AS and A LEVEL Topic Exploration Pack

H046/H446

COMPUTER SCIENCE

attp://w

Theme: Thinking logically

September 2015





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This Topic Exploration Pack should accompany the OCR resource 'Thinking Logically' learner activities, which you can download from the OCR website.



This activity offers an opportunity for English skills development.



Thinking Logically

For the topic 'Thinking logically' students will need to be familiar with the following points:

- a) Identify the points in a solution where a decision has to be taken.
- b) Determine the logical conditions that affect the outcome of a decision.
- c) Determine how decisions affect flow through a program

Prior knowledge

To complete the python task(s) students should be comfortable using the Python programming language.

Activity 1: Cash Register

This activity is a simple introduction to how logic can be used to solve a problem, but also how that logic might change depending on circumstance.

Give correct change from a cash register, based on certain initial set of

notes in register, payment value and notes given.

Extension: Can you extend your solution to take into account what happens if you haven't got that money in the till?

The activity could take place in an hour or could be spread over a number of lessons to incorporate extensions or to make a fuller implementation with GUI, etc.

Activity 2: Bayes Theorem

Bayes theorem allows us to calculate the probability that situation A occurs given that the event B occurs.

For the example given in the lesson plan, we start off being given survey results from boys and girls who have written down whether they play any sports or not. We can therefore generate the probability that a student chosen at random is a girl who plays sports by finding out the probability that it is a girl ratio and multiply this by the probability that they play sports. So, the question here is 'what is the probability that a student is a girl and plays sports?'



However, using this information we can find out the answer to the question 'What is the probability that a person who plays sports is a girl?' This is the **inverse** of the conditional probability we were originally finding out.

To calculate this we multiply the probability that the situation B occurs given event A occurs by the probability of A occurring. We then divide this by the probability of B occurring.

The lesson plan can be found at:

https://docs.google.com/document/d/1tpNEz6BGysz72scYwKpAePFXZuGaJ8zx8PWF2W9W2Jw/edit?hl =en_US

A good set of videos to accompany this idea (using a different example) can be found here: <u>https://www.youtube.com/watch?v=E4rIJ82CUZI</u>

Activity 3: Sudoku (See Worksheet)

Sudoku is a game based in logic and uses deduction to complete a grid of 9x9 squares with numbers so that each row and column contains unique numbers from 1 to 9.

Through this activity students will consider how they themselves approach the problem of solving a problem and then considering how a computer might achieve this. Are computers able to implement the same sort of deductions as we can?

Of course, Sudoku also borders on other areas of computational thinking such as abstraction (for instance, being able to solve different sizes of grids, or if symbols were used instead of numbers). We also have to think procedurally to determine the components of the problem and the order of steps needed to solve the problem.

Another Sudoku problem can be found at CS4FN http://www.cs4fn.org/logic/sudoku/leafletsudoku.php





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