Problem Solving in Mathematics

Number

Who am I?

Teacher Notes

Introduction

Pupils can work on this problem individually or with others.

- They can discuss how they will eliminate numbers that do NOT meet the criteria.
- They can discuss the strategy they will use (there may be a better order in which to consider the criteria).
- They can discuss the 3 and 5 times tables and the meaning of doubling, halving, even, odd, more than and less than.
- They can compare their approaches and adapt their own strategy if they need to.

This problem deals with a pupil's ability to read through information. It requires them to multiply and divide using their 2, 3 and 5 times tables. It requires them to have knowledge of mathematical language:

- whole number;
- positive;
- doubling;
- half;
- even;
- odd;
- more than; and
- less than.

What I know (think)

The pupils should know from the given problem:

- There is a number that they are trying to find that meets a set of given criteria.
- The number is a positive whole number which is less than 20.
- When the number is multiplied by 5 it is even.
- The number can be divided by 3 without a reminder.
- If doubled, the number is less than 30.
- If halved the number is more than five.

Who am I? (Continued)

What I need to know (identify)

Pupils need to identify:

- positive whole numbers less than 20;
- which numbers when multiplied by 5 give an even number (numbers must be even – end in 2, 4, 6, 8 or 0);
- numbers in the 3 times tables;
- the numbers, when doubled, which are less than 30; and
- the numbers, when halved, which are more than 5.

What I need to do (employ)

Pupils should use the information they have been given and come up with appropriate steps to help them solve the problem, for example:

- They recognise that they must rule out 0 and numbers which are 20 or more.
- They consider multiples of 5 by referring to their 5 times tables. They note that only even numbers when multiplied by 5 give an even number; therefore, their missing number must be even.
- They eliminate all odd numbers between 0 and 20.
- They use their knowledge of the 3 times tables to consider which of the remaining even numbers are multiples of 3 and eliminate those that are not.
- They use a reverse calculation to divide 30 by 2 to get 15. They note the criteria 'less than 30' and deduce that their number must be 14 less.
- They multiply 5 by 2 and note their number must be greater than 10. Some students may choose to multiply 6 by 2 and given that the number is a whole number this is perfectly valid.

The pupils should combine all of the above steps, in ANY given order, to correctly deduce the missing number to be 12.

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 that the number must be between 0 and 20?
- Did they correctly deduce that the missing number was even?
- Did they note that even times odd is even whereas odd times odd is odd?
- Did they correctly identify multiples of 3?
- Did they halve 30 to get 15, and did they note the word 'less'?
- Did they deduce that the missing number is 14 or less?
- Did they multiply either 5 or 6 by 2 to deduce that the missing even number was greater than 10, for example 12 or more?
- Did they use all of the above to eliminate incorrect solutions and correctly identify the number 12?
- Were they able to use the mathematical language of 'positive whole number', 'even', 'odd', 'doubling', 'halving', 'more than' and 'less than' confidently?
- Were they competent in using the 2, 3 and 5 times tables to help them solve the problem?

Who am I? (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 explain how they have solved the problem and identified the number by developing a strategy to correctly eliminate numbers that do not meet the specified requirements.

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 the most appropriate method for a task
Thinking, Problem-Solving and Decision Making	• Sequence, order, classify and make comparisons • Generate possible solutions, try out alternative approaches and evaluate outcomes
Being Creative	• Experiment with ideas and questions • Learn from and value other people's ideas
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

Cross-Curricular Skills

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

Using Mathematics