



## Energy Audit

### Five Light Bulbs

Determine which 5 bulbs should be replaced with 5 LED energy efficient bulbs.

Using your lights as normal for three days (2 weekdays and one weekend day), pay attention to the lighting in each room of your house. Use the Pre Audit Chart to record your findings. You may need to make a few copies of this chart.

POWER: How much power does each light use?

- Look at each bulb. Somewhere it will say how much power it uses, like 60W or 13W.
- How many bulbs are in each fixture? Do they all use the same Power?
- Add up the Power of all of the bulbs in a fixture, or controlled by the same switch, and put that number into the **Power** column.

TIME: How long is the light on?

- How long is each light on each day? Write that in the **Day** column
- Add up the time for each room, and write it in the **Total Time** column.
- Add up all the numbers in the Total Time column, and write it in the bottom square. That is the total number of hours overall that lights are on in your house.

Could you turn off lights that aren't needed to save even more energy?

ENERGY:

- For each row, multiply the number in the **Total Time** column by the number in the **Power** column to get **Energy**.
- Add up all the numbers in the **Energy** column, and write it in the bottom square. That is the total energy used for lighting in your house.

$$\text{Energy} = \text{Power} \times \text{Time}$$
$$\text{Energy} = \text{Watts} \times \text{hours} = \text{Wh}$$

Pick your top 5: Check your chart.

- Unless all the bulbs in your house use less than 20W, cross off all the bulbs that are less than 20W.
- Cross off any that are LED.
- On your sheet mark the 5 bulbs with the highest energy. **Replace these bulbs to save the most energy.**

**Note that the bulbs in this kit might look a different color than the lights you have now. You may want to change all the bulbs in one fixture, or all the bulbs in one room.**



Now keep track of all these lights again to see how lighting and power use have changed. Use the Post Audit Chart to record your findings. You can focus on just the bulbs you changed, or you can track all the bulbs again.

Compare the results of your Pre Audit with your Post Audit.

1. Did your family do a better job of turning off lights in the Post Audit period?

Pre Audit Total Hours	_____	
- Post Audit Total Hours	_____	
	<hr style="border-top: 3px double black;"/>	
= Reduced lighting hours	_____	

2. How much energy did you save?

Pre Audit Total Energy	_____	Wh
- Post Audit Total Energy	_____	Wh
	<hr style="border-top: 3px double black;"/>	
= Energy Saved	_____	Wh

3. How much money will you save?

At home we pay about 16.43 ¢/kWh (\$0.1643/kWh) for our electricity, including taxes. “kWh” means kilo Watt hour. A kilo Watt hour is 1000 Watt hours. (1kWh = 1000Wh)

$$\text{Cost} = \text{Energy saved} \times \text{Electricity rate}$$

$$\text{Cost} = \{ \text{Energy (Wh)} \times (\text{kWh}/1000\text{Wh}) \} \times \$0.1643/\text{kWh} = \$$$

4. How much greenhouse gas emissions will you reduce?

In Saskatchewan, for every kWh we use, 0.6 kgCO<sub>2e</sub> (kilograms of carbon dioxide equivalent) are released.

$$\text{Emissions} = \text{Energy} \times \text{Emission rate}$$

$$\text{Emissions} = \{ \text{Energy (Wh)} \times (\text{kWh}/1000\text{Wh}) \} \times 0.5 \text{ kgCO}_{2e}/\text{kWh} = \text{kgCO}_{2e}$$



5. How much will you save in a year?

You calculated how much energy, cost and greenhouse gas emissions you saved in 3 days. there are 365 days in a year.

$$\text{Annual Savings} = 3 \text{ day savings} \times 365/3$$

$$\text{Annual Energy Savings} = 3 \text{ day energy savings} \times 365/3 = (\text{kWh/year})$$

$$\text{Annual cost savings} = 3 \text{ day cost savings} \times 365/3 = (\$/\text{year})$$

$$\text{Annual greenhouse gas emission savings} = 3 \text{ day greenhouse gas emission savings} \times 365/3 = (\text{kgCO}_2\text{e /year})$$



**PRE AUDIT CHART**

Name \_\_\_\_\_

Date \_\_\_\_\_

Room	Power (W)	Day 1 (hours)	Day 2 (hours)	Day 3 (hours)	Total Time (hours)	Energy = Power x Time (W x hours)
Ex: Kitchen Ceiling 1	60 x 2 = 120	5	3	7	15	= 120 x 15 = 1800 Wh
Ceiling 2						
<b>Total</b>	W				h	Wh



**POST AUDIT CHART**

Name \_\_\_\_\_

Date \_\_\_\_\_

Room	Power (W)	Day 1 (hours)	Day 2 (hours)	Day 3 (hours)	Total Time (hours)	Energy = Power x Time (W x hours)
Ex: Kitchen Ceiling 1						
Ceiling 2						
<b>Total</b>	W				h	Wh



## Curriculum Connections

### Grade 4 Mathematics: N4.1

Demonstrate an understanding of whole numbers to 10 000 (pictorially, physically, orally, in writing, and symbolically) by: representing, describing, comparing two numbers, ordering three or more numbers. **N4.2** Demonstrate an understanding of addition of whole numbers with answers to 10 000 and their corresponding subtractions (limited to 3 and 4-digit numerals) by: using personal strategies for adding and subtracting, estimating sums and differences, solving problems involving addition and subtraction. **N4.3** Demonstrate an understanding of multiplication of whole numbers (limited to numbers less than or equal to 10) by: applying mental mathematics strategies, explaining the results of multiplying by 0 and 1 **N4.7** Demonstrate an understanding of decimal numbers in tenths and hundredths (pictorially, orally, in writing, and symbolically) by: describing, representing, relating to fractions.

**N4.8** Demonstrate an understanding of addition and subtraction of decimals limited to hundredths (concretely, pictorially, and symbolically) by: using compatible numbers, estimating sums and differences, using mental math strategies, solving problems.

**P4.1** Demonstrate an understanding of patterns and relations by: identifying and describing patterns and relations in a chart, table or diagram, reproducing patterns and relations in a chart, table, or diagram using manipulatives, creating charts, tables, or diagrams to represent patterns and relations, solving problems involving patterns and relations. **SS4.1** Demonstrate an understanding of time by: reading and recording time using digital and analog clocks (including 24 hour clocks), reading and recording calendar dates in a variety of formats.

**Grade 5 Mathematics: N5.1** Represent, compare, and describe whole numbers to 1 000 000 within the contexts of place value and the base ten system, and quantity. **N5.2**

Analyze models of, develop strategies for, and carry out multiplication of whole numbers. **N5.6** Demonstrate understanding of decimals to thousandths by: describing and representing, relating to fractions, comparing and ordering. **N5.7** Demonstrate an understanding of addition and subtraction of decimals (limited to thousandths).

**P5.1** Represent, analyse, and apply patterns using mathematical language and notation. **P5.2** Write, solve, and verify solutions of single-variable, one-step equations with whole number coefficients and whole number solutions. **SP5.1** Differentiate between first-hand and second-hand data.

**Grade 6 Mathematics: N6.3** Demonstrate understanding of the order of operations on whole numbers (excluding exponents) with and without technology. **N6.4** Extend understanding of multiplication and division to decimals (1-digit whole number multipliers and 1-digit natural number divisors). **P6.1** Extend understanding of patterns and relationships in tables of values and graphs. **P6.2** Extend understanding of preservation of equality concretely, pictorially, physically, and symbolically. **P6.3** Extend understanding of patterns and relationships by using expressions and equations involving variables. **SP6.1** Extend understanding of data analysis to include: line graphs, graphs of discrete data, data collection through questionnaires, experiments, databases, and electronic media, interpolation and extrapolation. **SP6.2** Demonstrate understanding of probability by: determining sample space, differentiating between experimental and theoretical probability, determining the theoretical probability, determining the experimental probability, comparing experimental and theoretical probabilities.

**Grade 7 Mathematics: N7.2** Expand and demonstrate understanding of the addition, subtraction, multiplication, and division of decimals to greater numbers of decimal places, and the order of operations.

**P7.3** Demonstrate an understanding of one- and two-step linear equations of the form  $ax/b + c = d$  (where  $a$ ,  $b$ ,  $c$ , and  $d$  are whole numbers,  $c \leq d$  and  $b \neq 0$ ) by modeling the solution of the equations concretely, pictorially, physically, and symbolically and explaining the solution in terms of the preservation of equality.

**P7.4** Demonstrate an understanding of linear equations of the form  $x + a = b$  (where  $a$  and  $b$  are integers) by modeling problems as a linear equation and solving the problems concretely, pictorially, and symbolically.

**Grade 8 Mathematics: N8.3** Demonstrate understanding of rates, ratios, and proportional reasoning concretely, pictorially, and symbolically. **P8.2** Model and solve problems using linear equations of the form:  $ax=b$ ,  $x, a, =b, a \neq 0$ ,  $ax+b=c$ ,  $x, a, +b=c, a \neq 0$ ,  $a(x+b)=c$ ,

concretely, pictorially, and symbolically, where  $a$ ,  $b$ , and  $c$  are integers.

**SP8.1** Analyze the modes of displaying data and the reasonableness of conclusions.