2006 HSC Notes from the Marking Centre
Software Design and Development

Published by Board of Studies NSW
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Internet: http://www.boardofstudies.nsw.edu.au

ISBN 978 174147 5975

2007131

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2006 HSC NOTES FROM THE MARKING CENTRE SOFTWARE DESIGN AND DEVELOPMENT

Introduction

This document has been produced for the teachers and candidates of the Stage 6 course in Software Design and Development. It provides comments with regard to responses to the 2006 Higher School Certificate examination, indicating the quality of candidate responses and highlighting the relative strengths and weaknesses of the candidature in each section and each question.

This document should be read along with the relevant syllabus, the 2006 Higher School Certificate examination, the marking guidelines and other support documents which have been developed by the Board of Studies to assist in the teaching and learning of Software Design and Development.

General Comments

In 2006, approximately 1800 candidates attempted the Software Design and Development examination.

Teachers and candidates should be aware that examiners may ask questions in Sections I and II that combine knowledge, skills and understandings from across the core of the HSC syllabus.

Section I

Question	Correct Response
1	A
2	B
3	D
4	D
5	C
6	A
7	C
8	C
9	B
10	B

Question	Correct Response
11	C
12	C
13	C
14	A
15	B
16	A
17	A
18	D
19	A
20	B

Section II

General Comments

The 2006 Higher School Certificate Examination in Software Design and Development required candidates to analyse and interpret situations and to apply their knowledge to these situations. Many candidates showed a sound understanding of concepts but were less able to apply this knowledge appropriately, often giving general answers or answers not directly related to the particular situation described in the question.

Question 21

(a) (i) The general understanding of the structure and purpose of a context diagram was poor. Many candidates were able to provide a diagram of the given system, but did not use context diagram standards and could not accurately or appropriately include external entities. A number of candidates tried to include the database even though context diagrams do not include external storage.

(ii) While a large number of candidates demonstrated a thorough understanding of the two development approaches, weaker responses did not relate their knowledge to the context of the question or provide examples of how the approaches benefited the development of the particular web-based system described in the question. The better responses portrayed understanding of using the two approaches in combination, while weaker responses simply described each approach in isolation.

(iii) There was confusion in a significant number of student responses as to the meaning of the term 'benchmarking'. Weaker responses tried to relate it to a program code maintenance strategy, or a process of measuring the user-friendliness of the interface. Others dwelt on a comparison with other similar products in the marketplace to see which was 'the best'. Better responses indicated that benchmarking was a process of conducting tests in a closely controlled environment to give a quantitative measure of performance on a variety of hardware platforms.

(b) Many students were competent at interpreting the system flowchart symbols, but only a minority demonstrated their understanding of the processes, particularly the authorisation process, and what it entailed. Better candidates were able to include the connections to the bank and describe why those connections were required, rather then just stating that they happened. Some candidates were confused by the choice in the systems flowchart (that is the presence of the two separate branches from the 'Process Authorisation' process), seeing each as a separate path that could be taken rather than part of the overall picture of the system.

(c) (i) This question was well answered. A variety of approaches was used to identify a flag (by just naming the variable 'valid', or by drawing a picture, or providing a description) and many students recognised the control parameter correctly.

(ii) The 'compare and contrast' in this part was poorly done, with weaker responses simply indicating features of a structure chart and a system flowchart. Often their comparison simply looked at the different types of symbols in each diagram, rather than including a discussion on the purpose of each. Better responses demonstrated an understanding of the purpose of each type of diagram and discussed its relationship to the software development process (for example, the use of the structure chart to aid programmers in understanding the modules to be developed and the data passed between modules).

(iii) Students who chose to present the algorithm in pseudocode were generally more successful as they were more able to demonstrate an understanding of parameter passing. Many candidates were able to produce a simple algorithm demonstrating an understanding of validation, though most did not pass the valid flag back to the main program. Weaker responses came from candidates who tried to write an algorithm explaining the termination and purchase processes rather than the validation process (that is, if details not correct, terminate the transaction, else process the purchase).

Question 22

This question was attempted relatively well by most candidates.

(a) (i) Most candidates were able to demonstrate sound knowledge of intellectual property. Good responses added necessary qualifications indicating the concept of ownership and originality. Poorer responses simply made reference to copyright laws without further amplification.

(ii) This part was well answered by the majority of candidates, with most responses correctly relating the two concepts. Again, poorer responses made incorrect references to copyright issues without any supporting discussion.

(iii) This part proved challenging for many candidates. Weaker responses simply reworded the question and did not indicate any understanding of the factors described in the question and how they could be used to identify plagiarism. Many candidates were unable to demonstrate an understanding of the concept of intrinsic documentation. Better responses discussed the features of the three factors as used in software solutions and described how these could be used to identify plagiarism.

(iv) Better responses identified limitations of the software, such as with small changes to the code plagiarism would not be detected. However, there were a significant number of responses that focused on determining which student did the plagiarising. Good responses identified other limitations and then proposed improvements to address them.

(b) (i) Better responses correctly identified the required variables. Responses indicated that some candidates were put off by the term 'undefined' used in the question to describe the size of the file, and tried to include this term to describe the size of all other variables included in the data dictionary. Weaker responses indicated a lack of understanding of the appropriate sizes of different variables such as integers, text and Boolean variables.

(ii) Weaker responses failed to fully compare and contrast the use of the required variables. Many responses discussed the use of the variables, with no attempt at providing comparisons between the three. Candidates who understood the concept of comparing and

contrasting were able to gain full marks with clear and succinct responses. Better responses discussed and compared the data types, use of the variables and the passing of parameters.

(iii) This question was well answered, with the majority of candidates producing responses which indicated an understanding of the problem. Many responses correctly included the need for two nested loops. Some strong responses failed to gain full marks by not re-setting the count of the students for each race.

Question 23

(a) Most candidates were able to provide a feature of both interpretation and compilation. Better responses highlighted the differences between the two translation methods. Candidates should avoid generalised statements such as 'faster' or 'better' without justification.

(b) (i) Many candidates were able to use the provided test data to produce an output. Better responses constructed a formal desk check in the form of a table showing the changes in values for each 'variable' with each operation, including the accumulator and both registers, clearly stating the output.

(ii) This section required candidates to explain the effect if the instruction on line 60 was changed. Better responses not only explained the change but also used the test data from the previous section to illustrate the effects of the change. Weaker candidates incorrectly assumed that the change would result in an infinite loop because the accumulator never becomes zero.

(c) (i) Many candidates could define the importance of data. Better responses related this to the design of the user interface and discussed such issues as number, type and size of both input and output fields

(ii) Better responses identified some advantages to the developer of using the facility of drag and drop of screen elements during the process of the software development, such as quicker development of appropriate interfaces. Weaker responses discussed drag and drop from a user point of view.

(iii) Better responses included a sketch of a user interface that included all the necessary input and output fields, although some candidates neglected to include the output (room for up to 5 student absences for the nominated days). Better responses used the whole page to lay out the fields and included icons or menus for navigation.

(iv) The best responses organised the array to include one dimension of 100 elements (the number of students in the school) and the second dimension including 2 indexes (one for storing the student's id and the other for storing the number of absences). In weaker responses, candidates did not attempt to use arrays or their indexes and some did not know how to correctly structure their algorithms.

Better responses recognised that two loops were required. The first loop is used to find the maximum number of days absent and the second loop can then print out all student ids for absences which match that number. The better responses clearly demonstrated understanding of how to manipulate and use the indexes appropriately within those loops.

Question 24 – Evolution of Programming Languages

Candidates need to have some practical experience with coding in each paradigm rather than just rote learning from a textbook. Many candidates could not discriminate between a programming language and a paradigm.

(a) A small number of candidates confused the logic paradigm with algorithm development. This error of understanding then cascaded through all parts of this question.

(i) Weaker responses tried to make a link between the logic paradigm and the need for mathematical functions, rather than discussing the processing of data in areas such as artificial intelligence where the relationship between defined facts and rules can be used.

(ii) Many candidates misunderstood the term 'goal' and answered in a very generic sense using the common English usage of the term, rather than providing an explanation which related to a goal as used in the context of the logic paradigm.

(iii) Better responses demonstrated knowledge of the use of this paradigm and how programmers actually code solutions using languages of this type, without the need to define the logical detail to solve the problem. Weaker responses suggested little or no practical experience with logical paradigm programming.

(b) This question was generally answered well by most candidates, demonstrating their understanding of the syntax used in functional languages.

(c) (i) Poorer responses included a general summary of the purpose of the code rather than identifying a specific attribute such as 'price' in the context of object-oriented programming.

(ii) Generally this question was answered poorly with few responses demonstrating an understanding of how to construct an object-oriented programming method. Experience in coding using a relevant language should assist students in understanding how to respond to questions of this type.

Instead of attempting to write a new method called staff_discount, weaker responses simply used the provided code and rewrote the processes inside the get_price method.

Poorer responses defined a class or sub-class staff_discount, usually by copying from the example, instead of writing a method.

(iii) Candidates became confused between the concepts of public/private and local/global variable scopes. A significant number of weaker responses incorrectly indicated that private elements of a class could not be inherited by a sub-class. Better responses clearly showed the difference between the two sections and what each is usually used for, often with the inclusion of specific examples.

(iv) A small number of candidates confused the idea of inheritance with polymorphism. A large number of candidates wrote about 'data' rather than attributes being passed from a parent class to a sub-class. Some candidates more familiar with Visual Basic occasionally mistook the instantiation of screen objects with inheritance. However, candidates who had little understanding of public/private were still able to demonstrate a good understanding of inheritance.

Better responses included a clear description of how all of the properties of a class are automatically defined for all members of sub-classes, often including specific examples from the question.

Question 25 – The Software Developer's View of the Hardware

(a) (i) Better responses showed ability to convert from decimal to binary representations. Some candidates failed to recognize that an 8 bit binary representation was required. Others who did realize this placed zeros at the wrong end of their conversion. While the majority of responses demonstrated a good understanding of two's complement, weaker responses indicated that there was no difference between the binary representation of 23 and its two's complement.

(ii) The use of relevant examples allowed better responses to demonstrate clear understanding of two's complement in binary division. Many candidates did not recognize that the role of two's complement in division enables the computer to shift and add the two's complement of the divisor to achieve the required shift and subtract process. Weaker responses reported that two's complement was used to divide negative numbers or simply offered a description of how the two's complement of a number is calculated.

(iii) This section was well answered, with many responses suggesting many different ways an 8 bit pattern could be interpreted, such as an ASCII value, a binary integer, a negative number, part of a graphic bit-map, and so on. Weaker responses misunderstood the word 'interpret' as 'read' describing the reading of bits from left to right. Better responses referred to the specific bit pattern 10010110 when discussing a possible 8 bit interpretation.

(b) (i) Some candidates correctly constructed a truth table for the circuit but failed to 'evaluate' its suitability as required by interpreting the produced output of all zeros regardless of the input. Weaker responses did not produce complete truth tables including all 8 states for the circuit.

(ii) Responses to this section were very pleasing, with better responses included a circuit that satisfied the requirements of the question. Weaker responses included the drawing of an electrical circuit as opposed to the required circuit diagram.

(c) (i) This section was well answered by the majority of candidates, with most recognising the mouse as the relevant input device.

(ii) This section was also well answered by candidates who could correctly interpret the commands to construct the correct design that would appear on the chip.

(iii) A significant number of candidates had difficulty with this section, failing to identify relevant data structures in a data stream. Poorer responses merely identified 'header' or 'trailer' without a description of their components. A surprising number of responses identified 'headers' and 'footers' as data structures in the data stream.

(iv) Better responses explained the effect of increasing the bits on transmission speed and total number of memory units on the chips. Some responses used the term byte instead of the term bits. In their explanations, some candidates referred to larger x and y values without mentioning an increase in bit size. In some cases, an increase in x and y values will not have an impact on transmission speed and number of memory units. For example, an increase in x from 80 to 90 will have no impact as both 80 and 90 can be represented by one byte.

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2006 HSC Software Design and Development Marking Guidelines

Section II

Question 21 (a) (i)

Outcomes assessed: H4.2

MARKING GUIDELINES

Criteria	Marks
• Provides a construction of a context diagram that demonstrates an understanding of the relationship of the system to the external world	2
• Provides a diagram that indicates a limited understanding of the context of the system	1

Question 21 (a) (ii)

Outcomes assessed: H4.2, H1.2

MARKING GUIDELINES

Criteria	Marks
• Provides discussion of the benefits, demonstrating a strong understanding of the combination of issues in the two development approaches, and how they relate to each other in context	4
• Provides discussion demonstrating an understanding of the benefits of the combined development approaches	3
• Provides discussion demonstrating an understanding of one development approach OR • Identifies a benefit from both approaches	2
• Identifies a benefit of a software approach	1

Question 21 (a) (iii)

Outcomes assessed: H5.1, H5.2

MARKING GUIDELINES

Criteria	Marks
• Provides definition of benchmarking • Description of the role, demonstrating understanding of benchmarking in the context of this software solution	3
• Provides definition of benchmarking • Description of the role, demonstrating limited understanding of benchmarking in the context of this software solution	2
• Demonstrates limited understanding of benchmarking	1

Question 21 (b)

Outcomes assessed: H1.1, H1.3, H4.2

MARKING GUIDELINES

Criteria	Marks
• Provides description indicating a strong understanding of the system, its physical components and their relationships that is substantially correct	4
• Provides description indicating an understanding of the system, its physical components and their relationships	3
• Provides description indicating a limited understanding of the system, its physical components and their relationships	2
• Identifies physical components OR • Identifies relationships between components	1

Question 21 (c) (i)

Outcomes assessed: H4.3

MARKING GUIDELINES

Criteria	Marks
• Identifies 'valid' is a flag	1

Question 21 (c) (ii)

Outcomes assessed: H4.3, H5.2

MARKING GUIDELINES

Criteria	Marks
• Provides comparison and contrast of the purposes of structure and system flow charts indicating understanding of internal software components and physical components	3
• Provides description of the purposes of structure and system flow charts indicating some understanding of internal software components and physical components	2
• Identifies a feature of structure and/or a feature of system flow charts	1

Question 21 (c) (iii)

Outcomes assessed: H4.2, H4.3, H5.1, H5.2

MARKING GUIDELINES

Criteria	Marks
• Constructs an algorithm for the procedure indicating understanding of parameter passing and data validation	3
• Constructs an algorithm for the procedure indicating some understanding of parameter passing or data validation	2
• Constructs an algorithm for the procedure indicating limited understanding of the problem context	1

Question 22 (a) (i)

Outcomes assessed: H3.1

MARKING GUIDELINES

Criteria	Marks
• Provides a definition, demonstrating an understanding of intellectual property	2
• Identifies factors indicating a limited understanding of intellectual property	1

Question 22 (a) (ii)

Outcomes assessed: H3.1

MARKING GUIDELINES

Criteria	Marks
• Provides a description that demonstrates an understanding of the relationship between plagiarism and intellectual property	2
• Identifies factors indicating a limited understanding of intellectual property AND plagiarism OR • Demonstrates a good understanding of plagiarism	1

Question 22 (a) (iii)

Outcomes assessed: H4.1, H4.2

MARKING GUIDELINES

Criteria	Marks
• Demonstrates a good understanding of the factors and how they could be used to identify plagiarism	2
• Demonstrates a good understanding of the factors OR • Demonstrates a good understanding of a factor and how it would be used to identify plagiarism	1

Question 22 (a) (iv)

Outcomes assessed: H3.2

MARKING GUIDELINES

Criteria	Marks
• Discusses limitations of this system that demonstrates a good understanding of the system AND • Proposes a range of improvements	4
• Discusses limitations of this system that demonstrates an understanding of the system AND • Proposes an improvement	3
• Discusses limitations of this system that demonstrates an understanding of the system OR • Proposes an improvement	2
• Identifies limitations of this system	1

Question 22 (b) (i)

Outcomes assessed: H5.2

MARKING GUIDELINES

Criteria	Marks
• Prepares a substantially correct data dictionary for all of the variables	2
• Prepares a data dictionary, demonstrating understanding of a data dictionary	1

Question 22 (b) (ii)

Outcomes assessed: H4.3, H5.2

MARKING GUIDELINES

Criteria	Marks
• Demonstrates a good understanding of the similarities and differences in the way the variables are used in this subprocedure	3
• Demonstrates an understanding of the similarities in the use of the variables in the subprocedure OR • Demonstrates an understanding of the differences in the use of the variables in the subprocedure	2
• Indicates an attribute of the variables	1

Question 22 (b) (iii)

Outcomes assessed: H4.2, H4.3

MARKING GUIDELINES

Criteria	Marks
• Proposes a pseudocode algorithm that will produce the required report which is correct	5
• Proposes an algorithm that demonstrates an understanding of the context of the problem and is substantially correct	4
• Proposes an algorithm that demonstrates an understanding of the problem	3
• Identifies items that indicate some understanding of the problem AND • Indicates some understanding of control structures	2
• Identifies items that indicate some understanding of the problem	1

Question 23 (a)

Outcomes assessed: H1.1, H1.3

MARKING GUIDELINES

Criteria	Marks
• Provides an outline of interpretation and compilation and highlights the differences between them	2
• Identifies a characteristic of each of interpretation and compilation	1

Question 23 (b) (i)

Outcomes assessed: H5.1

MARKING GUIDELINES

Criteria	Marks
• Provides a desk check that produces correct results	3
• Provides a desk check that is substantially correct	2
• Provides a desk check that shows some limited understanding	1

Question 23 (b) (ii)

Outcomes assessed: H5.1

MARKING GUIDELINES

Criteria	Marks
• Explains the effect of instruction change producing the correct result	2
• Identifies what happens when instruction is changed	1

Question 23 (c) (i)

Outcomes assessed: H6.4

MARKING GUIDELINES

Criteria	Marks
• Provides a justification demonstrating an understanding of the use of data in interface design with different features	2
• Identifies a factor related to data that is relevant to designing the user in interface with different features	1

Question 23 (c) (ii)

Outcomes assessed: H1.2, H5.3

MARKING GUIDELINES

Criteria	Marks
• Discusses in detail how the drag/drop based language helps in developing user interface software, demonstrating an understanding of its advantages over other approaches	3
• Discusses issues of developing user interface software using drag/drop based language, showing limited understanding	2
• Identifies an issue in using a language based on drag/drop of screen elements in the development of user interface software	1

Question 23 (c) (iii)

Outcomes assessed: H5.3, H6.4

MARKING GUIDELINES

Criteria	Marks
• Draws an effective interface in the context	3
• Draws an interface that shows sound understanding of relationship between software and user	2
• Draws an interface that has limited effectiveness	1

Question 23 (c) (iv)

Outcomes assessed: H4.2, H4.3

MARKING GUIDELINES

Criteria	Marks
• Proposes an appropriate algorithm that is substantially correct	5
• Proposes a sound algorithm that demonstrates an understanding of the problem	4
• Proposes an algorithm that demonstrates an understanding of the problem	3
• Identifies items that indicate some understanding of the problem AND indicate some understanding of control structures	2
• Identifies items that indicate some understanding of the problem	1

Section III

Question 24 (a) (i)

Outcomes assessed: H2.1

MARKING GUIDELINES

Criteria	Marks
• Provides a description of a reason that indicates understanding of development of logic paradigm	2
• Identifies a valid reason	1

Question 24 (a) (ii)

Outcomes assessed: H1.2

MARKING GUIDELINES

Criteria	Marks
• Shows a clear understanding of the role of goals in the logic paradigm	2
• Shows some understanding of the role of the term goal	1

Question 24 (a) (iii)

Outcomes assessed: H4.1

MARKING GUIDELINES

Criteria	Marks
• Discussion of features that show an understanding of the effect on productivity	3
• Describes one or more features that affect productivity	2
• Identifies a feature of the logic paradigm that affects productivity	1

Question 24 (b) (i)

Outcomes assessed: H4.1

MARKING GUIDELINES

Criteria	Marks
• Evaluates the function correctly, showing working	2
• Some evaluation of the function, showing some working	1

Question 24 (b) (ii)

Outcomes assessed: H4.1

MARKING GUIDELINES

Criteria	Marks
• Writes a function which shows a good understanding of the construction of functions	2
• Makes an attempt at writing a function which shows some understanding of the construction of functions	1

Question 24 (c) (i)

Outcomes assessed: H1.2

MARKING GUIDELINES

Criteria	Marks
• Identifies an attribute	1

Question 24 (c) (ii)

Outcomes assessed: H4.2

MARKING GUIDELINES

Criteria	Marks
• Writes a correct method	2
• Demonstrates some understanding of methods	1

Question 24 (c) (iii)

Outcomes assessed: H1.2, H4.2

MARKING GUIDELINES

Criteria	Marks
• Describes the use of private and public sections in a class definition showing a clear understanding of their purpose	3
• Demonstrates some understanding of private and public sections in a class definition	2
• Demonstrates a limited understanding of either private or public sections	1

Question 24 (c) (iv)

Outcomes assessed: H1.2, H4.2

MARKING GUIDELINES

Criteria	Marks
• Explains the concept of inheritance using this scenario, demonstrates a good understanding	3
• Demonstrates some understanding of inheritance	2
• Demonstrates a limited understanding of inheritance	1

Question 25 (a) (i)

Outcomes assessed: H1.3

MARKING GUIDELINES

Criteria	Marks
• Converts 23 to binary and states two's complement	2
• Provides a conversion or shows understanding of two's complement	1

Question 25 (a) (ii)

Outcomes assessed: H1.3

MARKING GUIDELINES

Criteria	Marks
• Shows a clear understanding of the role of two's complement in the concept of division	2
• Shows a limited understanding of the concept of division	1

Question 25 (a) (iii)

Outcomes assessed: H1.3

MARKING GUIDELINES

Criteria	Marks
• Discusses interpretation of bit patterns with context	3
• Describes one or more ways that the bit pattern can be interpreted	2
• Identifies one way that the bit pattern can be interpreted	1

Question 25 (b) (i)

Outcomes assessed: H1.1

MARKING GUIDELINES

Criteria	Marks
• Evaluates the circuit correctly (substantially) showing the truth table	2
• Some interpretation of the suitability of the circuit through the partial construction of a truth table	1

Question 25 (b) (ii)

Outcomes assessed: H1.1

MARKING GUIDELINES

Criteria	Marks
• Draws a circuit that shows a good understanding of the circuit pattern	2
• Makes an attempt at drawing a circuit that shows some understanding of the pattern	1

Question 25 (c) (i)

Outcomes assessed: H1.1

MARKING GUIDELINES

Criteria	Marks
• Identifies a device that is used to input data	1

Question 25 (c) (ii)

Outcomes assessed: H4.1

MARKING GUIDELINES

Criteria	Marks
• Constructs a correct design	2
• Demonstrates some understanding of the operation of the control characters	1

Question 25 (c) (iii)

Outcomes assessed: H1.1, H1.3

MARKING GUIDELINES

Criteria	Marks
• Describes the two data structures in a data stream packet showing a clear understanding of their purpose	3
• Demonstrates some understanding of the two data structures in a data stream packet	2
• Demonstrates a limited understanding of data structures	1

Question 25 (c) (iv)

Outcomes assessed: H1.1, H1.3

MARKING GUIDELINES

Criteria	Marks
• Explains the effect that bit size representation has on both factors in this context	3
• Demonstrates a limited understanding of the effects of the bit size representation on both factors OR • Demonstrates a good understanding on one factor	2
• Demonstrates a limited understanding of the effects of the bit size representation on either factor	1