

Teacher Notes

Introduction

Pupils can work on this problem individually or with others.

- They can discuss what they need from the information provided. They can then figure out how they will use it to work out how much savings Amy can make in running costs over the year by buying a new car.
- They can share their responses and compare approaches.

This problem deals with a pupil's ability to read through information, and identify and use the necessary detail needed to calculate costs involving gallons and litres.

What I know (think)

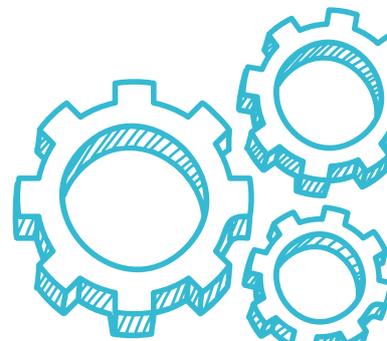
The pupils should know from the given problem:

- Amy wants to buy a new car.
- Her old car averages 49 miles per gallon (mpg) and the annual vehicle excise duty is £115.
- The new car she wants to buy averages 56 mpg and the annual vehicle excise duty is £30.
- She travels about 17 500 miles per year and the cost of petrol is approximately 114.9p per litre.
- They need to work out how much Amy could save in running costs by buying a new car.

What I need to know (identify)

The pupils should have the following information about the given problem:

- what 'mpg' means (miles per gallon);
- what the conversion rate for gallons to litres is (approximately one gallon to 4.5 litres (to one decimal place));
- what the miles per gallon values are in miles per litre;
- how much it will cost to travel 17 500 miles per year for both cars using the current price of petrol;
- what the total associated running costs for each car are; and
- what the difference in running costs for each car is.



Car Running Costs (Continued)

What I need to do (employ)

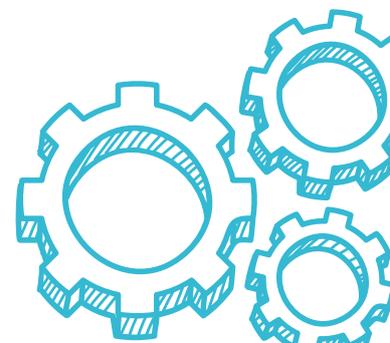
Pupils can work out a solution to this problem by using an approximation for gallons to litres rounded to either one or two decimal places. The accompanying solution provides both examples. This approach uses an approximation, rounded to one decimal place:

- Pupils find out what one gallon is in litres: conversion is one gallon = 4.54609 litres.
- Pupils round this conversion to one decimal place when making calculations: 4.5 litres.
- They convert the mpg for both the old car and new car by dividing the values given by 4.5 to get the miles per litre for each car.
- For the old car, they then divide the annual travel mileage (17 500) by the miles per litre (≈ 10.9) to find out how many litres they would need for the year.
- They multiply this by the current price of petrol (ensuring they convert to pounds) to give them the projected cost in petrol for the year.
- They then need to add the cost of vehicle excise duty to get the total running cost.
- They repeat the steps above to get the total running cost for the new car.
- To calculate how much Amy could save over the year, they subtract the total cost of running the new car from the total cost of running the old car.

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 identify what 'mpg' means and how many litres are in one gallon?
- Did they convert miles per gallon into miles per litre?
- Did they work out how many litres each car would need for each year based on 17 500 miles?
- Did they calculate how much it would cost for the amount of petrol needed for the year?
- Did they convert the price of petrol from pence to pounds?
- Did they remember to add the vehicle excise duty to the running costs?
- Do they think they have used a good approach to find a solution to the problem?
- Did they compare their answer to someone else that had rounded the conversion of gallons to litres to a different number of decimal places?



Car Running Costs (Continued)

Curriculum Objectives

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

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 information regarding capacity units and price to work out the costs of running a car.

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 a newer car 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

- Examine options and weigh 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
- Experiment with ideas and questions

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

