

## Math Review Answer Key:

#'s 1-5 use M \_ \_ k h D U. d c m to help convert in metric units...

1. 10 cm = 0.0000001 MM (capital M means Mega (millions) not milli (1/1000))
2. 6 mm = 0.000006 km
3. 1.5 km = 1,500,000 MW
4. 8 watts = 0.000008 MW
5. 5.4 mm = 0.54 cm

## Scientific Notation

6. One billion =  $1.0 \times 10^9$
7. Twenty three thousand =  $2.3 \times 10^4$
8. 0.0000676 =  $6.76 \times 10^{-5}$
9.  $(5.0 \times 10^{11}) \times (3.5 \times 10^4) = [(5.0 \times 3.5) \times 10^{(11+4)}] =$   
 $17.5 \times 10^{15}$  or  $1.75 \times 10^{16}$
10.  $(3.0 \times 10^{11}) / (6.0 \times 10^3) = [(3.0/6.0) \times 10^{(11 + (-3))}] =$   
 $0.5 \times 10^8$  or  $5 \times 10^7$
11.  $6000 \times .45 = 2700$  :  $6000 - 2700 = 3300$  acres
12.  $1000 \times .60 = 600$  :  $1000 - 600 = 400$  BTUs
13.  $(70 - 42)/70 = .40 \times 100 = 40\%$
14.  $(14 - 63)/14 = 3.5 \times 100 = 350\%$

## Other

15. How many seconds are in 3 years?  $9.5 \times 10^7$  seconds/3 years  
 $1 \text{ year} \times (365 \text{ days}/1 \text{ year}) \times (24 \text{ hrs}/1 \text{ day}) \times (60 \text{ min}/1 \text{ hr}) \times (60 \text{ sec}/1 \text{ min}) = 31536000$   
 $\text{sec} \times 3 \text{ years} = 9.5 \times 10^7 \text{ sec}/3 \text{ years}$
16.  $22 \times 300,000,000 = 6600000000 = 6.6 \times 10^9$
17.  $22 \times (6.8 \times 10^9) = (2.1 \times 10^{11}) \times (6.8 \times 10^9) = 14.3 \times 10^{10}$  or  $1.43 \times 10^{11}$

## Dimensional Analysis Worksheet

1.  $261 \text{ g} \times (1\text{kg}/1000\text{g}) = 0.261 \text{ kg}$
2.  $3 \text{ days} \times (24 \text{ hrs}/1 \text{ day}) \times (60 \text{ min}/1 \text{ hr}) \times (60 \text{ sec}/1 \text{ min}) =$   
 $259200 \text{ sec}$  or  $2.5 \times 10^5 \text{ sec}$
3.  $9474 \text{ mm} = 947.4 \text{ cm}$
4.  $1 \text{ year} \times (365 \text{ days}/1 \text{ yr}) \times (24 \text{ hrs}/1 \text{ day}) \times (60 \text{ min}/1 \text{ hr}) =$   
 $525600 \text{ min}$  or  $5.25 \times 10^5 \text{ min}$
5.  $175 \text{ lbs} \times (1 \text{ kg}/2.2 \text{ lbs}) = 79.5 \text{ kg}$
6.  $4.65 \text{ km} = 4650 \text{ m}$
7.  $22.4 \text{ kg/L} \times (1 \text{ L}/1000 \text{ mL}) = 0.0224 \text{ kg/mL}$
8.  $25 \text{ m/s} \times (1 \text{ mile}/1609.3 \text{ m}) \times (60 \text{ sec}/1 \text{ min}) \times (60 \text{ min}/1 \text{ hr}) = 56 \text{ miles/hr}$
9.  $6 \text{ ft} \times (12 \text{ in}/1 \text{ ft}) \times (2.54 \text{ cm}/1 \text{ in}) = 182.88 \text{ cm}$
10.  $65 \text{ miles/hr} \times (5280 \text{ ft}/1 \text{ mile}) \times (1 \text{ hr}/60 \text{ min}) = 5720 \text{ ft/min}$

$$5720 \text{ ft/min} \times 22 \text{ min} = 125840 \text{ ft}$$

### Energy Problems

1. a)  $1355 \text{ kwh} \times (3600 \text{ kJ} / 1 \text{ kwh}) = 4878000 \text{ kJ}$  or  $4.9 \times 10^6 \text{ kJ}$   
b)  $1355 \text{ kwh} / 30 \text{ days} = 45.17 \text{ kwh/day} \times (3600000 \text{ J} / 1 \text{ kwh}) = 1.6 \times 10^8 \text{ J/day}$   
c)  $1355 \text{ kwh} \times \$0.0749/\text{kwh} = \$ 101.49$
  
2. a)  $W = 110 \text{ V} \times 8 \text{ A} = 880 \text{ W} = 880 \text{ J/sec}$   
b)  $E = P \times T, 880 \text{ J/sec} \times (60 \text{ sec} / 1 \text{ min}) \times 5 \text{ min} = 264,000 \text{ J}$
  
3. a)  $20 \text{ J/sec} \times (60 \text{ sec} / 1 \text{ min}) \times (60 \text{ min} / 1 \text{ hr}) \times 12 \text{ hrs} = 864,000 \text{ J}$   
b)  $864,000 \text{ J}$   
c)  $80 \text{ J/sec} \times (60 \text{ sec} / 1 \text{ min}) \times (60 \text{ min} / 1 \text{ hr}) \times 12 \text{ hrs} = 3,456,000 \text{ J}$   
d)  $4,320,000 \text{ J} \times (1 \text{ kwh} / 3,600,000 \text{ J}) = 1.2 \text{ kwh}$
  
4. a)  $E = P \times T = 4000 \text{ J/sec} \times (60 \text{ sec} / 1 \text{ min}) \times (60 \text{ min} / 1 \text{ hr}) \times 20 \text{ hrs} =$   
 $2.8 \times 10^8 \text{ J} \times (1 \text{ kwh} / 3.6 \times 10^6 \text{ J}) = 80 \text{ kwh}$   
b)  $80 \text{ kwh} \times ( \$ .0758/\text{kwh}) = \$ 6.06$
  
5. a)  $110 \text{ therms} \times (100,000 \text{ BTUs} / 1 \text{ therm}) \times (1.05 \text{ kJ} / 1 \text{ BTU}) \times (1 \text{ kwh} / 3600 \text{ kJ})$   
 $= 3208.3 \text{ kwh}$   
b)  $\$ 88.78 / 3208.3 \text{ kwh} = \$ 0.03/\text{kwh}$