Unit 3: Problem Solving

Candidate: CE

AO	Pass	Merit	Distinction
Guidance for AO1	For Assessment Objective 1, the problem might be given to the candidates in general terms, but they should then carry out their own initial investigations and set their own hypotheses. For example, they might be asked to investigate some of the social effects of the Internet on young people. They would then use sources such as the World Wide Web to find out some of the main issues and set themselves hypotheses, such as 'Young people with access to the Internet at home do better at school' and/or 'Young people who spend more than 1 hour a day using the Internet are less fit than those who don't'. Merit and Distinction candidates should set more complex hypotheses, which consider whether other factors, eg the age group of the young person, affect the result, requiring more complex analysis. It is likely that many candidates, especially at the higher levels, will come up with more than one hypothesis. Candidates should be able to define the sort of information they need to find out in order to support or disprove their hypotheses. Some of this information might come from existing surveys, and information from publications such as Social Trends. However, the majority of the information will need to come from primary research, eg questionnaires. Candidates will need to identify the criteria that will be used to test the hypothesis. They will need to consider what the spreadsheet is required to do: the input, processing of data and the output required eg the type of graphs or charts that would be most suitable. There may be additional user requirements eg details of user aids, such as drop down lists and forms, to help the input, which will also need to be included. However, detailed plans for the spreadsheet itself are not required Although candidates need to comply with data protection legislation there is no need for them to demonstrate detailed knowledge of, for example, Data Protection principles, rather they should understand that statistical data does not require the collection, storage or processing of personal data as defined in data protection legislation. Whilst this must be considered at the beginning of the work, candidates must also demonstrate in work throughout the unit that they understand these requirements by complying with the requirements in their data collection, storage and analysis.		
AO1 Define a statistical problem to be investigated	~~Candidates will describe the background to the problem.~~ ~~They will set a simple hypothesis and list some criteria to be used to test it.~~ ~~They will identify some of the data that needs to be collected and briefly explain how it will be processed.~~ ~~They will demonstrate an understanding of Data Protection legislation and give a brief explanation of how they will comply with this.~~	Candidates will clearly describe the background to the problem. They will set a complex hypothesis and clearly describe criteria that will be used to test it. They will identify the data that needs to be collected and explain how it will be processed. They will demonstrate an understanding of Data Protection legislation and explain how they will comply with this.	Candidates will explain thoroughly the background to the problem. They will set a complex hypothesis and clearly describe and justify the criteria that will be used to test it. They will identify the data that needs to be collected and explain clearly how it will be processed. They will demonstrate an understanding of Data Protection legislation and explain how they will comply with this.
AO1 NOTES ***PASS***	The candidate has carried out research and described the background to the problem. There is some detail but some of this is just incompletely referenced quotes from websites. A simple hypothesis is set. Some criteria that could be used to test this hypothesis are listed in a rather general way There is a brief consideration of the data that will need to be collected and how it will be processed. Some understanding of the Data Protection Act is shown, although most of this is just a copy of the basic principles. The most important facts – the definition of personal data and sensitive data – are not considered. However, there is a recognition that data must not be excessive or intrusive. This is the minimum that can be accepted for the award of a Pass in this AO.		

AO	Pass	Merit	Distinction
Guidance for AO2	If data is collected electronically then work for Assessment Objectives 2, 3 and part of 4 might be carried out simultaneously, although each objective must be assessed separately. Assessment Objective 2 requires candidates to design and implement a data collection strategy. At Pass level candidates' choice of method might include some data of limited usefulness. At Distinction level candidates' strategies will ensure that appropriate data is collected and is stored in a way that will protect the anonymity of the data subjects. Where data is to be collected over a time period, sample interval and/or frequency should be defined by Distinction candidates.		
AO2 Design and carry out a data collection activity	~~Candidates will plan and carry out a data collection activity to gather some suitable data for their investigation.~~ ~~The plan will include a suitable sampling method.~~ ~~Candidates will list some of the constraints that could affect the reliability of their study.~~ ~~They will collect some useful data.~~	~~Candidates will plan and carry out a data collection activity to gather a range of suitable data for their investigation.~~ ~~The plan will include a suitable sampling method and size.~~ Candidates will describe most of the constraints that could affect the reliability of their study and identify some areas of potential error in their sampling regime. They will collect the data identified.	Candidates will plan and carry out a data collection activity to gather the data that is necessary for their investigation. They will make appropriate use of research and data collection methods. The plan will include a suitable sampling method and size, and frequency/interval if appropriate, with justification of choices. Candidates will describe the constraints that could affect the reliability of their study and identify areas of potential error in their sampling regime. They will explain the steps they have taken to eliminate bias from their study. They will collect the data identified.
AO2 NOTES ***PASS***	The candidate has planned a questionnaire that will collect a range of data relevant to the investigation – hours of internet use, participation in other activities, perception of addiction, health problems. The candidate states that he will use random sampling with a sample size of 100, with brief reasons given. Both could be considered suitable, although there is no consideration of any other sampling method. Some of the constraints that could affect reliability are considered. Evidence later in the portfolio shows that some data has been collected using the questionnaire. A **PASS** can be awarded here.		

AO	Pass	Merit	Distinction
Guidance for AO3	Assessment Objective 3 requires candidates to create a spreadsheet and enter and store the collected data. Candidates will need to ensure that the inputs to the spreadsheet match the collected data. They will need to consider how the data is going to be input and this will largely determine the type of interface designed. Where data is to be entered manually into the spreadsheet, an effective interface, required at the higher levels, would be a form, with macros to insert the data into the main sheet(s) and to reset the form. The layout of this form and other features such as drop-down boxes will determine how easy to use it is. Consideration will also need to be given to how the data is going to be protected from unauthorised access, alteration and loss. This should include a range of worksheet/workbook protection as well as file security options (eg protection against opening and editing). Validation and password/cell protection can be evidenced from the electronic file but candidates should make clear where such features have been used. If hard copy evidence is relied upon screenshots must be produced to show the measures taken.		
AO3 Collect data and store it using a spreadsheet	~~Candidates will create a simple interface for entering data into a spreadsheet.~~ ~~They will include at least one suitable validation routine to limit data entry errors.~~ ~~They will store some useful data.~~	~~Candidates will create an effective interface for entering data relevant to their research into a spreadsheet~~. ~~They will include suitable validation routines to limit data entry errors for most items of data where this is appropriate~~. ~~They will store the data collected and take at least one measure to ensure its security.~~ ~~They will demonstrate an understanding of the need for security measures.~~	~~Candidates will create an effective and easy-to-use interface for entering data relevant to their research into a spreadsheet~~. . They will use a range of effective validation methods to minimise data entry errors wherever possible. ~~They will store the data collected and protect it from unauthorised access~~ and from accidental and deliberate change and loss. They will demonstrate a thorough understanding of the need for security and the range of measures that are needed.
AO3 NOTES ***MERIT***	The candidate has created a form for data entry. This largely corresponds with the designed questionnaire, although it contains two additional questions – age, which could be useful, and name, which is unfortunate, although it seems that only the first name is entered. It can be seen that the questionnaire is answered using drop-down boxes for all questions shown, which is an appropriate and effective form of validation. Examination of the electronic spreadsheet file could confirm whether or not entries have been restricted to the list. There is no evidence of validation of age. The file has been password protected to ensure security and the candidate claims to have at least considered backups, although there is no evidence of these. It appears that data has been stored for all questions, for 95 respondents. A **MERIT** can be awarded for this AO.		

AO	Pass	Merit	Distinction
Guidance for AO4	In Assessment Objective 4 candidates must create and use a spreadsheet to analyse their results. There is no specific requirement for the spreadsheet workbook to contain more than one sheet, although higher level candidates might choose to organise their data across a number of sheets, perhaps putting summary tables on separate sheets. The statistical element of analysis may not be particularly advanced, as there is no requirement for candidates to have any advanced understanding of statistics. However, Distinction candidates should compare results across subgroups within the sample. For example, whilst Pass candidates might find the average number of hours spent using the Internet, Merit and Distinction candidates might also find the average number of hours spent by males and females and Distinction candidates might go on to compare these figures with the average number of hours spent by males and females in different age groups. Candidates should provide, as a minimum, evidence that they have tested the formulas in their spreadsheets by using test data that makes the results easy to check, by estimating the results and checking that the actual results are of the same order as the estimate or by using manual calculations or a calculator to work out what the result should be. Higher level candidates should provide a detailed test specification which tests all aspects of the spreadsheet, including input of data, validation and functions used.		
AO4 Create a suitable spreadsheet to analyse the data	~~Candidates create a structure to analyse and present the results of their study.~~ ~~They will apply appropriate titles, labels and formatting to display most information clearly.~~ ~~They will use appropriate functions to analyse some of the data, providing some useful data relevant to the hypothesis.~~ ~~They will carry out at least one test of their spreadsheet and use the results to make changes, if appropriate.~~	Candidates create an effective structure to analyse and present the results of their study. ~~They will apply appropriate titles, labels and formatting to display most information clearly.~~ ~~They will use appropriate functions to analyse the data, providing a range of useful data relevant to the hypothesis.~~ They will devise a test plan and use it to ensure that the spreadsheet works effectively.	Candidates create an effective and efficient structure to analyse and present the results of their study. They will apply appropriate titles, labels and formatting to display all information clearly. They will use appropriate functions to carry out a thorough analysis of the data, providing a range of useful data relevant to the hypothesis. They will devise a comprehensive test plan and use it to ensure that the spreadsheet works effectively.
AO4 NOTES ***MERIT***	Evidence for this AO would be strengthened by access to the electronic file. However, it appears that the data has been well organised, with appropriate functions used to analyse/summarise. The structure, with a main sheet containing all the data, then summaries of each question, is reasonably effective for a simple hypothesis and, giving the candidate the benefit of the doubt that each question has been dealt with in this way, would provide a range of useful data relevant to the hypothesis. Additional support for this is found in AO6. The test plan is reasonable but not comprehensive – the candidate has not tested the summary tables, only that a new record is added to the main data sheet. A **MERIT** is the best fit for this AO.		

AO	Pass	Merit	Distinction
Guidance for AO5	For Assessment Objective 5, candidates are required to produce charts/graphs that provide some useful information relevant to the hypothesis. All candidates at this level need to produce charts that display the data effectively, with consideration to the different requirements of discrete and continuous data. At higher levels candidates are required to demonstrate their understanding of why their choices of chart/graph types are appropriate. There is a requirement at Distinction level to create three different types of chart, but these also must be appropriate and relevant. If a candidate decides that by using the most appropriate types of chart for the data they have collected they will use less than this, they might provide further evidence of creating different types of charts, with explanations of why these were eventually rejected.		
AO5 Create suitable graphs/charts	~~Candidates will create at least one chart that is relevant to their hypothesis and appropriate for the data being presented.~~ ~~They will use some formatting and labelling features to improve the presentation of their chart(s).~~	~~Candidates will create at least two different types of chart that are relevant to their hypothesis and appropriate for the data being presented.~~ The choice of chart types is briefly explained. They will use appropriate formatting and labelling features to improve the presentation of their charts.	Candidates will create at least three different types of chart that are significant to their hypothesis. The choice of chart types will be appropriate and fully explained. They will use appropriate formatting and labelling features to display the data effectively.
AO5 NOTES ***PASS***	The candidate has created a bar chart to show the numbers of respondents using their computers for different amounts of time. It is a pity that he did not recognise the inappropriate order of the columns, which he could then have corrected. His second chart is also a bar chart, showing the number who own and do not own a computer, although his commentary suggests that he is more interested in proportions, in which case a pie chart would have been more appropriate. A third chart is a 3_D pie chart adequately comparing proportions, although this would have been more clearly shown in 2-D. The last chart is the poorest, with a default legend left on and the 'title' shown as an empty bar. The candidate has attempted to explain his choice of chart type for two of the four charts produced, but this shows little understanding of continuous/discrete data and/or the difference between proportions and absolute values. Some formatting and labelling has been used on the first three charts but further improvements could be made to all of them. A **PASS** can be awarded.		
Guidance for AO6	Assessment Objective 6 requires candidates to prepare a presentation of their findings, which might be as a slide-show presentation to accompany a talk, as a website or as a written report.		
AO6 Present findings to an audience	~~Candidates will create a straightforward presentation about the findings of their data analysis~~. ~~This will address their hypothesis and include at least one table of data and at least one graph/chart.~~ ~~They will state, with at least one reason, whether the analysis has supported or disproved the hypothesis.~~	~~Candidates will create a detailed presentation about the findings of their data analysis. This will address their hypothesis and include a range of tables and graphs/charts, formatted and presented effectively.~~ ~~They will explain whether the analysis has supported or disproved the hypothesis.~~	Candidates will create a comprehensive presentation about the findings of their data analysis. This will address their hypothesis and include a range of tables and graphs/charts, formatted and presented effectively. The presentation will be of near-professional standard. Candidates will explain the extent to which the analysis has supported or disproved the hypothesis. They will evaluate the effectiveness of the spreadsheet model.
AO6 NOTES ***MERIT***	The candidate has presented his findings using both a written report and a slide presentation. It should be noted that only one of these is required. The original hypothesis, simple as it was, is addressed and a range of tables and charts are included and presented reasonably effectively. Simple statements about whether or not the data has supported or disproved various aspects are given, with a little explanation, although there is some inaccuracy, largely confusing percentages with absolute values. Overall this work does meet the **MERIT** criteria, although much is rather simplistic.		

AO1	AO2	AO3	AO4	AO5	AO6
PASS	PASS	MERIT	MERIT	PASS	MERIT

The overall grade awarded for this unit is **PASS**

Although it appears by looking just at the levels awarded for the individual AOs that this is very borderline – nearly a Merit, the candidate would need to do a lot more, showing more understanding, to achieve the higher grade. The hypothesis was very simple, as was the analysis done. For a higher level it would be expected that a candidate would be using data analysis tools more effectively, tackling more complex problems and investigating dependencies.

August 2009