



**Practice Paper 2**

**GCE Computer Science**

H446/01 Computer Systems

**Duration:** 2 hours 30 minutes

**MAXIMUM MARK 140**

**Final**

**This document consists of 30 pages**

**MARKING INSTRUCTIONS****PREPARATION FOR MARKING****SCORIS**

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris assessor Online Training*; *OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal <http://www.rm.com/support/ca>
3. Log-in to scoris and mark the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

**TRADITIONAL**

Before the Standardisation meeting you must mark at least 10 scripts from several centres. For this preliminary marking you should use **pencil** and follow the **mark scheme**. Bring these **marked scripts** to the meeting.

**MARKING**

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the scoris 50% and 100% (traditional 50% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the scoris messaging system.

## 5. Rubric Error Response – Optional Questions

**Crossed Out Responses**

Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

**Rubric Error Responses – Optional Questions**

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. **Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded.** *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

**Multiple Choice Question Responses**

When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).

*When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.*

**Contradictory Responses**

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

**Short Answer Questions** (requiring only a list by way of a response, usually worth only **one mark per response**)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

**Short Answer Questions** (requiring a more developed response, worth **two or more marks**)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

**Longer Answer Questions** (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. There is a NR (No Response) option. Award NR (No Response)

- if there is nothing written at all in the answer space

- OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')

- OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.

Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The scoris **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

If you have any questions or comments for your Team Leader, use telephone, email or the scoris messaging system.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.













10. For answers marked by levels of response:

a. **To determine the level** – start at the highest level and work down until you reach the level that matches the answer

b. **To determine the mark within the level**, consider the following:

| Descriptor  | Award mark  |
|---|---|
| On the borderline of this level and the one below     | At bottom of level  |
| Just enough achievement on balance for this level     | Above bottom and either below middle or at middle of level (depending on number of marks available)       |
| Meets the criteria but with some slight inconsistency | Above middle and either below top of level or at middle of level (depending on number of marks available) |
| Consistently meets the criteria for this level        | At top of level   |

### 11. Annotations

| Annotation  | Meaning                                  |
|---|--|
|    | Omission mark                            |
|    | Benefit of the doubt                     |
|    | Subordinate clause / consequential error |
|    | Incorrect point                          |
|    | Expansion of a point                     |
|    | Follow through                           |
|  | Not answered question                    |
|  | No benefit of doubt given                |
|  | Point being made                         |
|  | Repeat                                   |
|  | Correct point                            |
|  | Too vague                                |

|           |   |
|-----------|---|
| <b>0</b>  | Zero (big)  |
| <b>BP</b> | Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response. |
| <b>L1</b> | Level 1   |
| <b>L2</b> | Level 2   |
| <b>L3</b> | Level 3   |

## 12. Subject-specific Marking Instructions

### INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper and its rubrics
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

**USING THE MARK SCHEME**

Please study this Mark Scheme carefully. The Mark Scheme is an integral part of the process that begins with the setting of the question paper and ends with the awarding of grades. Question papers and Mark Schemes are developed in association with each other so that issues of differentiation and positive achievement can be addressed from the very start.

This Mark Scheme is a working document; it is not exhaustive; it does not provide 'correct' answers. The Mark Scheme can only provide 'best guesses' about how the question will work out, and it is subject to revision after we have looked at a wide range of scripts.

The Examiners' Standardisation Meeting will ensure that the Mark Scheme covers the range of candidates' responses to the questions, and that all Examiners understand and apply the Mark Scheme in the same way. The Mark Scheme will be discussed and amended at the meeting, and administrative procedures will be confirmed. Co-ordination scripts will be issued at the meeting to exemplify aspects of candidates' responses and achievements; the co-ordination scripts then become part of this Mark Scheme.

Before the Standardisation Meeting, you should read and mark in pencil a number of scripts, in order to gain an impression of the range of responses and achievement that may be expected.

In your marking, you will encounter valid responses which are not covered by the Mark Scheme: these responses must be credited. You will encounter answers which fall outside the 'target range' of Bands for the paper which you are marking. Please mark these answers according to the marking criteria.

Please read carefully all the scripts in your allocation and make every effort to look positively for achievement throughout the ability range. Always be prepared to use the full range of marks.



**LEVELS OF RESPONSE QUESTIONS:**

The indicative content indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance.

Using 'best-fit', decide first which set of BAND DESCRIPTORS best describes the overall quality of the answer. Once the band is located, adjust the mark concentrating on features of the answer which make it stronger or weaker following the guidelines for refinement.

- **Highest mark:** If clear evidence of all the qualities in the band descriptors is shown, the HIGHEST Mark should be awarded.
- **Lowest mark:** If the answer shows the candidate to be borderline (i.e. they have achieved all the qualities of the bands below and show limited evidence of meeting the criteria of the band in question) the LOWEST mark should be awarded.
- **Middle mark:** This mark should be used for candidates who are secure in the band. They are not 'borderline' but they have only achieved some of the qualities in the band descriptors.

Be prepared to use the full range of marks. Do not reserve (e.g.) high Band 3 marks 'in case' something turns up of a quality you have not yet seen. If an answer gives clear evidence of the qualities described in the band descriptors, reward appropriately.

|                            | <b>AO1</b>   | <b>AO2</b>   | <b>AO3</b>   |
|----------------------------|--|--|--|
| <b>High (thorough)</b>     | Precision in the use of question terminology. Knowledge shown is consistent and well-developed. Clear appreciation of the question from a range of different perspectives making extensive use of acquired knowledge and understanding.      | Knowledge and understanding shown is consistently applied to context enabling a logical and sustained argument to develop. Examples used enhance rather than detract from response.  | Concerted effort is made to consider all aspects of a system / problem or weigh up both sides to an argument before forming an overall conclusion. Judgements made are based on appropriate and concise arguments that have been developed in response resulting in them being both supported and realistic.   |
| <b>Middle (reasonable)</b> | Awareness of the meaning of the terms in the question. Knowledge is sound and effectively demonstrated. Demands of question understood although at times opportunities to make use of acquired knowledge and understanding not always taken. | Knowledge and understanding applied to context. Whilst clear evidence that an argument builds and develops through response there are times when opportunities are missed to use an example or relate an aspect of knowledge or understanding to the context provided. | There is a reasonable attempt to reach a conclusion considering aspects of a system / problem or weighing up both sides of an argument. However the impact of the conclusion is often lessened by a lack of supported judgements which accompany it. This inability to build on and develop lines of argument as developed in the response can detract from the overall quality of the response. |
| <b>Low (basic)</b>         | Confusion and inability to deconstruct terminology as used in the question. Knowledge partial and superficial. Focus on question narrow and often one-dimensional.   | Inability to apply knowledge and understanding in any sustained way to context resulting in tenuous and unsupported statements being made. Examples if used are for the most part irrelevant and unsubstantiated.  | Little or no attempt to prioritise or weigh up factors during course of answer. Conclusion is often dislocated from response and any judgements lack substance due in part to the basic level of argument that has been demonstrated throughout response.  |

|              | <b>Assessment Objective</b>   |
|--------------|---|
| <b>AO1</b>   | Demonstrate knowledge and understanding of the principles and concepts of computer science, including abstraction, logic, algorithms and data representation. |
| <b>AO1.1</b> | Demonstrate <b>knowledge</b> of the principles and concepts of abstraction, logic, algorithms, data representation or other as appropriate.                   |
| <b>AO1.2</b> | Demonstrate <b>understanding</b> of the principles and concepts of abstraction, logic, algorithms, data representation or other as appropriate.               |
| <b>AO2</b>   | Apply knowledge and understanding of the principles and concepts of computer science including to analyse problems in computational terms.                    |
| <b>AO2.1</b> | Apply knowledge and understanding of the principles and concepts of computer science.   |
| <b>AO2.2</b> | Analyse problems in computational terms.  |
| <b>AO3</b>   | Design, program and evaluate computer systems that solve problems, making reasoned judgements about these and presenting conclusions.                         |
| <b>AO3.1</b> | Design computer systems that solve problems.  |
| <b>AO3.2</b> | Program computer systems that solve problems.   |
| <b>AO3.3</b> | Evaluate computer systems that solve problems, making reasoned judgements about these and presenting conclusions.   |

| Question |   |    | Answer  | Marks                      | Guidance |
|----------|---|----|---|----------------------------|----------|
| 1        | a | i  | Paging is fixed size / physical divisions (1)<br>Segmentation is dividing memory logically (i.e. will be variable size). (1)  | <b>2</b><br><b>(AO1.1)</b> |          |
|          |   | ii | Uses virtual memory (1) which is an allocated area of a hard drive/secondary storage device.(1) Pages that aren't needed are moved to VM (1) and moved back to physical memory when required (1)  | <b>4</b><br><b>(AO1.2)</b> |          |
|          | b | i  | A signal to the processor indicating a device/process needs attention (1)   | <b>1</b><br><b>(AO1.1)</b> |          |
|          |   | ii | Any five from:<br><br>If the interrupt is of a lower/equal priority to the current process then the current process continues (1)<br>If it is of a higher priority the CPU finishes its current Fetch-Decode-Execute cycle (1). The contents of the CPU's registers are copied to a stack (1) in memory (1). The location of the appropriate interrupt service routine is loaded into the program counter (1) When the ISR is complete, the previous contents are popped from the stack and loaded back into the registers (1). | <b>5</b><br><b>(AO1.2)</b> |          |
| 2        | a |    | Any two from:<br><br>GPS...(1) ...To determine the user's geographical location (1)<br>Compass/magnetometer (1)... ...To determine direction in which use is facing.<br>Accelerometer...(1) ...to recognise user's movement. (1)<br>Touchscreen.... (1) .... To select options/play the   | <b>2</b><br><b>(AO1.2)</b> |          |

|   |   |  |  |  |   |
|---|---|--|--|--|---|
|   |   | game (1)   |  |  |   |
|   | b | When an attribute is made private (so it can't be directly accessed or changed from outside the class) (1)<br>Public methods are used to read / amend the attribute's value (1)<br>The attribute name's value can only be amended through the method <code>changeName</code> . (1) | <b>3</b><br><b>(AO 1.2)</b>  |  |   |
|   | c | When a class has the attributes and methods of its parent class. (1) It may also have methods and attributes of its own (1)<br><code>TreasureChest</code> inherits from the class <code>Treasure</code> (1)  | <b>3</b><br><b>(AO 1.2)</b>  |  |   |
|   | d | Methods: (constructor/new), <code>changeName</code> , <code>pickLock</code> (1)<br>Attributes: <code>value</code> , <code>weight</code> , <code>name</code> , <code>locked</code> (1)  | <b>2</b><br><b>(AO 1.2)</b>  | Do not penalise for not including constructor.<br>Only give method mark if both other methods are listed<br>Only give attributes mark if all four attributes are listed. |   |
| 3 | a | i  | & immediate addressing   | <b>1</b><br><b>(AO2.2)</b>   |   |
|   |   | ii   | # indirect addressing  | <b>1</b><br><b>(AO2.2)</b>   |   |
|   | b |  | A program that translates assembly code (1) into machine code/object code (1)  | <b>2</b><br><b>(AO1.1)</b>   |   |
|   | c |  | Pipelining would allow one instruction to be fetched as the previous one is being decoded and the one before that is being executed.(1)<br>For example <code>OUT</code> could be fetched (1) . As there are no jump/branch instructions it pipelines well (as there is no need to flush the pipeline). (1) | <b>3</b><br><b>(2 AO2.2,</b><br><b>1 AO3.2)</b>  | Accept any valid example from the given code. |
| 4 | a |  | 09:40  | <b>1</b>   |   |

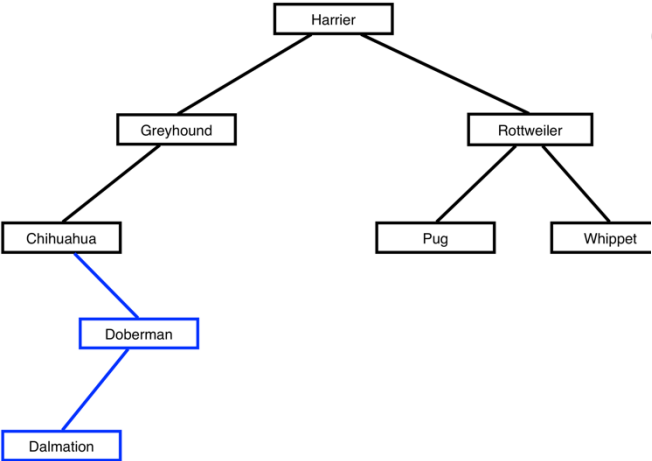
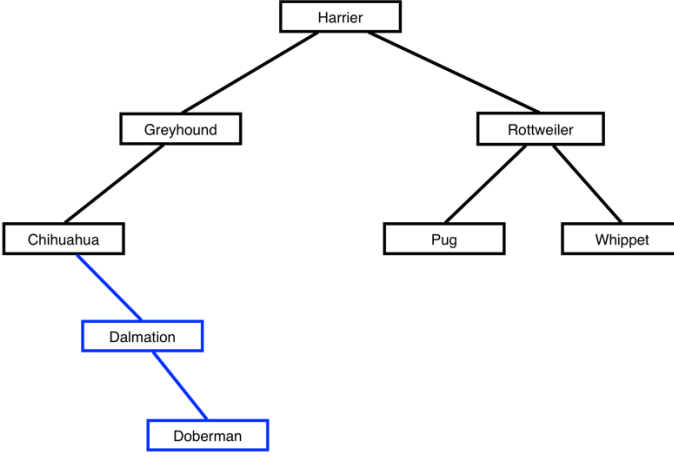
|   |   |  |                             |  |
|---|---|--|-----------------------------|--|
|   |   |  | <b>(AO1.2)</b>              |  |
|   | b | Correctly named function that takes in time as a parameter and returns a value. (1)<br>Minutes element is correct (1)<br>Hours element is correct (1)  | <b>3</b><br><b>(AO 3.2)</b> | Returned value needn't be correct for first mark<br>Example solution:<br><pre>function timeValue(givenTime)     intTime=int(givenTime.substring(3,2))     intTime=intTime+int(givenTime.substring(0,2))*100     return intTime endfunction</pre>   |
|   | c | Correct stop array extracted/referenced in code (1)<br>Sensible attempt to iterate through the array (1)<br>Program returns time of next bus (1)<br>Program returns No Buses when no more buses left. (1)<br>Program runs without an index out of bounds error (You may assume short circuit evaluation i.e. if the array is in the second part of an and condition it won't be checked if the first half evaluates to false.) (1) | <b>5</b><br><b>(AO3.2)</b>  | Marks 1-2 can be awarded even if the program doesn't exhibit behaviour needed for marks 3-5<br>Marks 1-4 can be awarded even if mark 5 can't be awarded as program would in reality crash.<br><pre>count = 0 timesLeft = true timesList = times[stopName] while timesLeft == true and timeValue(timesList[count]) &lt; currentTime     count = count + 1     if count == timesList.length then         timesLeft = false     endif endwhile if timesLeft == true then     return timesList[count] else     return "No Buses" endif</pre> |
| 5 | a | Branch name depends on Sort Code (i.e. there is a transitive relationship).  | <b>1</b><br><b>(AO2.1)</b>  |  |
|   | b | Create another table for Branches which should   | <b>3</b>                    |  |

|   |  |  |  |   |
|---|--|--|--|---|
|   |  | <p>include sort-code and branch name. (1)<br/>         Make sort code the primary key of the BRANCH table/ Add a primary key to BRANCH. (1)<br/>         Remove Branch name from Customers, leave sortcode as primary key/ Remove sort-code and branch name from customers and add the primary key values from BRANCS as the foreign key (1)</p> <p>ALTERNATIVE ANSWER (ER-DIAGRAM)<br/>         Two tables CUSTOMER and BRANCH (or similar names) (1)<br/>         Link from CUSTOMER to BRANCHES is Many (1) to One (1)</p>  | (AO3.1)  |   |
| c |  | <p><b>Mark Band 3–High Level (7-9 marks)</b><br/>         The candidate demonstrates a thorough knowledge and understanding of transaction processing. The material is generally accurate and detailed.</p> <p>The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation.</p> <p>The candidate provides a thorough discussion which is well balanced. Evaluative comments are consistently relevant and well-considered.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and</i></p> | <p><b>2</b><br/>(AO1.1)<br/><b>2</b><br/>(AO1.2)<br/><b>2</b><br/>(AO2.1)<br/><b>3</b><br/>(AO3.3)</p> | <p><i>Answers may include, but are not limited to, some of the points below.</i></p> <p><b>AO1: Knowledge and Understanding</b><br/>         Transactions should be:<br/>         Atomic; They should either succeed or fail but never partially succeed.<br/>         Consistent: The transaction should only change the database according to the rules of the database.<br/>         Isolated: Each transaction shouldn't affect/overwrite other transactions concurrently being processed.<br/>         Durable: Once a transaction has been started it remains no matter what happens.<br/>         Records should be locked when in use. If one transaction is amending a record, no other transaction should be able to until the first transaction is complete.<br/>         Transactions should maintain referential integrity. Changes to data in one table must take into account data in linked tables.<br/>         Data should have redundancy – if part of a database is lost it should be recoverable from elsewhere.</p> |

|  |  |  |  |  |
|--|--|--|--|--|
|  |  | <p><i>substantiated.</i></p> <p><b>Mark Band 2-Mid Level (4-6 marks)</b><br/>                 The candidate demonstrates reasonable knowledge and understanding of transaction processing; the material is generally accurate but at times underdeveloped.</p> <p>The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation.</p> <p>The candidate provides a sound discussion, the majority of which is focused. Evaluative comments are for the most part appropriate, although one or two opportunities for development are missed.</p> <p><i>There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.</i></p> <p><b>Mark Band 1-Low Level (1-3 marks)</b><br/>                 The candidate demonstrates a basic knowledge of transaction processing; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided.</p> <p>The candidate provides a limited discussion which is narrow in focus. Judgments if made</p> |  | <p>Data entered must be accurate in the first place. Security measures need to be in place to prevent malicious tampering of data. Data entered should be validated (automatically checked it is sensible) and verified (checked that the data entered matches the original).</p> <p><b>AO2.1: Application</b><br/>                 Ensuring the accuracy of transactions will be partly down to the DBMS and partly down to the code accessing the DBMS. Referential Integrity is often enforced by the database management system. Redundancy can be provided in a number of ways. This could be a RAID setup or mirroring servers. Bank may use validation and verification when data is input. Security procedures may include firewall, enforcement of sensible passwords and enforced user access rights. Validation may include range checks, list checks, presence checks etc. Verification may include double entry and proof reading,</p> <p><b>AO3.3: Evaluation</b><br/>                 It is essential the bank follows the precautions discussed. Verification and validation help ensure the data is initial data is sound (garbage in = garbage out) If they make mistakes with their financial data they may lose money or overcharge customers and lose business/find themselves in legal trouble. Without redundancy data could be lost. Without careful transaction processing, one transaction could accidentally overwrite another or half complete leading to inaccurate data. Under the Data Protection Act they have an obligation to keep personal data accurate.</p> |
|--|--|--|--|--|



|       |   |   |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                     |     |   |  |  |  |  |  |  |   |  |  |  |  |  |  |   |  |  |  |  |  |  |       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                     |  |
|-------|---|---|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-------------------------------------|-----|---|--|--|--|--|--|--|---|--|--|--|--|--|--|---|--|--|--|--|--|--|-------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-------------------------------------|--|
|       |   | <p>are weak and unsubstantiated.</p> <p><i>The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</i></p> <p><b>0 marks</b><br/>No attempt to answer the question or response is not worthy of credit.</p>   |  | Verification and Validation.  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                     |     |   |  |  |  |  |  |  |   |  |  |  |  |  |  |   |  |  |  |  |  |  |       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                     |  |
| 6     | a | <table border="1"> <tr> <td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td> </tr> </table> <p>One byte correct (1) all three bytes correct.(1)</p>   | 0  | 0   | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | <p><b>2</b><br/><b>(AO 1.2)</b></p> |     |   |  |  |  |  |  |  |   |  |  |  |  |  |  |   |  |  |  |  |  |  |       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                     |  |
| 0     | 0 | 0   | 0  | 1   | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |   |   |   |                                     |     |   |  |  |  |  |  |  |   |  |  |  |  |  |  |   |  |  |  |  |  |  |       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                     |  |
|       | b | <table border="1"> <tr> <td>(a)</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td> <td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td> </tr> <tr> <td>Key</td> <td colspan="7">A</td> <td colspan="7">B</td> <td colspan="7">C</td> </tr> <tr> <td>Value</td> <td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td> <td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td> <td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td> </tr> <tr> <td>XOR</td> <td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td> <td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td> <td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td> </tr> </table> <p>One byte correct (1) all three bytes correct.(1)</p> | (a)  | 0   | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1                                   | Key | A |  |  |  |  |  |  | B |  |  |  |  |  |  | C |  |  |  |  |  |  | Value | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | XOR | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | <p><b>2</b><br/><b>(AO 1.2)</b></p> | Allow FT if (a) is incorrect but bottom row must match XOR with top row and key. |
| (a)   | 0 | 0   | 0  | 0   | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |   |   |                                     |     |   |  |  |  |  |  |  |   |  |  |  |  |  |  |   |  |  |  |  |  |  |       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                     |  |
| Key   | A |   |  |   |   |   |   | B |   |   |   |   |   |   | C |   |   |   |   |   |   |   |   |   |   |   |                                     |     |   |  |  |  |  |  |  |   |  |  |  |  |  |  |   |  |  |  |  |  |  |       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                     |  |
| Value | 0 | 1   | 0  | 0   | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |   |   |                                     |     |   |  |  |  |  |  |  |   |  |  |  |  |  |  |   |  |  |  |  |  |  |       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                     |  |
| XOR   | 0 | 1   | 0  | 0   | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |   |   |                                     |     |   |  |  |  |  |  |  |   |  |  |  |  |  |  |   |  |  |  |  |  |  |       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                     |  |
|       | c | Symmetric (1) .... as the same key is used to decrypt it as encrypt it (1)  | <p><b>2</b><br/><b>(1 - AO1.2, 1 - AO 2.2)</b></p> | Allow FT for asymmetric if (b) indicates asymmetric encryption used |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                     |     |   |  |  |  |  |  |  |   |  |  |  |  |  |  |   |  |  |  |  |  |  |       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                     |  |
|       | d | <p>Any four from:<br/>Symmetric encryption would require both parties to have copy of the key (1) this couldn't be transmitted over the internet or an eavesdropper monitoring the message may see it (1) Asymmetric gets round this requirement as there are two different keys (1) One key encrypts the data (1) which can be publically distributed (1) and a different key to decrypt it (1) which is kept private (1)</p>  | <p><b>4</b><br/><b>(AO 1.2)</b></p>                |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                     |     |   |  |  |  |  |  |  |   |  |  |  |  |  |  |   |  |  |  |  |  |  |       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                     |  |

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| <p>7 a</p> |  <p>Doberman in correct position (1)<br/>Dalmatian in correct position (1)<br/>(Allow FT if first mark is incorrect)</p> | <p>2<br/>(AO 2.2)</p> | <p>Allow one mark if added in wrong order.</p>  |
| <p>b</p>   | <p>Pug &gt; Harrier (go right) (1)<br/>Pug &lt; Rottweiler (go left) (1)<br/>Found Pug (1)</p>   | <p>3<br/>(AO 2.2)</p> |  |
| <p>c</p>   | <p>Spaniel &gt; Harriet (go right) (1)<br/>Spaniel &gt; Rottweiler (go right) (1)<br/>Spaniel &lt; Whippet, no child node so Spaniel is not in tree (1)</p>  | <p>3<br/>(AO 2.2)</p> |  |

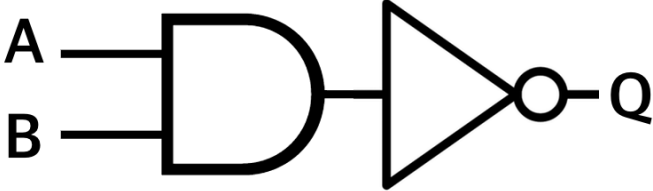
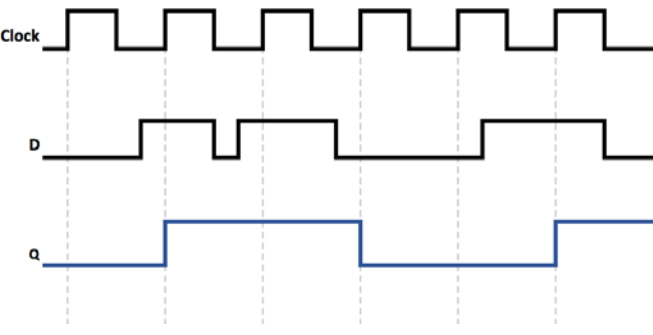
|   |   |  |  |   |
|---|---|--|--|---|
|   | d | <p>Calls <code>getLeftNode()</code> when name is less than the value of the current node (1)<br/> and calls <code>getRightNode()</code> when name is less than the value of the current node. (1)<br/> Declares a breed to be in the tree if and only if it exists.(1)<br/> Declares a breed not to be in the tree if and only if it doesn't exist (1)<br/> Presents output strings in correct format (1)<br/> Sensible use of variable names and correctly indented (1)</p> | <p><b>6</b><br/> <b>(5 AO</b><br/> <b>3.2, 1 AO</b><br/> <b>1.2)</b></p> | <p>Points 4 and 5 can be awarded even if 1-3 aren't.</p> <pre>notThere = false  while breedNode.getName() != name and notThere == false   if name &lt; breedNode.getName() then     if breedNode.getLeftNode() != null then       breedNode = getLeftNode()     else       notThere = true     endif   else // must be greater     if breedNode.getRightNode() != null then       breedNode = getRightNode()     else       notThere = true     endif   endif endif endwhile  if notThere == true then   print(name+ " is not in the tree.") else   print(name+" is in the tree") endif</pre> |
| 8 | a | <p>Code enclosed within <code>#warning{...}</code> (1)<br/> <code>color: red;</code> (1)<br/> <code>font-family: monospace;</code> (1)</p>   | <p><b>3</b><br/> <b>(AO 3.1)</b></p>                                     | <pre>#warning{ color: red; font-family: monospace; }</pre> <p>Also accept hex color and RGB color notations.<br/> Don't penalise for missing semicolons.</p> <p>Accept a named suitable font like Courier New.</p>  |
|   | b | <p>Creates a textbox (1)<br/> To hold the username/which is referred to as</p>   | <p><b>2</b><br/> <b>(AO 2.2)</b></p>                                     |   |

|   |  |   |   |   |
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|   |  | username (1)  |   |   |
| c |  | <p><b>Mark Band 3–High Level (7-9 marks)</b><br/>The candidate demonstrates a thorough knowledge and understanding of client and server side processing. The material is generally accurate and detailed.</p> <p>The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation.</p> <p>The candidate provides a thorough discussion which is well balanced. Evaluative comments are consistently relevant and well-considered.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p><b>Mark Band 2-Mid Level (4-6 marks)</b><br/>The candidate demonstrates reasonable knowledge and understanding of client and server side processing; the material is generally accurate but at times underdeveloped.</p> <p>The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation.</p> <p>The candidate provides a sound discussion, the majority of which is focused. Evaluative comments are for the most part appropriate, although one or</p> | <p>2<br/>(AO1.1)</p> <p>2<br/>(AO1.2)</p> <p>2<br/>(AO2.1)</p> <p>3<br/>(AO3.3)</p> | <p>Answers may include, but are not limited to, some of the points below.</p> <p><b>AO1: Knowledge and Understanding</b><br/>Server side processing takes place on the webserver. Data is sent from the browser to the server, the server processes it and sends the output back to the browser.<br/>Client side processing takes place in the web browser.</p> <p><b>AO2.1: Application</b><br/>Client side processing doesn't require data to be sent back and forth meaning code is much more responsive.<br/>Code is visible which means it can be copied. The browser may not run the code either because it doesn't have the capability or because the user has intentionally disabled client side code.<br/>Server side processing takes away the reliance of the browser having the correct interpreter. It hides the code from the user, protecting copyright and avoiding it being amended/circumvented.<br/>Server side processing puts extra load on the server. This is at the cost of the company hosting the website.</p> <p><b>AO3.3: Evaluation</b><br/>Client side processing is best used when it's not critical code that runs. If it is critical then it should be carried out on the server. Client side processing is also best where a quick response is needed – an example being games.<br/>Server side processing is best used where it is integral that processing is carried out. It is often used for generating content. It can be used to access data including secure data. For this reason any data passed to it has to be checked carefully.<br/>With some things like validation good practice is to do both: First on the client for a quick response if there is an issue, then on the server</p> |

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|  |  | <p>two opportunities for development are missed.</p> <p><i>There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.</i></p> <p><b>Mark Band 1-Low Level (1-3 marks)</b><br/>The candidate demonstrates a basic knowledge of client and server side processing; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided.</p> <p>The candidate provides a limited discussion which is narrow in focus. Judgments if made are weak and unsubstantiated. <i>The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</i></p> <p><b>0 marks</b><br/>No attempt to answer the question or response is not worthy of credit.</p> |  | <p>in case the client side processing has been circumvented.</p> |
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|  | d | <p>Any five from:<br/>         Takes the <code>username</code> and <code>password</code> from the form (1)<br/>         Uses the <code>username</code> to create an SQL statement (1) to get the <code>passwordHash</code> belonging to the given <code>username</code> (1) Runs the SQL Statement(1)<br/>         hashes the given <code>password</code> and compares it to the retrieved hash (1)<br/>         If they match it generates a success webpage, otherwise it records the user's IP address. (1)</p> | <p><b>5</b><br/> <b>(3 AO2.2,<br/>         2 AO3.3)</b></p> |  |
|  | e | <p>i</p> <p>Any two from:<br/>         A numerical address made of 4 numbers each between 0 and 255 / 32 hexadecimal digits (1)<br/>         That uniquely identifies a device on a network. (1)<br/>         It is a logical identifier (i.e. can change on a physical device) (1)</p>  | <p><b>2</b><br/> <b>(AO2.1)</b></p>                         |  |

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|   |   | ii  | IP address can help identify a user... (1)<br>...so company can potentially track users attempting to gain unauthorised access (1)  | <b>2</b><br><b>(AO 2.2)</b> |  |
| f | i |     | SELECT passwordHash FROM users WHERE name = 'admin'   | <b>1</b><br><b>(AO 1.2)</b> |  |
|   |   | ii  | 0e5a511   | <b>1</b><br><b>(AO 1.2)</b> |  |
| g | i |     | SELECT passwordHash FROM users WHERE name = 'DenverJ34'; DROP TABLE users; --'  | <b>1</b><br><b>(AO 1.2)</b> |  |
|   |   | ii  | Gets passwordHash for username DenverJ34 (1)<br>then deletes the table called users. (1)  | <b>2</b><br><b>(AO 3.3)</b> |  |
|   |   | iii | Computer Misuse Act   | <b>1</b><br><b>(AO 1.1)</b> |  |
| 9 | a |     | $(\neg A \wedge \neg D) \vee (A \wedge B \wedge C) \vee (A \wedge \neg B \wedge \neg C \wedge \neg D)$<br>One mark for each bracketed section.<br>One mark for them being joined with ORs | <b>4</b><br><b>(AO 1.2)</b> |  |
|   | b | i   | A   | <b>1</b><br><b>(AO 1.1)</b> |  |
|   |   | ii  | $\neg(A \vee B)$  | <b>1</b><br><b>(AO 1.1)</b> |  |
|   |   | iii | $A \vee B$  | <b>1</b><br><b>(AO 1.1)</b> |  |

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| 10 | a |  <p data-bbox="353 427 795 494">One AND one NOT gate used (1)<br/>In correct configuration (1)</p> | <p data-bbox="1070 188 1176 255">2<br/>(AO 1.2)</p>   |  |
|    | b | <p data-bbox="353 518 683 550">To store the state of a bit</p>   | <p data-bbox="1070 518 1176 585">1<br/>(AO1.1)</p>    |  |
|    | c |  <p data-bbox="353 1021 929 1053">One mark for each two correct clock cycles.</p>                  | <p data-bbox="1070 646 1176 713">3<br/>(AO2.2.)</p>   |  |
| 11 | a | <p data-bbox="302 1114 481 1145">i 10101011</p>  | <p data-bbox="1070 1114 1176 1181">1<br/>(AO1.2)</p>  |  |
|    |   | <p data-bbox="302 1204 414 1236">ii 171</p>  | <p data-bbox="1070 1204 1176 1272">1<br/>(AO 1.2)</p> |  |
|    | b | <p data-bbox="302 1295 481 1327">i 11110111</p>  | <p data-bbox="1070 1295 1176 1362">1<br/>(AO 1.2)</p> |  |



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|    | ii | 10001001   | 1<br>(AO 1.2)   |  |
| c  | i  | Not Normalised   | 1<br>(AO 1.2)   |  |
|    | ii | (Mantissa) Starts with 00 (normalised numbers start 01 or 10)  | 1<br>(AO 1.2)   |  |
| d  |    | <p>Exponent of first number is 3 (1)<br/>                     Making it 0100.1100 (1)<br/>                     Exponent of second number is 2 (1)<br/>                     Making it 010.01010 (1)</p> $  \begin{array}{r}  \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{.} \phantom{0} \phantom{1} \phantom{1} \phantom{0} \phantom{1} \phantom{0} \\  \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{.} \phantom{0} \phantom{1} \phantom{1} \phantom{0} \phantom{1} \phantom{0} \\  \hline  0 \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{.} \phantom{0} \phantom{1} \phantom{1} \phantom{0} \phantom{1} \phantom{0} \\  \hline  0 \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{.} \phantom{0} \phantom{1} \phantom{1} \phantom{0} \phantom{1} \phantom{0}  \end{array}  $ <p>Subtract numbers (1)<br/>                     Normalised is 01001110 0010 (1)</p> | 5<br>(AO 1.2)   | Accept any sensible method (eg converting one number to have same exponent as other and subtracting) with correct answer for full marks.   |
| 12 |    | <p><b>Mark Band 3–High Level (9-12 marks)</b><br/>                     The candidate demonstrates a thorough knowledge and understanding of methods of utilising large amounts of computing power. The material is generally accurate and detailed.</p> <p>The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation.</p> <p>The candidate is able to weigh up both sides of the argument which results in a supported and realistic judgment as to which approaches to provide increasingly larger amounts of computing power are</p>  | <p>2<br/>(AO1.1)<br/>                     2<br/>(AO1.2)<br/>                     3 (AO2.1)<br/>                     5 (AO3.3)</p> | <p><i>Answers may include, but are not limited to, some of the points below.</i></p> <p><b>AO1: Knowledge and Understanding</b><br/>                     Processors have increasingly large clock speeds and can be overclocked.<br/>                     Processors can have multiple cores.<br/>                     Super computers can have multiple processors (and GPUs).<br/>                     GPUs can be applied to problems other than graphics processing.<br/>                     Problems can be distributed across a number of computers working together.</p> <p><b>AO2.1: Application</b><br/>                     Having multiple cores can speed up smaller problems but this will not be enough for larger problems.<br/>                     Supercomputers are prohibitively expensive to buy</p> |

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|  | <p>best.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p><b>Mark Band 2-Mid Level (5-8 marks)</b><br/>The candidate demonstrates reasonable knowledge and understanding of methods of utilising large amounts of computing power; the material is generally accurate but at times underdeveloped.</p> <p>The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation.</p> <p>The candidate makes a reasonable attempt to come to a conclusion showing some recognition of which approaches to provide increasingly larger amounts of computing power are best.</p> <p><i>There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.</i></p> <p><b>Mark Band 1-Low Level (1-4 marks)</b><br/>The candidate demonstrates a basic knowledge of methods of utilising large amounts of computing power; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided.</p> <p>The candidate provides nothing more than an</p> | <p>and run for all but large organisations.<br/>GPUs are becoming a cost efficient way of tackling problems. GPUs tend to have large number of cores so can run on highly parallelisable problems... ..but only where the same instruction is being applied to multiple pieces of data (SIMD)</p> <p><b>AO3.3: Evaluation</b><br/>Increased clock speed is limited to smaller problems. Even doubling the clock speed would only halve the time taken. Parallel processing isn't suited to all problems. Most problems are only partially parallelisable. Writing algorithms for parallel processing is more challenging than GPUs suited to a subset of science/ engineering problems where the same calculation is repeated on multiple data sets.</p> |
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|  |  | <p>unsupported assertion.</p> <p><i>The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</i></p> <p><b>0 marks</b><br/>No attempt to answer the question or response is not worthy of credit.</p> |  |  |
|--|--|--|--|--|

| Question | Assessment Objectives |       |       |       |       |       |       | Total |
|----------|-----------------------|-------|-------|-------|-------|-------|-------|-------|
|          | AO1.1                 | AO1.2 | AO2.1 | AO2.2 | AO3.1 | AO3.2 | AO3.3 |       |
| 1ai      | 2                     |       |       |       |       |       |       | 2     |
| 1aii     |                       | 4     |       |       |       |       |       | 4     |
| 1bi      | 1                     |       |       |       |       |       |       | 1     |
| 1bii     |                       | 5     |       |       |       |       |       | 5     |
| 2a       |                       | 2     |       |       |       |       |       | 2     |
| 2b       |                       | 3     |       |       |       |       |       | 3     |
| 2c       |                       | 3     |       |       |       |       |       | 3     |
| 2d       |                       | 2     |       |       |       |       |       | 2     |
| 3ai      |                       |       |       | 1     |       |       |       | 1     |
| 3aii     |                       |       |       | 1     |       |       |       | 1     |
| 3b       | 2                     |       |       |       |       |       |       | 2     |
| 3c       |                       |       |       | 2     |       | 1     |       | 3     |
| 4a       |                       | 1     |       |       |       |       |       | 1     |
| 4b       |                       |       |       |       |       | 3     |       | 3     |
| 4c       |                       |       |       |       |       | 5     |       | 5     |
| 5a       |                       |       | 1     |       |       |       |       | 1     |
| 5b       |                       |       |       |       | 3     |       |       | 3     |
| 5c*      | 2                     | 2     | 2     |       |       |       | 3     | 9     |
| 6a m     |                       | 2     |       |       |       |       |       | 2     |
| 6b m     |                       | 2     |       |       |       |       |       | 2     |
| 6c       |                       | 1     | 1     |       |       |       |       | 2     |
| 6d       |                       | 4     |       |       |       |       |       | 4     |
| 7a       |                       |       |       | 2     |       |       |       | 2     |
| 7b       |                       |       |       | 3     |       |       |       | 3     |
| 7c       |                       |       |       | 3     |       |       |       | 3     |
| 7d       |                       | 1     |       |       |       | 5     |       | 6     |
| 8a       |                       |       |       |       | 3     |       |       | 3     |
| 8b       |                       |       |       | 2     |       |       |       | 2     |
| 8c*      | 2                     | 2     | 2     |       |       |       | 3     | 9     |
| 8d       |                       |       |       | 3     |       |       | 2     | 5     |
| 8ei      |                       |       | 2     |       |       |       |       | 2     |
| 8eii     |                       |       |       | 2     |       |       |       | 2     |
| 8fi      |                       | 1     |       |       |       |       |       | 1     |
| 8fii     |                       | 1     |       |       |       |       |       | 1     |
| 8gi      |                       | 1     |       |       |       |       |       | 1     |
| 8gii     |                       |       |       |       |       |       | 2     | 2     |
| 8giii    | 1                     |       |       |       |       |       |       | 1     |
| 9a m     |                       | 4     |       |       |       |       |       | 4     |
| 9bi m    | 1                     |       |       |       |       |       |       | 1     |
| 9bii m   | 1                     |       |       |       |       |       |       | 1     |
| 9biii m  | 1                     |       |       |       |       |       |       | 1     |
| 10a m    |                       | 2     |       |       |       |       |       | 2     |
| 10b      | 1                     |       |       |       |       |       |       | 1     |
| 10c      |                       |       |       | 3     |       |       |       | 3     |

|                |    |    |    |    |   |    |    |     |
|----------------|----|----|----|----|---|----|----|-----|
| <i>11ai m</i>  |    | 1  |    |    |   |    |    | 1   |
| <i>11aii m</i> |    | 1  |    |    |   |    |    | 1   |
| <i>11bi m</i>  |    | 1  |    |    |   |    |    | 1   |
| <i>11bii m</i> |    | 1  |    |    |   |    |    | 1   |
| <i>11ci m</i>  |    | 1  |    |    |   |    |    | 1   |
| <i>11cii m</i> |    | 1  |    |    |   |    |    | 1   |
| <i>11d m</i>   |    | 5  |    |    |   |    |    | 5   |
| 12*            | 2  | 2  | 3  |    |   |    | 5  | 12  |
| <b>TOTALS</b>  | 16 | 56 | 11 | 22 | 6 | 14 | 15 | 140 |

\* = extended response

*m* = mathematical content

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