Use of programming techniques:

- This mark group is about attempting the tasks, if the candidate has made a decent attempt at all of the tasks using a suitable range of techniques then they should be placed in the top band.

This block is intended to reward realistic attempts at the tasks. It is a feature of the assessment that to move beyond the first mark band, two tasks must have been attempted; to move to the third band all three must have been attempted.	**0-2 marks** Typically this will be a candidate who has only made a reasonable attempt at one task. There may be elements for a second or third task but these will not lead to any code that could be identified as a partially working solution to these
	3-4 marks There must be two working solution for 4 marks. One of the solutions may only be partially successful but can be interpreted as a realistic attempt at a second task for 3 marks.
	5-6 marks If there is a reasonable attempt at all three tasks then 5 or 6 is appropriate. For 6 marks we would expect all three solutions to work, for 5 two will work fully and the third partially.

Efficient use of programming techniques:

- This mark group is about the effective and efficient use of coding techniques. For work in the top band ALL of the solutions should work and techniques should be used appropriately and efficiently.

  For example a sequential approach when an iterative approach would be more effective would limit the marks for this section.

This block is intended to reward the quality of the finished products. If only one or two tasks have been attempted then the marks will be restricted to the first or second band accordingly, however, good the programming is.	**0-4 marks** Marks in this band will reflect a series of partial solutions not fully solving the original problem or one fully working solution only.

	5-8 marks For marks in this band candidates should be providing working solutions to all three tasks or efficient solutions to two tasks. If all three tasks have been attempted the solutions may well include some inefficiencies such as use of unsuitable variable names or multiple variables when an array would be more appropriate or possibly hard coded data when a file may be more appropriate
	9-12 marks In this band there must be working solutions for all three tasks and these need to be reasonably efficient. For 9 marks we would expect to see at least two of the solutions with few missing features or minor inefficiencies and, for 12 marks, there should be no obvious inefficiencies in the code for all three tasks.

Design:

- This mark group is about the quality of the design.
- For the top band marks there should be:
  - A detailed analysis of the problem including any validation
  - Detailed algorithms describing the solution
  - Suitable success criteria
  - A test strategy with suitable test data identified for use during development

This block should contain all the design elements including a detailed analysis of the problem to identify the success criteria for the solution. Working solutions should not fall over easily so some validation will be required. We expect testing throughout the development process so a suitable test strategy with appropriate test data should be identified. The design should be presented as an algorithm either as a flowchart or as pseudocode, preferably in both formats. Once again marks are limited to band one for only one completed tasks and band two if only two are completed.	**0-3 marks** In this band there will be some evidence of planning but this will be largely superficial.
	4-6 marks To achieve marks in this band there must be evidence of some analysis, some thought given to validation and a set of algorithms. The algorithms will define the solution in general terms but may lack detail or may be in sufficient detail for one or two of the tasks only. Pseudocode that is reverse engineered code should not be accepted. There will be some indication of how the solutions will be tested but this may lack detail for all or

	some of the tasks.
	7-9 marks For marks in this band the design must be complete for all three tasks. A good rule of thumb is that the design is capable of being given to another programmer to complete the tasks and expect a similar solution without further analysis and design.

Development:

- This mark group is about the story of the development process.
- Candidates need to show the process including
  - Systematic testing during development
  - The code needs to be annotated
  - Meaningful variable names should be used
  - The code needs to be explained indicating the function of each section

This is the story of the development and should show how the solutions were taken from design to finished product using an iterative approach. The whole report should take a narrative style explaining stage by stage how the products were developed and tested.	**0-3 marks** In this band there will be some evidence of a solution but with little explanation of the process. For a single attempt this may well be a detailed explanation of how one solution was achieved.
	4-6 marks For marks in this band there will be good evidence of development. There will be annotated code and some explanation of how this was tested during development. There must be sensible variable names but there will be some gaps in the explanation and missing evidence of testing for some sections.
	7-9 marks To achieve marks in the top band there must be clear evidence of iterative development for all three tasks. Fully explained code and evidence of testing at various key stages, with any remedial actions fully documented. Meaningful variable names and fully annotated code will be provided alongside the other evidence.

Testing:

- This mark group is about the testing and evaluation of the product.
- Testing should have been completed during development
- Some post development testing should be completed
- End user testing needs to be completed and feedback supplied.
- The evaluation of the product should use all the evidence from testing and cross reference these to the success criteria defined in the design section to establish the success or otherwise of the solution.
- Candidates may identify weaknesses and recommend how these might be dealt with, or even fix these, knowing about them is what is most important.

Most of the test evidence should be generated as part of the development process. The design success criteria and test strategy form the basis for this testing which will be evidenced as part of the narrative. Some post development testing may also be necessary to fully test the products as is third party testing by other students. Feedback from this testing will feed back into the evaluation and students may well find time to 'fix' any problems that are identified in this part of the process before going on the evaluate the solution against the original requirements and success criteria. This section is used to test the quality of written communication, which may help determine the mark point in the appropriate band.	**0-3 marks** There will be some evidence of tests being completed but these will be limited in scope and probably mostly completed post development. If marking a single attempt then we would expect to see evidence of testing during development. Evaluation may well be limited to generic comments on the solution.
	4-6 marks There will be evidence of testing during development but this may be limited in scope with much of the testing being post development. There must be evidence of the test results available in the report, simply stating that the product was tested will not be sufficient for this mark band. Testing in this band is likely to focus on showing that the solution worked with little attempt to 'break it'. Evaluations will refer to the test evidence and attempt to explain how the solution meets the requirements.
	7-9 marks There will be clear evidence of testing during development fully explained and linked to the success criteria and test strategy. Testing will be extensive and clearly attempt to find flaws in the solution. The evaluation will link the test evidence and the success criteria to evaluate how well the solution matches the requirements.