Intermediate Math Lesson

Title: Holiday Lights Math

Grade-level: 6^{th} – 9^{th} grade

Procedure:

Follow the instructions below to estimate the extra electricity used by holiday lights and the resulting cost and carbon dioxide emissions.

Estimate Electricity Use for Holiday Lights:

1. Check the packaging for the wattage ratings for the string of lights.
2. Estimate how many hours you will leave the lights on.
3. Calculate the amount of electricity that the lights will use with this formula:

   Electricity Use (kWh) = (String Wattage x Number of Strings x Hours On) / 1000

Estimate the Cost of the Extra Electricity:

1. Follow the link to your state's Electricity Profile listed at: http://www.eia.gov/cneaf/electricity/st_profiles/e_profiles_sum.html.
2. Find the average electricity price in your state on the line called "Average Retail Price (cents/kWh)" at the bottom of the table
3. Then, multiply the price by the amount of electricity used by the lights (you estimated this above):

   Cost of Electricity (cents) = Use (kWh) x Price (cents per kWh)

Estimate CO2 Emissions Resulting from Your Holiday Lights:

4. Find the estimate for pounds of CO_2 emissions per Megawatthour (or 1000 kWh) on the row of Table 1 called "Carbon Dioxide (lbs/MWh)."

5. Divide the pounds per MWh by 1000 to convert to pounds per kWh.

6. Multiply the pounds per kilowatthour (lbs/kWh) by the amount of electricity used by the lights. Then, multiply by 1.065 to account for electricity that is lost on the way to your home. The product is an estimate of CO_2 emissions resulting from your decorative lights.

   CO_2 emissions (lbs) = Electricity Use (kWh) x CO_2 (lbs/kWh) x 1.065