

Maths

Calculating the cost of electricity



Overview of Session



Session Length | 60 mins



Age Group | 9-11 Years

Learning Outcomes

Students will understand how to calculate the cost of electricity in their household by using the given electrical household items. All the items have different kWh ratings. There is no all encompassing rating. However, there is a set price of 15p per kWh. They will then work out how long they use the item/product for and subsequently how much it will cost to use/run each day, week, month and year.

Learning Outcomes

- To be able to divide numbers by 1000.
- To be able to use and apply given formulae
 - $\text{Cost} = \text{energy used in kWh} \times \text{cost of 1kWh}$
 - $\text{Cost to run} = \text{cost per hour} \times \text{number of hours used}$.
- To use and apply mathematical skills to solve real life problems.

Lesson Overview

This lesson will develop students' ability to convert measurements and make calculations using a given equation. Initially, students will practise dividing numbers by 1000 before being introduced to the main lesson objectives.

Examples of household objects, such as a toaster, alongside how many kWh of energy it uses will be shown to students. 15p per kWh will be used to work out the amount these items cost to use. Students will be given examples of how long an item is used for, and they must work out how much it will cost to use that item for that amount of time.

After a few examples, students will be given handout 1 which is a table of household objects and how much energy they use in Watts. Students will convert the Watts into kWh. Students will then estimate how long they use each of the items for per day in their own household. Students will then use this estimation to calculate how long they use

each item per week, then per month as well as using a rounded number of 15p per kWh to calculate daily, weekly and monthly costs.

The plenary will look at students' energy use in their household. They will be asked to see if there is anything more they can do to save energy.

Key Terms and Principles

kWh, kilowatts, Watts, energy, divide, multiply, dividing by 1000, converting measurements, applying formulae to a problem.

Resources

- PowerPoint presentation
- Worksheets 1 and 2

OK, Let's Go!



Part 1: Introduction



Suggested length | 15 mins

Explain who Northern Powergrid is and the work it does.

Setting the Scene

Students will understand the breakdown of an electricity bill.

Students will then have the opportunity to practise converting Watts to kilowatts accurately, using the examples on the PowerPoint.

Resources



- PowerPoint slide

Part 2: Body of Lesson



Suggested length | 20 mins

Introduction

- A washing machine will be shown alongside the energy it uses per hour – 1200Watts per hour.
- Students are asked to convert this figure into kilowatts before working out how much it costs to use for 2 hours.
- 'Use the formulae: $\text{Cost} = \text{energy used in kWh} \times \text{cost of 1 kWh}$ '
- A standard unit of 15p per kWh will be used throughout the lesson to avoid confusion.
- Next, a toaster with an energy rating of 800Watts per hour will be displayed. Students will convert this figure into kWh before calculating cost to use for an hour. However, the question asks for the cost per half hour and students must divide the answer by two.
- A couple more examples are shown in the next few slides, a hairdryer and a coffee machine. The coffee machine example requires students to work out how much the coffee machine costs for 5 minutes each day. They must then work out how much it costs to use 5 minutes per day for a whole week.

Resources



- PowerPoint slide



Task 1

- Students will be shown and given Worksheet One with electrical household items alongside the Wattage per hour. Their first task is to convert Watts into kWh.
- Students will look at the table of items in their house and choose their top 7 “frequently used” items and list them on Worksheet Two.
- Students will then work out how much energy these items use in a single day.
- If there is an electrical item they use often that isn’t on the list, you may want to allow students to look up extra items online and research the kWh consumed by them.
- As well as listing the items in the table on the worksheet, the students must note the amount of time they use each item per day. Using the strategies taught during the input (‘15p per kWh’ and ‘cost = energy used in kWh × cost of 1 kWh’ calculation), students must calculate how much energy they use in a day for each electronic item. They then need to work out how much in a week and then a month.

Resources



- PowerPoint Slide



- Worksheets 1 and 2

Extension task

- Students to be given the difference in price when paying for electricity via direct debit vs. paying monthly over the phone:
 - Direct Debit price per month is 14.71p per kWh
 - Price with paying monthly over the phone is 16.42p per kWh
- Students will be asked to work out the amount their household would save by paying for the usage of their favourite items by direct debit.
- Hints are provided for students who need further prompting

Plenary

- Feedback and decide whose “frequently used” items are consuming the most energy and potentially creating the highest bills.
- Students to be asked to investigate which items they could use less frequently – how will these changes impact their lifestyle or daily routine?
- This activity should be lead as a whole class discussion, with students encouraged to offer each other advice or ideas for reducing energy consumption.

Next Steps



- Based on their plenary discussion, students will be asked to revise their estimates of how often they will use their chosen household items per day (including reductions where possible).
- As part of this homework task, students should then calculate what this will cost per day, week and year.
- Students to calculate how much money they could save if they stick to using these items at their new reduced rate.
- Challenge – students could also research ways in which energy consumed by kettles, washing machines, etc. can be reduced (e.g. amount of water put into the kettle, using a short wash, etc.)

