How Algorithms Change the World

Key Learning Content

This film describes the roles played by algorithms in everyday life, from verifying credit cards to running life support systems. Algorithms are defined, and flow charts shown on screen. The film ends with programme trading on Wall Street, and an example of the unfortunate consequences when things go wrong.

Knowledge of the concepts of algebra is assumed in the film.

Core Outcomes

Learning Points

- Be able to use and apply number in everyday personal, domestic or community life.
- Be able to understand that symbols can be used to represent numbers in equations or variables in expressions and formulae.
- Be able to understand that a letter can represent an unknown number or a variable.

Suggested Activities

- Explore simple arithmetic using algorithms.
- Give simple mathematical algorithms and get students to explore how these work.

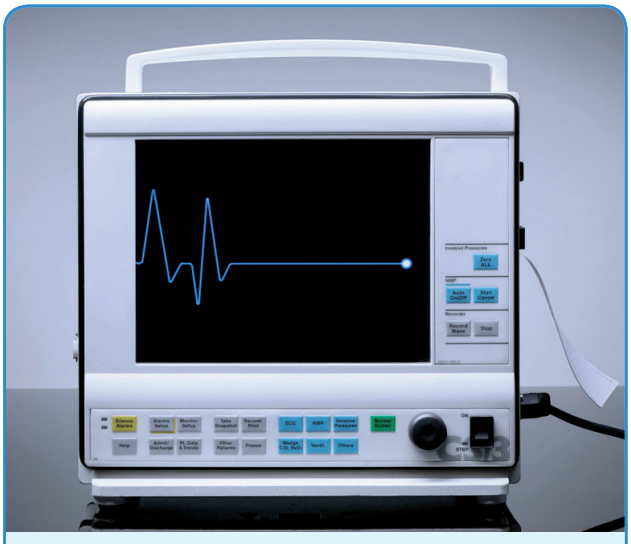
Extension Outcomes

Learning Points

- Be able to use formulae from mathematics and other real-life contexts expressed initially in words and convert these to letters and symbols.
- Be able to understand the use of flow charts to capture the steps in an algorithm.

Suggested Activities

- Give algorithms from real life and get students to explore how these work.
- Write algorithms for everyday processes.



Algorithms keep life support machines running in hospitals.

Related Films

To use before the lesson plan:

The Arabic Science of Balancing	This film examines the roots of algebraic modelling, initially developed by traders in Arab markets fifteen hundred years ago.

To use after the lesson plan:

Variables: Dating By Numbers	This film describes how a mathematician is trying to develop a formula that predicts a person's chances of success in dating.
Beating the Stock Market	This film looks at how complex mathematical modelling can help to make and lose enormous sums of money.
The Prime Number Code	This film explains how mathematical algorithms lie behind almost every electronic transaction.
Chaos By Mistake	This film features the uses of algebraic modelling in trying to predict the outcomes of extremely complex events such as weather systems and population growth.

Guide Lesson Plan

Introduction

Show students the following algorithm:
Step 1: Call friend.
Step 2: Ask if homework done; if Yes, then Step 3, otherwise wait 30 minutes and return to Step 1.
Step 3: Get friend to email to you.
End
Ask what the algorithm is for; what is its input and what is its output?

Show Film

How Algorithms Change the World

Main Activity

Foundation

Ask students to add 236 and 497 without using a calculator, then get them to explain how they did it as precisely as they can. Get them to write an algorithm with input, output and sequential steps. Explore alternative algorithms (e.g. along lines of: add 500, subtract 3...). Then attempt algorithms for long multiplication and long division.

Main Activity cont ...

Advanced

Give students the following algorithm and ask them what it does.

Check signal. If > A, return to start. Otherwise find new signal. Return to start.

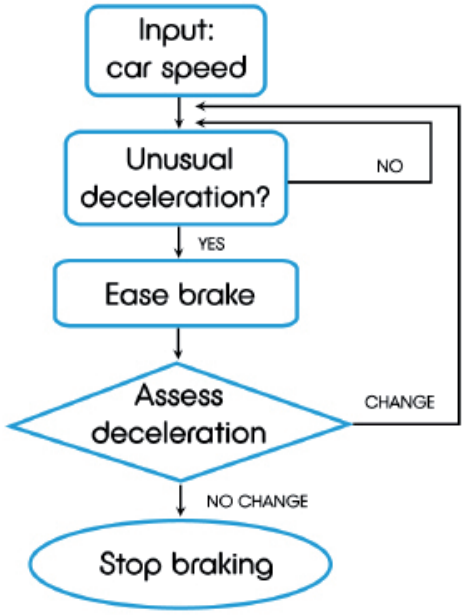
Agree it could be an algorithm for a mobile phone searching for a signal. Get students to expand the algorithm to include specific inputs and more detailed steps. Check and compare algorithms. Next get students to write an algorithm for a tumble dryer that has both a timer and a moisture sensor (so that it stops as soon as clothes are dry, or when the set time is up). Then set students to work in pairs, with one writing algorithms of their choice and then seeing if their partner can work out what it does.

Extension Activity

Get students to write an algorithm that works out someone's birth date (year, month, day). The person can answer questions only with a yes or no. Compare algorithms, and give a prize to the algorithm that will work out the birth date of anyone under 100 years of age (and old enough to answer) in the shortest number of steps.

Optional Extra

Get students to use a simple programming language to capture the birth date algorithm above. Then write a program that identifies all the prime factors of any given number.



An algorithm is a formula, or a set of step-by-step instructions, used to solve a particular problem. They always have an input, a set of definite rules and a clear end point.