TAKE IT TO THE MAT

A NEWSLETTER ADDRESSING THE FINER POINTS OF MATHEMATICS INSTRUCTION

Math Audit Team
Regional Professional Development Program
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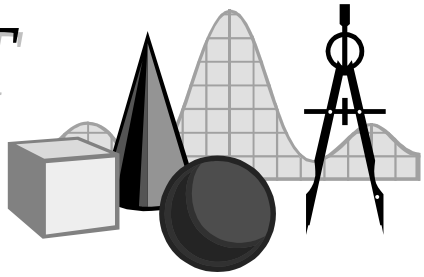

Greetings! An enthusiastic welcome and welcome back to new and returning teachers from the Math Audit Team. With this issue, we embark on our second year of producing *Take It to the MAT*, a newsletter provided as a resource for teachers of all levels.

No doubt many have looked upon recent power bills with shock, mainly due to the high temperatures experienced this past summer. These statements are a great resource in middle school mathematics—they contain bar graphs, ratios, and percents. They even show that "goods and services", like electricity, may not be priced to the whole cent. In this edition we will focus on an often misunderstood concept—the unit of electricity for which one pays.

If the label on an electrical appliance is examined, several specifications of various quantities and units will be seen. A light bulb may state 120 V, 60 W. Again, the bulb requires 120 volts and uses energy at a rate of 60 watts. The rate at which energy is used (or delivered) is called power.

Read that last sentence again. Power is the *rate* at which energy is used. Thus, $power = \frac{energy}{time}$. Multiplying both sides of the equation by *time* we get $power \cdot time = energy$. Power is measured in watts (or kilowatts, milliwatts, etc.), time is measured in seconds (or hours, etc.), and energy is the product of the two. Energy can then be measured in units like watt-seconds or kilowatt-hours. The charges on an electricity bill are based on the quantity of kilowatt-hours used. So it's really an *energy* bill, not a *power* bill.

Going back to the light bulb, it had a power rating of 60 watts or 0.06 kilowatts. If one were to leave that bulb turned on for 16 hours 40 minutes, the energy used would be 0.06 kilowatts $\times$ $16\frac{2}{3}$ hours = 1 kilowatt-hour. Looking at the sample *energy* bill, that light would have cost a total of \$0.06299.

A note about writing the units used above. The basic unit of power is the watt, abbreviated W. Even though, the unit is written in lower case letters, the abbreviation is upper case. When units are named after people—in this case the British engineer James Watt—the abbreviations are capitalized, but prefixes are used as usual. Kilowatt is abbreviated kW, milliwatt is mW, and megawatt is MW.