Let's Compare Holiday Lights!

If we compare different holiday lights we can find out where and how we can waste less energy!

First, we will use these assumptions for this activity:

1) We will use <u>four strands</u> of holiday lights to decorate the outside of our house. <u>Each strand has 100 bulbs</u>.
2) We will run these holiday lights on a timer for about <u>six hours per day</u>.
3) We will use the holiday lights for a total of <u>30 days</u> this holiday season.
4) The cost of energy in Nova Scotia is <u>$0.15/kWh</u>.

Large Incandescent Holiday Lights (C9)	Large LED Holiday Lights (C9)
Consumption per 100 bulbs: 700 watts (0.7kW)	Consumption per 100 bulbs: 6 watts (0.006 kW)
0.7kW x _____ light strands = _____kW _____kW x _____hr/day = _____kWh/day _____kWh/day x _____days/holiday season =_____kWh/holiday season	0.006kW x _____ light strands = _____kW _____kW x ____ hr/day = _____kWh/day _____kWh/day x _____days/holiday season =_____kWh/holiday season
_____kWh/holiday season x $0.15/kWh = $_____/holiday season	_____kWh/holiday Season x $0.15/kWh = $_____/holiday season

Mini Incandescent Holiday Lights (M5)	Mini LED Holiday Lights (M5)
Consumption per 100 bulbs: 45 watts (0.045 kW)	Consumption per 100 bulbs: 2 watts (0.002 kw)
0.045kW x _____ strands = _____kW _____kW x ____ hr/day = _____kWh/day _____kWh/day x _____days/holiday season = _____kWh/holiday season	0.002kW x _____ strands = _____kW _____kW x ____ hr/day = _____kWh/day _____kWh/day x _____days/holiday season = _____kWh/holiday season
_____kWh/holiday season x $0.15/kWh = $_____/holiday season	_____kWh/holiday season x $0.15/kWh = $_____/holiday season

DISCUSSION:

1. Which type of holiday light has the highest electricity cost for the whole holiday season?

   _____

2. Which type of holiday light has the lowest electricity cost for the holiday season?

   _____

3. How much would you save in electricity costs per season if you changed the large incandescent holiday lights to large LED holiday lights?

   _____

4. How much would you save in electricity costs each season if you changed the small incandescent holiday lights to small LED holiday lights?

   _____

CURRICULUM LINKS

Mathematics 4

N06 Students will be expected to demonstrate an understanding of multiplication (one-, two-, or three-digit by one-digit numerals) to solve problems by
   - using personal strategies for multiplication, with and without concrete materials;
   - using arrays to represent multiplication;
   - connecting concrete representations to symbolic representations;
   - estimating products;
   - applying the distributive property [C, CN, ME, PS, R, V].
N07 Students will be expected to demonstrate an understanding of division (one-digit divisor and up to two-digit dividend) to solve problems by:
   - using personal strategies for dividing, with and without concrete materials;
   - estimating quotients;
   - relating division to multiplication [C, CN, ME, PS, R, V].

Mathematics 5

N05 Students will be expected to demonstrate, with and without concrete materials, an understanding of multiplication (two-digit by two-digit) to solve problems. [C, CN, PS, V]
N06 Students will be expected to demonstrate, with and without concrete materials, an understanding of division (three-digit by one-digit), and interpret remainders to solve problems. [C, CN, PS]

Mathematics 6

Numbers
N02: Students will be expected to solve problems involving whole numbers and decimal numbers
N08 Students will be expected to demonstrate an understanding of multiplication and division of decimals (one-digit whole number multipliers and one-digit natural number divisors). [C, CN, ME, PS, R, V]
*Patterns and Relation*s
PR01 Students will be expected to demonstrate an understanding of the relationships within tables of values to solve problems. [C, CN, ME, PS, R, V]

Mathematics 7

B4 determine and use the most appropriate computational method in problem situations involving whole numbers and/or decimals [C, CN, ME, PS, R, V]
B14 solve and pose problems that utilize addition, subtraction, multiplication, and division of integers
C1 describe a pattern, using written and spoken language and tables and graphs

<u>C9</u> construct and analyze graphs to show how change in one quantity affects a related quantity

<u>D1</u> identify, use, and convert among the SI units to measure, estimate, and solve problems that relate to length, area, volume, mass, and capacity

<u>D3</u> develop and use rate as a tool for solving indirect measurement problems in a variety of contexts

Mathematics 8

<u>B12</u> add, subtract, multiply, and divide positive and negative decimal numbers with and without the calculator

<u>B13</u> solve and create problems involving addition, subtraction, multiplication, and division of positive and negative decimal numbers

<u>C1</u> represent patterns and relationships in a variety of formats and use these representations to predict unknown values

<u>C3</u> construct and analyze tables and graphs to describe how change in one quantity affects a related quantity

<u>D2</u> solve measurement problems, using appropriate SI units

Grade 9 Mathematics

<u>B1</u> model, solve, and create problems involving real numbers

<u>B2</u> add, subtract, multiply, and divide rational numbers in fractional and decimal forms using the most appropriate methods

<u>B14</u> select and use appropriate strategies in problem situations

<u>C1</u> represent patterns and relationships in a variety of formats and use these representations to predict and justify unknown values

<u>C3</u> construct and analyse tables and graphs to describe how changes in a quantity affect a related quantity

<u>C5</u> explain the connections among different representations of patterns and relationships

<u>D2</u> solve measurement problems involving conversion among SI units

<u>F5</u> draw inferences and make predictions based on data analysis and data displays

Mathematics 10

<u>M01</u> Students will be expected to solve problems that involve linear measurement, using SI and imperial units of measure, estimation strategies, and measurement strategies. [ME, PS, V]

<u>M02</u> Students will be expected to apply proportional reasoning to problems that involve conversions between SI and imperial units of measure. [C, ME, PS]

Mathematics at Work 10

<u>M01</u> Students will be expected to demonstrate an understanding of the International System of Units (SI) by:
   - describing the relationships of the units for length, area, volume, capacity, mass, and temperature;
   - applying strategies to convert SI units to imperial units [C, CN, ME, V].

<u>N01</u> Students will be expected to solve problems that involve unit pricing and currency exchange, using proportional reasoning. [CN, ME, PS, R]

Mathematics Essentials 10

<u>A1</u> understand purchasing power
<u>F4</u> make decisions regarding the purchase of costly items by identifying and ranking criteria for the comparison of possible choices
<u>F5</u> make decisions regarding the payment options for purchases
<u>F6</u> identify various incentives to make purchases

Mathematics at Work 11

<u>M01</u> Students will be expected to solve problems that involve SI and imperial units in surface area
measurements and verify the solutions
<u>A01</u> Students will be expected to solve problems that require the manipulation and application of formulas related to:
   - finance charges.
<u>A03</u> Students will be expected to solve problems by applying proportional reasoning and unit analysis.

Mathematics Essentials 12

Module 1: Measurement
<u>1.6</u> identify, use, and convert among and between SI units and imperial units to measure and solve
measurement problems

Science 6

Physical Science: Electricity
- Learners will evaluate renewable and non-renewable sources of energy; Indicator: Compare renewable and non-renewable energy (CZ, COM, PCD, CT, TF);
Investigate types of energy transformation (COM, CT, TF); Analyse impact of electrical energy consumption (CZ, COM, PCD, CT, TF)

Science 9
Electricity, Energy, and the Environment
- relate electrical energy to domestic power consumption costs (308-18)
- make informed decisions and propose a course of action on science, technology, and social issues, including human and environmental needs for electricity and
energy (113-9, 113-13)

CROSS CURRICULAR LINKS

Information and Communication Technology Integration 9

Social, Ethical, and Human Issues (SEHI)

SEHI 9.1 (relates to 6.1, 6.2, 6.3) demonstrate understanding of the nature of technology and its impacts on different societies and environments; using technology, in local and global contexts, with due regard for the legal and human rights of others

Productivity (PTS)

- The efficient selection and use of ITC to perform tasks such as:
  - the exploration of ideas;
  - data collection;
  - data manipulation, including the discovery of patterns and relationships;
  - problem solving;
  - the representation of learning.

Research, Problem Solving, and Decision Making (RPSD)

RPSD 9.1 (relates to 6.2) select appropriate measuring and recording devices and/or software to collect data, discover patterns of change over time, solve problems and make logical decisions based on their investigations; with teacher assistance

Technology Education 9

Module 2: Energy Engineering

2.7 use knowledge of energy sources to make decisions about real-life energy problems

Exploring Technology 10

Module 2: Green Technology

2.2 examine the consequences of technology in domestic use and consumption of energy

Science 10

Sustainability of an Ecosystem

- predict and analyze the impact of external factors on the sustainability of an ecosystem, using a variety of formats (212-4, 214-3, 331-6)

Energy, Power, and Transportation Technology 11

Unit 6: Environmental Impact of Energy, Power, and Transportation

6.3 provide examples of methods used to save energy in the commercial and residential sectors of society, and identify the use of several energy-saving appliances

Mathematics at Work 12

<u>A01</u> Students will be expected to demonstrate an understanding of linear relations by

- recognizing patterns and trends;
- graphing;
- creating tables of values;
- writing equations;
- interpolating and extrapolating;
- solving problems [CN, PS, R, T, V].