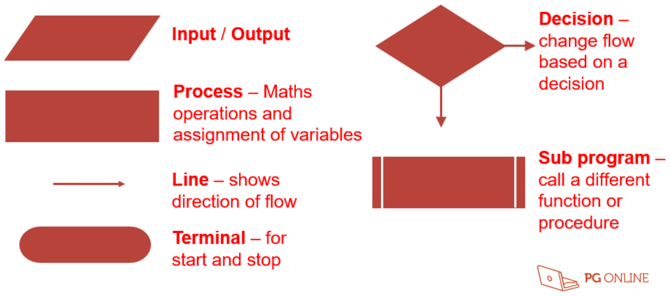
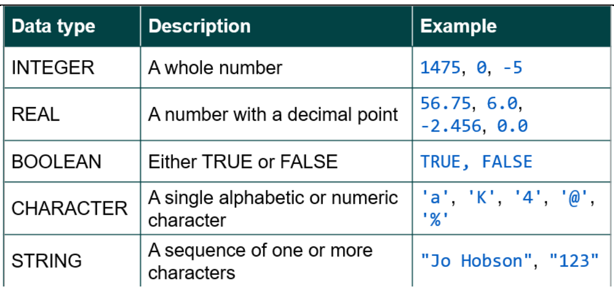
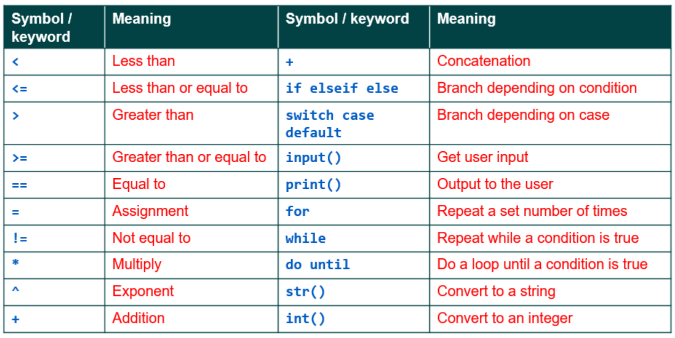
Athena Sixth Form College

DOWNHAM MARKET ACADEMY

Year 11 Summer 1 Keywords: Computational Thinking

Topic Title: Computational Thinking

Keyword	Definition
Abstraction	Removing unimportant parts of a problem in order to concentrate on those that are important
Decomposition	Breaking down a problem into smaller more manageable ones
Algorithmic thinking	An approach to solving problems by the use of algorithms (sequences of steps that lead to a solution)
Structure diagram	A hierarchical diagram that shows how a problem is broken down into sub-sections/sub-tasks
Binary search	This only works on a sorted list The middle item of the list is first checked If the item searched for is less than this item the right of the list is discarded, and a binary search is carried out on the left of the list
Linear search	Each item in the list is checked against the search item in order
Sorting algorithms	• Bubble sort • Insertion sort • Merge sort Choice of algorithm - Merge sort is generally faster to sort lists, so would be the recommended algorithm
Flowchart Symbols	 Input / Output Process – Maths operations and assignment of variables Line – shows direction of flow Terminal – for start and stop Decision – change flow based on a decision Sub program – call a different function or procedure PG ONLINE

<table>
<tr><td>Data Types</td><td>
<table>
<tr><th>Data type</th><th>Description</th><th>Example</th></tr>
<tr><td>INTEGER</td><td>A whole number</td><td>1475, 0, -5</td></tr>
<tr><td>REAL</td><td>A number with a decimal point</td><td>56.75, 6.0, -2.456, 0.0</td></tr>
<tr><td>BOOLEAN</td><td>Either TRUE or FALSE</td><td>TRUE, FALSE</td></tr>
<tr><td>CHARACTER</td><td>A single alphabetic or numeric character</td><td>'a', 'K', '4', '@', '%'</td></tr>
<tr><td>STRING</td><td>A sequence of one or more characters</td><td>"Jo Hobson", "123"</td></tr>
</table></td></tr>
<tr><td>Boolean operators and programming symbols</td><td>
<table>
<tr><th>Symbol / keyword</th><th>Meaning</th><th>Symbol / keyword</th><th>Meaning</th></tr>
<tr><td>&lt;</td><td>Less than</td><td>+</td><td>Concatenation</td></tr>
<tr><td>&lt;=</td><td>Less than or equal to</td><td>if elseif else</td><td>Branch depending on condition</td></tr>
<tr><td>&gt;</td><td>Greater than</td><td>switch case default</td><td>Branch depending on case</td></tr>
<tr><td>&gt;=</td><td>Greater than or equal to</td><td>input()</td><td>Get user input</td></tr>
<tr><td>==</td><td>Equal to</td><td>print()</td><td>Output to the user</td></tr>
<tr><td>=</td><td>Assignment</td><td>for</td><td>Repeat a set number of times</td></tr>
<tr><td>!=</td><td>Not equal to</td><td>while</td><td>Repeat while a condition is true</td></tr>
<tr><td>*</td><td>Multiply</td><td>do until</td><td>Do a loop until a condition is true</td></tr>
<tr><td>^</td><td>Exponent</td><td>str()</td><td>Convert to a string</td></tr>
<tr><td>+</td><td>Addition</td><td>int()</td><td>Convert to an integer</td></tr>
</table></td></tr>
<tr><td>Trace Tables</td><td>Trace tables are used to help find errors in a program.
Variable names and outputs are put in columns.
The programmer traces through the program line by line.
updating the values of variables and outputs.
A row is used for each iteration.</td></tr>
<tr><td>Syntax error</td><td>An error casuesd by not following the rules of the language e.g missing brackets or quotemarks.</td></tr>
<tr><td>Logical error</td><td>The logic of the program is incorrect – e.g. wrong values used to create a total.</td></tr>
<tr><td>Boolean Functions</td><td>AND, OR and NOT are Boolean operators
A computer can calculate the results of <b>A AND B</b>,
<b>A OR B</b>, or <b>NOT A</b></td></tr>
<tr><td>Truth Tables</td><td>A <b>truth table</b> shows the output from all possible combinations of inputs from a Boolean expression</td></tr>
<tr><td>Logic Gates</td><td>A logic gate is a device that acts as a building block for digital circuits. They perform basic logical functions that are fundamental to digital circuits.</td></tr>
<tr><td>Logic Diagrams</td><td>Diagrams to represent digital circuits and logic gates.</td></tr>
<tr><td>Truth Table</td><td>It shows all possible combinations of inputs and
the outputs they create.</td></tr>
<tr><td>Input validation</td><td>Checking input meets certain rules, e.g. the type of data</td></tr>
<tr><td>Anticipating misuse</td><td>Preventing too many entries of a password to make it harder for hackers to guess</td></tr>
<tr><td>Authentication</td><td>Entering data twice or checking from an alternative source</td></tr>
<tr><td>Syntax errors</td><td>A syntax error is one where the code written doesn’t conform to the rules of the language</td></tr>
</table>

Logic Error	The program will run, but it won't work as the programmer intended
Machine Code	Instructions that computers can understand e.g. binary
Assembly language	Allows a programmer to create programs more easily that writing in machine code
High level languages	High-level languages – programming language such as Python that generally have statements that look a bit like English or Maths.