) 12 cents per day to dollars per year
   (c) \$12 per square yard to cents per square inch
   (d) 65 miles per hour to feet per second
   (e) 3 watts per hour to kilowatts per week
   (f) 3 square meters per minute to square centimeters per second
   (g) 6 liters per second to kiloliters per hour
   (h) a fourth of a kilogram per day to grams per hour
   (i) 16 feet per second to meters per second ($2.54\ cm\ = 1\ in$)

2. Convert as indicated:
   (a) 2.5 foot-pounds to inch-ounces
   (b) 32 feet per second per second to kilometers per minute-squared
   (c) 25 man-hours to team-minutes, where 1 team equals 10 men/people
   (d) 6.5 kilowatt-hours to watt-seconds

1. (a) $\frac{\$6.75}{1\ hour} \times \frac{100\ cents}{\$1} \times \frac{1\ hour}{60\ min} = 11.3$ cents per minute

   (b) $\frac{12\ cents}{1\ day} \times \frac{365\ days}{1\ year} \times \frac{\$1}{100\ cents} = \$43.80$ per year

   (c) $\frac{\$12}{1\ yd \cdot yd} \times \frac{100\ cents}{\$1} \times \frac{1\ yd}{36\ in} \times \frac{1\ yd}{36\ in} = 0.9$ cents per square inch (not 90 cents!)

   (d) $\frac{65\ miles}{1\ hour} \times \frac{5280\ feet}{1\ mile} \times \frac{1\ hour}{60\ min} \times \frac{1\ min}{60\ sec} = 95.3$ feet per second

   (e) $\frac{3\ watts}{1\ hour} \times \frac{1\ kilowatt}{1000\ watts} \times \frac{24\ hours}{1\ day} \times \frac{7\ days}{1\ week} = 0.5$ kW per month

   (f) $\frac{3\ m \cdot m}{1\ min} \times \frac{100\ cm}{1\ m} \times \frac{100\ cm}{1\ m} \times \frac{1\ min}{60\ sec} = 500 cm^2$ per second

   (g) $\frac{6\ \ell}{1\ sec} \times \frac{1\ k\ell}{1000\ \ell} \times \frac{60\ sec}{1\ min} \times \frac{60\ min}{1\ hour} = 21.6$ kℓ per hour

   (h) $\frac{0.25\ kg}{1\ day} \times \frac{1000\ g}{1\ kg} \times \frac{1\ day}{24\ hours} = 10.4$ grams per hour

   (i) $\frac{16\ ft}{1\ sec} \times \frac{12\ in}{1\ ft} \times \frac{2.54\ cm}{1\ in} \times \frac{1\ m}{100\ cm} = 4.9$ meters per second

2. (a) $\frac{2.5\ ft \cdot lb}{1} \times \frac{12\ in}{1\ ft} \times \frac{16\ oz}{1\ lb} = 480\ in \cdot oz$

   (b) $\frac{32\ ft}{sec \cdot sec} \times \frac{60\ sec}{1\ min} \times \frac{60\ sec}{1\ min} \times \frac{12\ in}{1\ ft} \times \frac{2.54\ cm}{1\ in} \times \frac{1\ m}{100\ cm} \times \frac{1\ km}{1000\ m} = 35.11\ km\ per\ min^2$

   (c) $\frac{25\ man \cdot hr}{1} \times \frac{1\ team}{10\ men} \times \frac{60\ min}{1\ hour} = 150\ team \cdot minutes$

   (d) $\frac{6.5\ kW \cdot hr}{1} \times \frac{1000\ W}{1\ kW} \times \frac{60\ min}{1\ hr} \times \frac{60\ sec}{1\ min} = 23,400,000\ W \cdot sec$