Problem Solving in Mathematics

Number

Fuel Types

Rewarding Learning

Teacher Notes

Introduction

Pupils can work on this problem individually or with others.

- They can discuss how they will use the information on fuel economy, currency exchange rate and prices to work out which car would be best to buy.
- They can share their responses and compare approaches.

This problem deals with a pupil's ability to read through information, use conversion rates (gallons to litres and sterling to euro), and calculate associated costs.

What I know (think)

The pupils should know from the given problem:

- Lara lives in Strabane and wants to buy an economical car.
- She has a choice between a car with an unleaded hybrid engine (73 mpg) and one with a diesel engine (66 mpg).
- She wants the car to travel to and from her work in Donegal Town which is 32 miles away from her house.
- She can buy petrol in Strabane or in Country Donegal.
- The exchange rate for sterling to euro is £1 = €1.10.
- She works five days a week and has budgeted £25 a week for fuel, but would like the cost to be as little as possible.
- The pupils need to advise Lara on which car to buy.
- One gallon = 4.5 litres

What I need to know (identify)

Pupils need to identify:

- how to convert miles per gallon into miles per litre;
- how to convert the prices given in cents into pence, or vice versa;
- how many miles in total Lara travels each week;
- what the weekly costs are for the unleaded hybrid engine for buying fuel in Strabane and Country Donegal;
- what the weekly costs are for the diesel engine for buying fuel in Strabane and Country Donegal; and
- which engine is the most economical.

Fuel Types (Continued)

What I need to do (employ)

Pupils can work out a solution to this problem using whichever steps they feel appropriate. For example, they may convert euro to sterling or sterling to euro as part of their approach. As Lara's budget is £25 they are more likely to convert euro to sterling, as the following approach shows:

- They convert the mpg for both the hybrid and diesel cars by dividing the respective mpg values by 4.5 and rounding to one decimal place to get the miles per litre for each car.
- They also convert euro to sterling by dividing the County Donegal prices for unleaded and diesel fuel by 1.10 and rounding to one decimal place to get the prices in pence.
- Pupils can choose to turn the pence prices into pounds at this stage or do it at a later stage.
- Pupils can double the distance from Lara's house in Strabane to her work in Donegal Town to get the total miles for a return journey (64).
- They then multiply the return journey by five to get the total miles travelled in one week (320).
- They look at the costs for each car separately.
- For the hybrid car, they divide 320 miles by the miles per litres they have already calculated, rounding as appropriate to find how many litres the car needs for the week (20 litres).
- They multiply 20 litres by the sterling prices and record as pounds to find how much it would cost to buy fuel in Strabane and County Donegal.
- They then repeat this process for the diesel car.
- They compare both petrol costs for both cars to see which costs less than £25 and which is the cheapest.
- They provide an argument for which car Lara should choose based on her conditions and their own calculations.

What I did (review)

Pupils will use self-assessment, peer assessment or teacher feedback to decide whether they have approached the problem as intended.

- Did they convert miles per gallon into miles per litre?
- Did they convert euro prices into sterling prices?
- Did they work out how many miles in total Lara drives each week?
- Did they calculate how many litres each car would use to travel the total distance each week?
- Did they calculate for each car how much it would cost for the litres required in both Strabane and County Donegal?
- Did they record their answers in pounds and pence rather than just pence?
- Did they provide a good argument for which car Lara should choose?
- Did they use appropriate rounding throughout?

Fuel Types (Continued)

Curriculum Objectives

This problem should enable pupils to demonstrate their knowledge, understanding and skills through:

Developing pupils as individuals	**Demonstrate an ability and willingness to develop logical arguments** • Pupils will demonstrate through their work which is the best choice of car for Lara.
Developing pupils as Contributors to the Economy and the Environment	**Apply mathematical skills in everyday financial planning and decision making:** • Pupils will show how they have used exchange rates and prices to determine fuel costs within a budget. **Explore issues related to Education for Sustainable Development** • Pupils will explore how using less fuel can also lead to spending less money on fuel, and how different fuel types may be better for the environment.

Thinking Skills and Personal Capabilities

This problem can provide an opportunity for pupils to demonstrate a variety of the following Thinking Skills and Personal Capabilities:

Managing Information	• Plan and set goals and break a task into sub-tasks
Thinking, Problem-Solving and Decision Making	• Justify methods, opinion and conclusions • Examine options and weight up pros and cons • Generate possible solutions, try out alternative approaches and evaluate outcomes
Being Creative	• Seek out questions to explore and problems to solve • Make new connections between ideas/information
Working with Others	• Listen actively and share opinions • Suggest ways of improving their approach to working collaboratively
Self-Management	• Seek advice when necessary • Organise and plan how to go about a task • Focus, sustain attention and persist with tasks

Cross-Curricular Skills

This problem should enable pupils to demonstrate a variety of the following Cross-Curriculum Skills:

Using Mathematics