Problem Solving in Mathematics

Number

Forensic Science

Rewarding Learning

Teacher Notes

Introduction

Pupils can work on this problem individually or with others.

- They can discuss how they have used the height to foot size ratio and the information provided to determine which suspect was most likely to have left the footprint.
- They can share their responses and compare approaches.

This problem deals with a pupil's ability to use ratio and convert between units in order to arrive at a desired solution.

The information on height to foot size ratio is from **www.livestrong.com** (accessed 19 October, 2016).

Pupils could perform their own investigation using the ratio:

- They could measure their own foot sizes and see if they provide a reasonable estimate for their height.
- They could compare all the results for the class and see how often the ratio was accurate.

What I know (think)

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

- Forensic scientists and police use a height to foot size ratio of 6.6:1 (inches).
- If they know the size of someone's foot or footprint then they can use the ratio to estimate the height of the person.
- The police have found a footprint measuring 11.5 inches long.
- They have three suspects of different heights and want to find the most likely suspect.

What I need to know (identify)

Pupils need to identify:

- how they will approach the problem;
- what units of measure they will use (foot size in inches and height in metres);
- how to convert from one unit to the other (they could do this by asking their teacher or sourcing conversion rates);
- how they will use the ratio to work out how tall the suspect with the footprint might be; and
- which suspect is closest to the height they have worked out.

Forensic Science (Continued)

What I need to do (employ)

This problem can be approached by converting imperial to metric or metric to imperial. This approach deals with converting imperial units to metric units:

- Pupils source what one inch is in metric units – for example, one inch is 0.0254 m or one inch is 2.54 cm.
- Pupils use the ratio to work out how tall the suspect might be – the suspect has a foot size of 11.5 inches, so multiplying 11.5 inches by 6.6 will give a height of 75.9 inches (75.9:11.5).
- Pupils multiply the height in inches by either 0.0254 or 2.54 (depending on whether they are converting to metres or centimetres).
- If working in centimetres, pupils:
  - need to divide their answer by 100 to get the height in metres; or
  - multiply each suspect's height in metres by 100 to get their height in centimetres.
- Pupils then compare their calculated height with each suspect's height to decide which is the most likely suspect.

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 find out how to convert imperial units to metric units, or vice versa?
- Did they convert the footprint size into metres or convert the heights of the suspects into inches?
- Did they use the ratio to work out how tall a person with a footprint of 11.5 could be?
- Did they use the ratio appropriately?
- Did they convert the height from imperial units to metric units, if need be?
- Did they identify a likely suspect from the three given?

Forensic Science (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	**Explore how the skills developed through mathematics will be useful to a range of careers** • Pupils will engage in a problem experienced by forensic scientists and the police.

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 • Select, classify, compare and evaluate information
Thinking, Problem-Solving and Decision Making	• Sequence, order, classify and make comparisons • Make predictions, examine evidence and distinguish fact from opinion • 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 • See opportunities in mistakes and failures
Working with Others	• Listen actively and share opinions • Take personal responsibility for work with others and evaluate their own contribution to the group
Self-Management	• Seek advice when necessary • Compare their own approach with others' and in different contexts • Organise and plan how to go about a task

Cross-Curricular Skills

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

Using Mathematics