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CB1 2EU

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This Topic Exploration Pack should accompany the OCR resource ‘Computational Methods’ learner activities, which you can download from the OCR website.

*This activity offers an opportunity for English skills development.*
Computational Methods

Here are general descriptions for the following tasks.


http://www.cs.iit.edu/~cs100/ProblemSolving.pdf

Features that make a problem solvable by computational methods.

http://www.multiwingspan.co.uk/as1.php?page=problem

Problem Recognition. The first part of the system life cycle covers this, check problem to be solved is the actual problem to be solved and then …

Problem Decomposition. Top down design will cover both problem decomposition and divide and conquer.

Use of divide and conquer.

Task 1 - Eating a biscuit

Create a divide and conquer diagram (top down design) for eating a biscuit (The biscuits are in the kitchen, in a sealed packet in a cupboard that is too high for you to reach)

Break down the steps for each task i.e. getting to the cupboard, opening the packet, putting the biscuits on a plate (they can’t eat them out of the packet, it’s not civilised).

Use of abstraction. OOP defining a generic data type for the purpose of sub classes that will be given concrete methods.

http://interactivepython.org/runestone/static/pythonds/Introduction/introduction.html (about five ‘clicks’ down is a good bit about why use abstraction)

Task 2

Using a class diagram, create an abstract class called biscuit and decide what sub-types there could be. Will there be any sub-sub-types? Yes.

No real criteria for being a biscuit, used to be cakes were soft and biscuits were hard but then there came Jaffa cakes defined as a biscuit.
Suggestions if they have trouble getting started.

Digestives, chocolate digestives, milk chocolate or dark chocolate, milk chocolate with a plain biscuit or milk chocolate with a chocolate biscuit. Use ingredients for methods.

Size or shape could be an alternative way of dividing classes

Learners should apply their knowledge of:

- **backtracking** – backtracking is used in a declarative type of programming language that will allow for more than one solution to be found, if a solution is found/not found the program will ‘backtrack’ and explore other paths/possibilities to try to find alternatives. [http://www.cis.upenn.edu/~matuszek/cit594-2012/Pages/backtracking.html](http://www.cis.upenn.edu/~matuszek/cit594-2012/Pages/backtracking.html)

- **data mining** - the process of looking for general trends in large sets of data. [http://www.anderson.ucla.edu/faculty/jason.frand/teacher/technologies/palace/datamining.htm](http://www.anderson.ucla.edu/faculty/jason.frand/teacher/technologies/palace/datamining.htm)


- **pipelining** – pipelining is the same as running a multi-tasking system, a task can be in one of three states: Running, where the task is being processed. Ready, where it waiting to be processed. Blocked, where it is awaiting an input. A possible way of utilising multi-core processors more efficiently. [http://msdn.microsoft.com/en-us/library/ff963548.aspx](http://msdn.microsoft.com/en-us/library/ff963548.aspx) [http://link.springer.com/chapter/10.1007%2F978-3-642-24322-6_14#page-1](http://link.springer.com/chapter/10.1007%2F978-3-642-24322-6_14#page-1)

**Task 3 – Backtracking**

For steps to be shown working through the example students should use

Solution to first example:

Attempt to solve cake \((X, \text{Battenberg})\)

Finds \(X = \text{Jeremy}\)

Sets \(X = \text{Jeremy}\)

Backtracks to try to find another solution

Finds \(X = \text{Kim}\)

Sets \(X = \text{Kim}\)

Facts

**Biscuits** (Custard creams)

- (Digestive)
- (Garibaldi)

**Cakes** (Victoria sponge)

- (Battenberg)
- (Chocolate)

**Eats** (Anthony, Custard creams)

- (Cilla, Digestive)
- (Jeremy, Battenberg)
- (John, Garibaldi)
- (Kim, Battenberg)
- (Roger, Victoria sponge)

Rules

- Likes biscuits Eats\((X, Y)\) if Biscuits\((Y)\)
- Likes cake Eats\((X, Y)\) if Cakes\((Y)\)

Show the steps taken to get the results of:

- Likes cake \((X, \text{Battenberg})\)
- Likes biscuits \((\text{Roger}, Y)\)
- Likes cake \((X, \text{Chocolate})\)
- Likes biscuits \((X, \text{Hobnobs})\)

Add another fact, another rule and a query using that rule.
OCR Resources: the small print

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