Teaching Notes - Programming Techniques

This section of the tool allows students to start applying the knowledge of problem solving that they have been developing. Many of the features from the previous sections are included along with some additional features such as the ability to dry run each flow chart or piece of pseudo code.



Each activity comprises three screens; a screen presenting the problem, a flowchart screen and a pseudo code screen.



As the students work through the unit they will be required to complete more of the problem solving and charting and coding tasks. Many activities will require the students to select effective test data and dry run the activities. In some cases they will need to add text to a flow chart or rearrange the statements on the pseudo code page.

Calculating an average

The first problem has been set up for the students. However you may wish to use the Problem Solving tool for the students to brainstorm the problem for themselves and produce their own method of solution.



This problem presents the students with a completed flow chart and the facility to enter data to test the solution.







Students can choose data and use the run button to generate an outcome.

The values of the variables are shown as the control runs through the program and the loop is executed.

Students should be encouraged to use several sets of data to ensure their understanding of the code being run.

In particular students should consider extreme data. For example what happens if all students achieve 100 marks or all students fail to gain any marks at all?!

The pseudo code for the problem is presented as a series of pseudo code statements shown in a random order.



Averages 2 - working to different number bases.

The second problem involves the calculation of average ages. This provides an opportunity to practise working with a variety of number bases. The steps for the solution of the problem are included on the problem scheme. However, if you wish to reinforce your students’ number skills you may wish to use the Problem Solving tool to brainstorm the problem.





Percentages

The problem page contains relevant statements but needs to be re-arranged to produce a solution to the given problem. The mechanisms are as usual with a reset button if the students struggle with the problem.



The flow chart has been constructed but the text has not been added to the symbols. Students should drag and drop the correct text to each box.



Students should dry run the program with sets of data designed to ensure that the solution is robust.

What would need to be altered for the solution to work for tests with totals other than 45 marks?

The pseudo code is incomplete and students need to drag and drop the correct text into place.



Final Solution



Maximum and Minimum Values

This activity involves finding the highest value in a set of numbers. The techniques used here can be adapted to identify any particular piece of data in a set of items.



This activity presents the students with the steps to solve the problem however you may wish to use the Problem Solving tool to allow students to develop their own approach to the problem.

The activity allows students to complete the flow chart using drag and drop text.



Students can also enter data. The activity will generate output that will allow the students to follow the flow of control throughout the process.

Sorting

Programming Techniques continues with an introduction to the concept of sorting data into a given order. Although we are only using one-dimensional arrays you may wish to introduce the concept of sorting records into order by key field.



The activity has the normal features of a flow chart with drag and drop text to complete the diagram. Students also need to add the Yes/No outcomes for decision boxes. The students are also able to enter sets of data to investigate the efficiency of the solution. Students should be encouraged to consider situations when data is in both the correct and reverse order to investigate the least and most number of passes needed to sort n items of data.

The pseudo code screen requires the students to re-arrange the lines of code to produce the solution. As usual the screen can be reset and there is an auto complete function.



Searching

The searching activity is based on locating a name in an array of names. You may wish to explain to the students that the concept can be used to locate any item of data in a data set. Students should be encouraged to consider what happens when the search item is not present.



When completing the flow chart students will also need to add the Yes/No outcomes for decision boxes.



If students are comfortable with this concept you may wish them to consider a binary search in terms of, for example, the number of guesses need to find a chosen item from a data set of 1024!!

String Handling

This activity is designed to allow students to practise the use of the LEFT() and RIGHT() string handling commands to take a first name and surname to create a username. The stated convention involves the use of the first five letters of the surname plus the first initial to create the user name. This convention could be varied to include MID() commands to further strength the students understanding.



As usual the flow chart has an auto complete function and students can dry run the program can work through the output.





Extension Activity

The extension activity is based on the WJEC GCSE Sample Assessment Material that can be accessed at <https://www.wjec.co.uk/uploads/publications/16366.pdf>

The task asks students to create a system to solve the problem, including the ability to:

* Generate random numbers
* Check that a number has not be generated previously
* Store the numbers either permanently or as the program is run
* To sort the numbers
* To output the numbers

Students should use the three aspects of the problem-solving tool to investigate this problem and produce a flow chart and pseudo code that could be used by a competent programmer to code up a functioning solution.



The WJEC Sample Assessment for GCSE Computer Science.

