

GCE AS

# WJEC Eduqas GCE AS in COMPUTER SCIENCE

ACCREDITED BY OFQUAL

## SPECIMEN ASSESSMENT MATERIALS

Teaching from 2015



# Contents

	Page
Question Papers	
COMPONENT 1: Fundamentals of Computer Science	5
COMPONENT 2: Practical Programming to Solve Problems	23
Mark Schemes	
COMPONENT 1: Fundamentals of Computer Science	32
COMPONENT 2: Practical Programming to Solve Problems	45



Candidate Name	Centre Number					Candidate Number				



**AS COMPUTER SCIENCE**

**COMPONENT 1**

**Fundamentals of Computer Science**

**SPECIMEN PAPER**

**2 hours**



### **INSTRUCTIONS TO CANDIDATES**

Answer ALL questions.

Write your name, centre number and candidate number in the spaces at the top of this page.

Write your answers in the spaces provided in this booklet.

### **INFORMATION FOR CANDIDATES**

The number of marks is given in brackets at the end of each question or part-question. You are advised to divide your time accordingly.

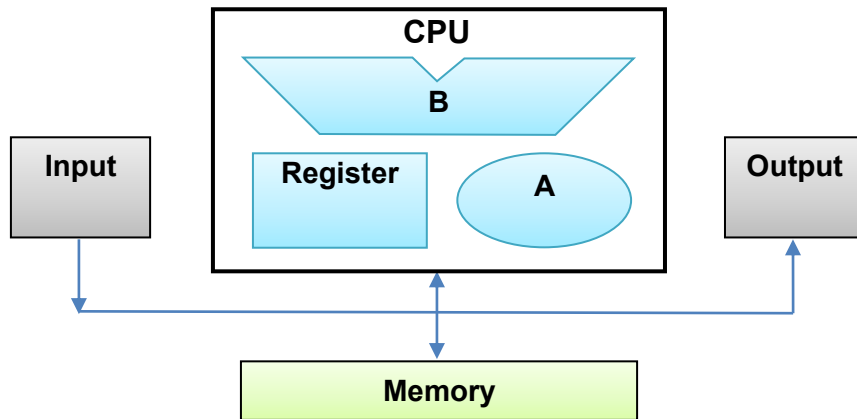
The total number of marks available is 100.

You are reminded of the need for good English and orderly, clear presentation in your answers.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

Answer *all* questions

1. Below is an incomplete diagram of a typical Von Neumann architecture computer.



(a) Identify and explain the function of components A and B above. [4]

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(b) The following data is stored in a 16-bit register.

1001 0110 1101 1011

Name the logical operation and draw the truth table required to clear this register.  
Include a worked example of clearing the register with the data above.

[3]

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2. (a) Describe the importance of standard network protocols. [2]

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(b) Describe the use of the following protocols: [3]

(i) **IMAP:** .....

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(ii) **DHCP:** .....

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(iii) **UDP:** .....

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4. (a) Different data transmission methods are used by computer systems. Identify the most suitable transmission method for the following scenarios and explain their suitability.

(i) Sending sound to a speaker system. [3]

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(ii) A video conferencing call. [3]

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(b) Describe what is meant by the terms multiplexing and switching. [3]

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(c) Identify three typical items contained in a TCP/IP packet and describe their purpose. [6]

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5. (a) Using binary addition, calculate the number that would result from adding  
00100101 and 00111100

Convert the result into hexadecimal. [2]

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- (b) Assuming that 1 is used to indicate a negative number, show how the negative number  $-13_{10}$  will be represented using sign/magnitude in an 8 bit register. [1]

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- (c) Integers can also be represented using two's complementation.

Describe, using an example, how the two's complement of a binary number is derived. [2]

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- (d) (i) Give an advantage and disadvantage of using floating point form rather than integer form. [2]

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- (ii) Real numbers stored in floating point form can be stored using 16 bits as shown below:

<p><b>Mantissa</b> (12 bits in two's complement form. The binary point in the mantissa is immediately after the left bit.)</p>	<p><b>Exponent</b> (4 bits in two's complement form.)</p>
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Convert the number 63.25 into this floating point form. [2]

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- (iii) In a different computer system, the following is a floating point representation of a number, using an 8 bit mantissa and a 4 bit exponent:

0•1011000 0101

Calculate the mantissa, exponent and decimal equivalent of the number. [3]

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9. Explain the role of an Integrated Development Environment (IDE). Describe the purpose of **three** typical features of an IDE. [4]

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10. (a) Explain how a bubble sort operates. [2]

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- (b) An algorithm is written for a bubble sort in one particular application. The input to the algorithm is a set of 6 positive integers.

One set of data which would test this algorithm is:

<b>BubbleSortArray</b>					
45	32	5	35	19	62
(0)	(1)	(2)	(3)	(4)	(5)

Write down two other sets of data which will more fully test the algorithm. [2]

<b>DataSet1</b>					
(0)	(1)	(2)	(3)	(4)	(5)

<b>DataSet2</b>					
(0)	(1)	(2)	(3)	(4)	(5)



12. An organisation is responsible for paying its employees and calculating their tax and national insurance. Each employee is paid a different hourly rate.

The employee pay details, including their hourly rate are stored in a master file. The number of hours each employee works each month is entered and stored in a transaction file.

At the end of each month the hours worked by the employee and the hourly rate are used to calculate the month's pay, tax and national insurance.

- (a) Explain why sequential file organisation is the most suitable for the master file and why serial file organisation is the most suitable for the transaction file. [2]

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- (b) Give one item of data that would appear in both the transaction file and the master file. [1]

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- (c) Draw a clearly labelled diagram below which shows how the transaction file and the master file are used to produce a pay slip for every employee. [4]







Candidate Name	Centre Number				Candidate Number			



**AS COMPUTER SCIENCE**

**COMPONENT 2**

**Practical Programming to Solve Problems**

**SPECIMEN PAPER**

**2 hours 15 minutes**



### **INSTRUCTIONS TO CANDIDATES**

Answer **ALL** of questions 1, 2 and 3.

Answer only **ONE** section of question 4. This must be the section which requires you to use the Integrated Development Environment (IDE) of your chosen programming language.

You will need to record all of your answers to questions 1, 2 and 3 in a word processed document.

### **INFORMATION FOR CANDIDATES**

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the need for good English and orderly, clear presentation in your answers.

The total number of marks available is 60.

You will need a computer with an installed functional copy of the Integrated Development Environment (IDE) appropriate to your chosen programming language and word processing software.

Remember to save your work regularly.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

**Scenario**



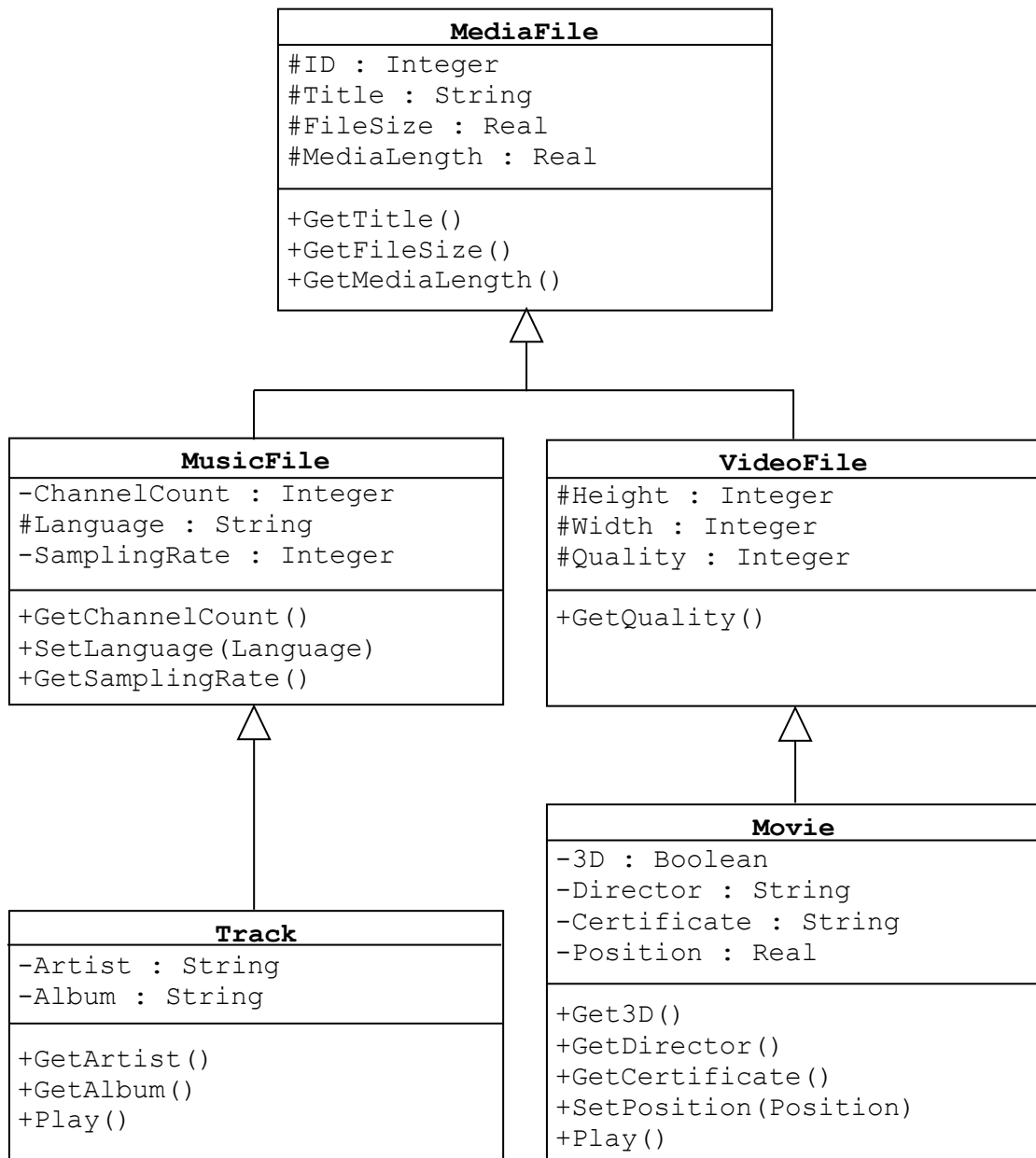
**MEDIA STREAMING**

**SmashHits** is a new online company that will provide digitally streamed media, such as movies and music, to its customers.

They intend to provide a media on demand service with instant access to movies and music, based around customers' preferences. For movies, these preferences could be favourite Director, Genre, or Lead Actor. In addition to this information other useful items of data such as movie title, duration (in minutes), release date, age rating, whether the film is available in 3D or not, need to be included. Once subscribed to the service, customers pay a flat monthly fee for access to the entire library of media. They have arranged copyright licences with the relevant rights holders to have access to the media, and have sub-contracted the streaming software out to technology experts. However, they do not have a fully functioning computer system that can provide the customisation and search facilities that they wish to offer.



1. The following class diagram represents the relationships between some of the classes that **SmashHits** have decided to create.



- (a) State the name of an identifier for a subclass. [1]
- (b) State the name of an appropriate identifier for a variable that is used to store the following:
- (i) TRUE [1]
  - (ii) 1080 [1]
  - (iii) 34.2 [1]
- (c) Explain the significance of the “-” in the property “-Album : String” in the class **Track** above. [2]
- (d) An object called **Track1** is instantiated from the class **Track**.

Applying the concept of inheritance, list **all** of the methods that would be contained within the the object **Track1**. [3]

(e) An object called `Movie1` is instantiated from the class `Movie`.

Applying the concept of inheritance, list **all** of the attributes that would be contained within the object `Movie1`. [3]

(f) Explain why the method `SetPosition` is required within the class `Movie`. [2]

(g) Give an example from the class diagram above where a parameter is used.

Name and explain two different methods of passing this parameter to the method. [5]

2. Each **SmashHits** customer has a unique five digit account number. An initial attempt at calculating a check digit is shown below:

- The four digits are added together to produce a single or double digit number.
- The check digit is either:
  - the single digit produced, for example, 2124 gives the check digit 9
  - the last digit of the double digit number produced, for example, 2546 gives 17, so the check digit is 7.

(a) Find the check digit for the code 7546. [1]

(b) Giving examples, explain the problem with the check digit algorithm given above. [5]

(c) *Below is an improved algorithm which generates a check digit for a customer account number.*

```

1  declare A array(1..4) of integer
2  set CustomerNumber = 0
3  set i = 0
4  set Total = 0
5  set CheckDigit = -1
6
7  input CustomerNumber
8
9  A(1)= FirstDigit(CustomerNumber) {split CustomerNumber into array}
10 A(2)= SecondDigit(CustomerNumber)
11 A(3)= ThirdDigit(CustomerNumber)
12 A(4)= FourthDigit(CustomerNumber)
13
14 for i = 1 to 4
15
16   if i MOD 2 = 0 then
17     Total = Total + A(i)
18   else
19     Total = Total + (A(i) * 2)
20   end if
21
22 next i
23
24 CheckDigit = (Total * 9) MOD 10
25
26 output CheckDigit

```

Test data:

**CustomerNumber = 6748**

Copy and complete the table below to show how each variable changes when the algorithm is tested by dry-running the test data given above.

i	A[i]	Total	CheckDigit

[4]

3. **SmashHits** is concerned that their customers will be shown duplicate results on screen when searching for movies.

Using a recognised convention, design an algorithm that performs a search for duplicate consecutive integers in a pre-populated and sorted array. If a duplicate is found, the algorithm should output the location of the duplicate and the word "TRUE". If a duplicate is not found, the algorithm should output the word "FALSE". [11]

4. Select the programming language of your choice from section **a**, **b** or **c** and answer **all** questions in your chosen section.

(a) **Visual Basic**

**SmashHits** wants a computer system to be developed using **Visual Basic** that meets the requirements outlined below:

- The ability to store movie details
- The ability to count the number of movies with particular attributes, e.g. the total number of “Romance” films that are available
- The ability to store customer contact details
- The ability to search customer contact details.

- (i) Open the file `MovieGenres.sln`
- Read through the code and familiarise yourself with its contents
  - The file contains incomplete code that counts the number of movies with particular attributes.

**Complete this code.** [4]

**Remember to save the changes made to the file `MovieGenres.sln`**

- (ii) Create a new form that will allow **SmashHits** to:
- Input customer details
  - Validate customer details
  - Store customer details on disc in a text file called `customerdetails.txt`
  - Confirm storage of customer details in a text file called `customerdetails.txt`
  - Retrieve specified customer details from disc.

[12]

**Save your new form and annotations as `CustomerDetails.sln`**

- (iii) Using the internal facility of your chosen language, add annotated listings to your code from question 4a(ii) that would clearly explain the design of your program to another software developer.

[4]

**Save your annotations in the file `CustomerDetails.sln`**

(b) **Java**

**SmashHits** wants a computer system to be developed using **Java** that meets the requirements outlined below:

- The ability to store movie details
  - The ability to count the number of movies with particular attributes, e.g. the total number of “Romance” films that are available
  - The ability to store customer contact details
  - The ability to search customer contact details.
- (i) Open the file `MovieGenres.java`
- Read through the code and familiarise yourself with its contents.
  - The file contains incomplete code that counts the number of movies with particular attributes

**Complete this code.** [4]

**Remember to save the changes made to the file `MovieGenres.java`**

(ii) Create a new application that will allow **SmashHits** to:

- Input customer details
- Validate customer details
- Store customer details on disc in a text file called `customerdetails.txt`
- Confirm storage of customer details in a text file called `customerdetails.txt`
- Retrieve specified customer details from disc.

[12]

**Save your new application as `CustomerDetails.java`**

(iii) Using the internal facility of your chosen language, add annotated listings to your code from question 4*b(ii)* that would clearly explain the design of your program to another software developer.

[4]

**Save your annotations in the file `CustomerDetails.java`**

## (c) Python

**SmashHits** wants a computer system to be developed using **Python** that meets the requirements outlined below:

- The ability to store movie details
- The ability to count the number of movies with particular attributes, e.g. the total number of “Romance” films that are available
- The ability to store customer contact details
- The ability to search customer contact details.

- (i) Open the file `MovieGenres.py`
- Read through the code and familiarise yourself with its contents
  - The file contains incomplete code that counts the number of movies with particular attributes

**Complete this code.** [4]

**Remember to save the changes made to the file `MovieGenres.py`**

- (ii) Create a new application that will allow **SmashHits** to:

- Input customer details
- Validate customer details
- Store customer details on disc in a text file called `customerdetails.txt`
- Confirm storage of customer details in a text file called `customerdetails.txt`
- Retrieve specified customer details from disc.

[12]

**Save your new application as `CustomerDetails.py`**

- (iii) Using the internal facility of your chosen language, add annotated listings to your code from question 4c(ii) that would clearly explain the design of your program to another software developer.

[4]

**Save your annotations in the file `CustomerDetails.py`**

## COMPONENT 1 Fundamentals of Computer Science

### MARK SCHEME

#### Guidance for examiners

##### Positive marking

It should be remembered that learners are writing under examination conditions and credit should be given for what the learner writes, rather than adopting the approach of penalising him/her for any omissions. It should be possible for a very good response to achieve full marks and a very poor one to achieve zero marks. Marks should not be deducted for a less than perfect answer if it satisfies the criteria of the mark scheme.

For questions that are objective or points-based the mark scheme should be applied precisely. Marks should be awarded as indicated and no further subdivision made.

For band marked questions in **Component 1**, mark schemes are in two parts.

Part 1 is advice on the indicative content that suggests the range of computer science concepts, theory, issues and arguments which may be included in the learner's answers. These can be used to assess the quality of the learner's response.

Part 2 is an assessment grid advising bands and associated marks that should be given to responses which demonstrate the qualities needed in AO1, AO2 and AO3. Where a response is not creditworthy or not attempted it is indicated on the grid as mark band zero.



## **Banded mark schemes**

Banded mark schemes are divided so that each band has a relevant descriptor. The descriptor for the band provides a description of the performance level for that band. Each band contains marks.

Examiners should first read and annotate a learner's answer to pick out the evidence that is being assessed in that question. Once the annotation is complete, the mark scheme can be applied.

This is done as a two stage process.

### **Stage 1 – Deciding on the band**

When deciding on a band, the answer should be viewed holistically. Beginning at the lowest band, examiners should look at the learner's answer and check whether it matches the descriptor for that band. Examiners should look at the descriptor for that band and see if it matches the qualities shown in the learner's answer. If the descriptor at the lowest band is satisfied, examiners should move up to the next band and repeat this process for each band until the descriptor matches the answer.

If an answer covers different aspects of different bands within the mark scheme, a 'best fit' approach should be adopted to decide on the band and then the learner's response should be used to decide on the mark within the band. For instance if a response is mainly in band 2 but with a limited amount of band 3 content, the answer would be placed in band 2, but the mark awarded would be close to the top of band 2 as a result of the band 3 content.

Examiners should not seek to mark candidates down as a result of small omissions in minor areas of an answer.

### **Stage 2 – Deciding on the mark**

Once the band has been decided, examiners can then assign a mark. During standardising (marking conference), detailed advice from the Principal Examiner on the qualities of each mark band will be given. Examiners will then receive examples of answers in each mark band that have been awarded a mark by the Principal Examiner. Examiners should mark the examples and compare their marks with those of the Principal Examiner.

When marking, examiners can use these examples to decide whether a learner's response is of a superior, inferior or comparable standard to the example. Examiners are reminded of the need to revisit the answer as they apply the mark scheme in order to confirm that the band and the mark allocated is appropriate to the response provided.

Indicative content is also provided for banded mark schemes. Indicative content is not exhaustive, and any other valid points must be credited. In order to reach the highest bands of the mark scheme a learner need not cover all of the points mentioned in the indicative content but must meet the requirements of the highest mark band. Where a response is not creditworthy, that is contains nothing of any significance to the mark scheme, or where no response has been provided, no marks should be awarded.

Q	Answer	Mark	AO1	AO2	AO3	Tot																								
1a	<p><u>Component A</u></p> <ul style="list-style-type: none"> <li>• <b>Name:</b> Control unit</li> <li>• <b>Explanation:</b> Fetches each instruction in sequence, decodes and synchronises it before executing it by sending control signals to other parts of the computer.</li> </ul> <p><u>Component B</u></p> <ul style="list-style-type: none"> <li>• <b>Name:</b> Arithmetic Logic Unit (<i>Accept</i> ALU)</li> <li>• <b>Explanation:</b> The processing and manipulation of data which normally consists of arithmetic operations or logical comparisons, allowing a program to take decisions</li> </ul>	1 1  1 1	1.1a 1.1b  1.1a 1.1b			4																								
1b	<p><b>Logical operator: AND</b></p> <p>Truth table</p> <table border="1"> <thead> <tr> <th>Input (A)</th> <th>Input (B)</th> <th>Output (A AND B)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> </tr> </tbody> </table> <p>Table could also be written as:</p> <table border="1"> <tbody> <tr> <td></td> <td>0</td> <td>1</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> </tr> </tbody> </table> <p>Original      1001 0110 1101 1011 Mask            0000 0000 0000 0000 <b>Result</b>        0000 0000 0000 0000</p>	Input (A)	Input (B)	Output (A AND B)	0	0	0	0	1	0	1	0	0	1	1	1		0	1	0	0	0	1	0	1	1  1  1	1.1a	2.1a		3
Input (A)	Input (B)	Output (A AND B)																												
0	0	0																												
0	1	0																												
1	0	0																												
1	1	1																												
	0	1																												
0	0	0																												
1	0	1																												
2a	<p>Description should include the following:</p> <p>A protocol is a standard set of rules that enable devices to communicate with each other.</p> <p>Network protocols are important as programs where a programmer invents their own protocol would be unable to communicate with other programs.</p>	1  1	1.1b  1.1b			2																								
2bi	<b>IMAP</b> – transferring emails ( <b>NOT</b> messages) between computer systems (via the internet).	1	1.1a			1																								
2bii	<b>DHCP</b> – assigning dynamic IP addresses to devices on a network.	1	1.1a			1																								
2biii	<b>UDP</b> – sending datagrams across a network with very few error recovery services.	1	1.1a			1																								
3a	<p>Data is split and stored on different parts of the disc.</p> <p>If data is fragmented, it takes longer for the disc heads to move between parts of the file, which slows the process of loading it.</p>	1  1	1.1a  1.1b			2																								

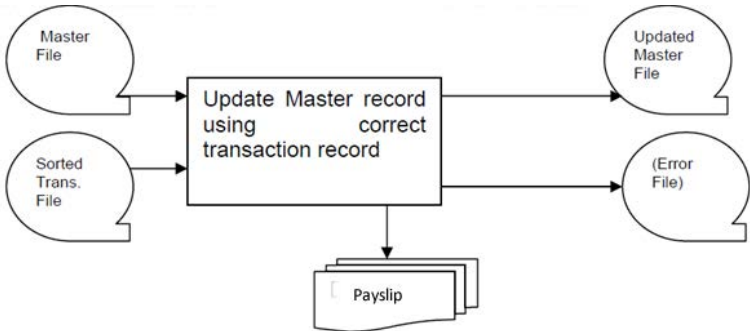
Q	Answer	Mark	AO1	AO2	AO3	Tot
3b	<ul style="list-style-type: none"> <li>SSD uses direct access to data (files) so there would be no improvement in read times as there's no physical read-head to move</li> <li>Defragmentation may perform "trim" command which may slightly improve the speed of future write operations</li> <li>SSD is currently made out NAND based flash memory, NAND based flash memory has a limited lifespan – defragmentation process may shorten its lifespan.</li> </ul>	1 1 1	1.1b 1.1b 1.1b			3
4ai	Simplex. Transmission of data is in one direction only Which would allow sound to be sent by the computer to the speakers with no feedback required	1 1 1		2.1a 2.1a 2.1a		3
4aii	Full-duplex. Simultaneous transmission of data in both directions is possible Which would allow both video and sound to be transmitted to all members of the conference at the same time.	1 1 1		2.1a 2.1a 2.1a		3
4b	<ul style="list-style-type: none"> <li>Multiplexing is where several independent data sources are <b>combined</b></li> <li>to be sent along a <b>single route</b> to a specific destination</li> <li>Switching is the process of examining packets and routing data to a specific destination.</li> </ul>	1 1 1	1.1b 1.1b 1.1b			3
4c	Any <b>three</b> of: <ul style="list-style-type: none"> <li>Source address <ul style="list-style-type: none"> <li>allows tracing of sender</li> </ul> </li> <li>Destination address <ul style="list-style-type: none"> <li>allows packet to be routed to destination</li> </ul> </li> <li>Re-assembly information / packet number <ul style="list-style-type: none"> <li>allows packets to be assembled in correct order</li> </ul> </li> <li>Tracking information <ul style="list-style-type: none"> <li>allows route taken to be traced</li> </ul> </li> <li>The data itself <ul style="list-style-type: none"> <li>required as packet can contain meaningful data</li> </ul> </li> <li>Checksum <ul style="list-style-type: none"> <li>allows checking of data for errors</li> </ul> </li> </ul> 1 mark for identifying item 1 mark for description of purpose	3 3	1.1a 1.1b			6
5a	$\begin{array}{r} 00100101 \\ 00111100 + \\ \hline 01100001 \end{array}$ Hexadecimal number = 61	1 1		2.1a 2.1a		2
5b	10001101	1		2.1a		1







Q	Answer	Mark	AO1	AO2	AO3	Tot
10b	<p>Any <b>two</b> of:  <b>45 32 5 32 19 62 (duplicated number)</b>  <b>5 19 32 35 45 62 (ascending order) or</b>  <b>62 45 35 32 19 5 (descending order)</b>  <b>32 45 19 62 -35 5 (negative number)</b></p> <p><b>Accept (but cannot gain two marks for repetition of these (e.g. if two arrays showing two different sets of more than 6 integers)):</b>            Example with:</p> <ul style="list-style-type: none"> <li>• &lt;6 or &gt;6 integers</li> <li>• Decimal(s)</li> <li>• Letters / other characters</li> </ul>	1 1		2.1b 2.1b		2
11	<p>Summary should draw on any <b>eight</b> of the following points:</p> <ul style="list-style-type: none"> <li>• Communicates with and sends data output to a printer / monitor / other valid output device</li> <li>• Communicates with and receives data input to a keyboard / mouse / other valid input device</li> <li>• In spooling, data is stored on hard disc / in memory / stored in a queue / in a buffer</li> <li>• Manages backing store by ensuring that data is stored and can be retrieved correctly from any disc drive</li> <li>• O/S creates and maintains a filing system such as FAT or NTFS</li> <li>• Organise files in a hierarchical directory structure</li> <li>• O/S offers compression which can be used to save disc space</li> <li>• The O/S manages memory (RAM) by ensuring all programs and data including itself is stored in correct memory locations/do not try to occupy the same memory location</li> <li>• The O/S manages memory (RAM) by ensuring all programs and data have enough memory allocated</li> <li>• The O/S can utilise virtual memory when not enough memory (RAM) is available to run a program</li> <li>• Ensures different processes can utilise the CPU and do not interfere with each other or crash</li> <li>• On a multi-tasking O/S, the O/S ensures that all tasks appear to run simultaneously</li> </ul>	8	1.1b			8

Q	Answer	Mark	AO1	AO2	AO3	Tot
12a	Sequential file is most suitable because employee records need to be accessed in order for update process.  Serial file most suitable because hours worked are entered in no particular order.	1  1		2.1a  2.1a		2
12b	Employee ID / Number	1		2.1a		1
12c	<ul style="list-style-type: none"> <li>Two input files: old master file and <b>sorted</b> transaction file</li> <li>Explanation of update process i.e. <b>comparison</b> record by record with <b>corresponding</b> master record - update master record where appropriate</li> <li>New (updated) master file and pay slip as output – arrows must clearly show flow of record</li> <li>After last transaction record is processed, remaining old master records are read from old master file and written to new master file</li> </ul> 	1  1  1  1		2.1b  2.1b  2.1b  2.1b		4



Q	Answer	Mark	AO1	AO2	AO3	Tot
13	<p>Comparison can refer to commonalities and differences between changeover methods as referenced in the indicative content.</p> <p><b>Indicative content</b></p> <p>Direct “big bang” approach can be adopted - sudden change to new system</p> <ul style="list-style-type: none"> <li>○ Could be used where a failure would not be catastrophic</li> <li>○ Can be cheaper to implement</li> <li>○ New system is available immediately if required</li> <li>○ Can be the least disruptive if implemented well</li> <li>○ New system may not work as well until staff are fully used to using it</li> <li>○ If new system fails organisation have no system which could be costly or dangerous</li> </ul> <p>Parallel running - both systems running together for a time</p> <ul style="list-style-type: none"> <li>○ Safest option as if new system fails they still have existing system</li> <li>○ New system is available immediately if required</li> <li>○ The outputs from the old and new systems can be compared to check that the new system is running correctly</li> <li>○ Expensive as require temporary staff or overtime for current staff to operate both systems</li> <li>○ Could cause confusion for staff / customers having two systems</li> </ul> <p>Phased changeover - part-by-part (by functionality)</p> <ul style="list-style-type: none"> <li>○ Allows users to gradually get used to the new system</li> <li>○ Staff training can be done in stages</li> <li>○ All staff can focus on one area to resolve any problems</li> <li>○ Problems can be fixed quicker as more experts to resolve one functionality problem at a time</li> <li>○ Difficulties identified in one area can be resolved and managed in next area</li> </ul>	10	1.1b			13

	<ul style="list-style-type: none"> <li>○ Might cause problems in the changeover period when they need to communicate with each other and have different systems</li> <li>○ Slower to get new system up and running compared to some other methods</li> <li>○ If a part of the new system fails, there is no back-up system, so data can be lost</li> </ul> <p>Pilot changeover - part-by-part (by part of the organisation)</p> <ul style="list-style-type: none"> <li>○ All features of the new system can be fully trialled</li> <li>○ If something goes wrong with the new system, only a small part of the organisation is affected</li> <li>○ The staff who were part of the pilot scheme can help train other staff.</li> <li>○ All staff can focus on one area to resolve any problems</li> <li>○ Difficulties identified in one area can be resolved and managed in next area</li> <li>○ For the office / department doing the pilot, there is no back-up system if things go wrong</li> <li>○ Might cause problems in the changeover period when they need to communicate with each other and have different systems</li> <li>○ Slower to get new system up and running compared to some other methods</li> </ul> <p>Consideration of processes that would protect the security and integrity of data during changeover:</p> <ul style="list-style-type: none"> <li>● Disaster recovery policies in place             <ul style="list-style-type: none"> <li>○ backups should be in place for both old and new system</li> <li>○ archiving off-site</li> <li>○ backup system – compatible with old and new system</li> <li>○ staff need to be trained to be able to recover data from systems successfully</li> </ul> </li> <li>● Do archived files need to be restored to new system</li> <li>● Data redundancy occurs in computer systems where the same data is stored in two or more places which leads to inconsistency.             <ul style="list-style-type: none"> <li>○ this could be a problem when the same data is stored on two different systems</li> </ul> </li> <li>● Standard backup procedures             <ul style="list-style-type: none"> <li>○ e.g. three generations of backup</li> </ul> </li> <li>● Review levels of permitted access             <ul style="list-style-type: none"> <li>○ allow users to read / write to / amend / delete only parts of the system</li> <li>○ allow users to access only certain data</li> </ul> </li> </ul>	3		2.1a		
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Band	AO1.1b Max 10 marks	AO2.1a Max 3 marks
3	<p style="text-align: center;"><b>8-10 marks</b></p> <p>The candidate has:</p> <ul style="list-style-type: none"> <li>• written an extended response that has a sustained line of reasoning which is coherent, relevant, and logically structured</li> <li>• shown clear understanding of the requirements of the question and a clear knowledge of the indicative content. Clear knowledge is defined as a response that provides four to five relevant detailed points on each of two changeover methods, which relate to an extensive amount of the indicative content</li> <li>• addressed the question appropriately with minimal repetition and no irrelevant material</li> <li>• has presented a balanced discussion and justified their answer with examples</li> <li>• effectively drawn together different areas of knowledge, skills and understanding from all relevant areas across the course of study. Effectively drawn together is defined by a response that identifies two methods of changeover and relates these to specific security considerations relevant to those changeover methods</li> <li>• used appropriate technical terminology referring to the indicative content confidently and accurately.</li> </ul>	<p style="text-align: center;"><b>3 marks</b></p> <p>The candidate has:</p> <ul style="list-style-type: none"> <li>• shown clear understanding of the requirements of the question and a clear knowledge the processes that would protect the security and integrity of data during changeover. Clear knowledge is defined as a response that provides three relevant detailed points on the practical implications of managing security and data during the changeover process, which relate to the indicative content.</li> </ul>
2	<p style="text-align: center;"><b>4-7 marks</b></p> <p>The candidate has:</p> <ul style="list-style-type: none"> <li>• written a response that has an adequate line of reasoning with elements of coherence, relevance, and logical structure</li> <li>• shown adequate understanding of the requirements of the question and a satisfactory knowledge of the topic of changeover as specified in the indicative content. Satisfactory knowledge is defined as a response that provides four to seven points across two changeover methods as signalled in the indicative content. Up to five marks could be awarded to a response that provides detailed points on one changeover method</li> <li>• has presented a discussion with limited examples</li> <li>• drawn together different areas of knowledge, skills and understanding from a number of areas across the course of study. Drawn together is defined by a response that identifies two methods of changeover and identifies security considerations, although these may not be relevant to the changeover methods described</li> <li>• used appropriate technical terminology referring to the indicative content.</li> </ul>	<p style="text-align: center;"><b>2 marks</b></p> <p>The candidate has:</p> <ul style="list-style-type: none"> <li>• shown adequate understanding of the requirements of the question and a satisfactory knowledge of the topics of security and integrity of data as specified in the indicative content. Satisfactory knowledge is defined as a response that provides two relevant points on the practical implications of managing security and data during the changeover process, which relate to the indicative content.</li> </ul>

<b>Band</b>	<b>AO1.1b Max 10 marks</b>	<b>AO2.1a Max 3 marks</b>
<b>1</b>	<p style="text-align: center;"><b>1-3 marks</b></p> <p>The candidate has:</p> <ul style="list-style-type: none"> <li>• written a response that that lacks sufficient reasoning and structure</li> <li>• produced a discussion which is not well developed</li> <li>• attempted to address the question but has demonstrated superficial knowledge of the topics specified in the indicative content. Superficial knowledge is defined as a response that provides one to three points on only one changeover method as signalled in the indicative content</li> <li>• used limited technical terminology referring to the indicative content.</li> </ul>	<p style="text-align: center;"><b>1 mark</b></p> <p>The candidate has:</p> <ul style="list-style-type: none"> <li>• attempted to address the question but has demonstrated superficial knowledge of the topics specified in the indicative content. Superficial knowledge is defined as a response that provides one relevant point on the practical implications of managing security and data during the changeover process, which relate to the indicative content.</li> </ul>
<b>0</b>	<p style="text-align: center;"><b>0 marks</b></p> <p>Response not credit worthy or not attempted.</p>	<p style="text-align: center;"><b>0 marks</b></p> <p>Response not credit worthy or not attempted.</p>

## COMPONENT 2 Practical Programming to Solve Problems

### MARK SCHEME

#### Guidance for examiners

##### Positive marking

It should be remembered that learners are writing under examination conditions and credit should be given for what the learner writes, rather than adopting the approach of penalising him/her for any omissions. It should be possible for a very good response to achieve full marks and a very poor one to achieve zero marks. Marks should not be deducted for a less than perfect answer if it satisfies the criteria of the mark scheme.

For questions that are objective or points-based the mark scheme should be applied precisely. Marks should be awarded as indicated and no further subdivision made.

For band marked questions in **Component 2** the assessment grid advises the marks to allocate to responses which demonstrate the qualities needed in AO2 and AO3. There is limited indicative content as learner response will vary significantly, as the choice of solution will differ based on a variety of factors (e.g. IDE used, interface type chosen, file handling routine used). Where a response is not credit worthy or not attempted it is indicated on the grid as mark band zero.

## **Banded mark schemes**

Banded mark schemes are divided so that each band has a relevant descriptor. The descriptor for the band provides a description of the performance level for that band. Each band contains marks.

Examiners should first read and annotate a learner's answer to pick out the evidence that is being assessed in that question. Once the annotation is complete, the mark scheme can be applied.

This is done as a two stage process.

### **Stage 1 – Deciding on the band**

When deciding on a band, the answer should be viewed holistically. Beginning at the lowest band, examiners should look at the learner's answer and check whether it matches the descriptor for that band. Examiners should look at the descriptor for that band and see if it matches the qualities shown in the learner's answer. If the descriptor at the lowest band is satisfied, examiners should move up to the next band and repeat this process for each band until the descriptor matches the answer.

If an answer covers different aspects of different bands within the mark scheme, a 'best fit' approach should be adopted to decide on the band and then the learner's response should be used to decide on the mark within the band. For instance if a response is mainly in band 2 but with a limited amount of band 3 content, the answer would be placed in band 2, but the mark awarded would be close to the top of band 2 as a result of the band 3 content.

Examiners should not seek to mark candidates down as a result of small omissions in minor areas of an answer.

### **Stage 2 – Deciding on the mark**

Once the band has been decided, examiners can then assign a mark. During standardising (marking conference), detailed advice from the Principal Examiner on the qualities of each mark band will be given. Examiners will then receive examples of answers in each mark band that have been awarded a mark by the Principal Examiner. Examiners should mark the examples and compare their marks with those of the Principal Examiner.

When marking, examiners can use these examples to decide whether a learner's response is of a superior, inferior or comparable standard to the example. Examiners are reminded of the need to revisit the answer as they apply the mark scheme in order to confirm that the band and the mark allocated is appropriate to the response provided.

Indicative content is also provided for banded mark schemes. Indicative content is not exhaustive, and any other valid points must be credited. In order to reach the highest bands of the mark scheme a learner need not cover all of the points mentioned in the indicative content but must meet the requirements of the highest mark band. Where a response is not creditworthy, that is contains nothing of any significance to the mark scheme, or where no response has been provided, no marks should be awarded.

Q	Answer	Mark	AO1	AO2	AO3	Tot
1a	Any one of: <ul style="list-style-type: none"> <li>• MusicFile</li> <li>• VideoFile</li> <li>• Track</li> <li>• Movie</li> </ul>	1		2.1a		1
1bi	3D	1		2.1a		1
1bii	Any one of: <ul style="list-style-type: none"> <li>• Height</li> <li>• Width</li> <li>• Quality</li> <li>• ID</li> <li>• SamplingRate</li> <li>• ChannelCount</li> </ul>	1		2.1a		1
1biii	Any one of: <ul style="list-style-type: none"> <li>• FileSize</li> <li>• MediaLength</li> <li>• Position</li> </ul>	1		2.1a		1
1c	The property album is private to that class.  Any one of: <ul style="list-style-type: none"> <li>• Only an object of type Track would be able to make changes to its internal property Album</li> <li>• To read from the property you would need a method within the class that returns the contents (such as GetAlbum may provide) and similar to make changes to the property</li> <li>• To make changes to the property you would need a method within the class that changes its contents.</li> </ul>	1  1		2.1a  2.1b		2
1d	1 mark for all methods within Track: <ul style="list-style-type: none"> <li>• GetArtist()</li> <li>• GetAlbum()</li> <li>• Play()</li> </ul> 1 mark for all methods within superclass MusicFile: <ul style="list-style-type: none"> <li>• GetChannelCount()</li> <li>• SetLanguage()</li> <li>• GetSamplingRate()</li> </ul> 1 mark for all methods within superclass MediaFile: <ul style="list-style-type: none"> <li>• GetTitle()</li> <li>• GetFileSize()</li> <li>• GetMediaLength()</li> </ul>	1  1  1		2.1b  2.1b  2.1b		3
1e	1 mark for all properties within Movie: <ul style="list-style-type: none"> <li>• 3D</li> <li>• Director</li> <li>• Certificate</li> <li>• Position</li> </ul> 1 mark for all properties within superclass VideoFile: <ul style="list-style-type: none"> <li>• Height</li> <li>• Width</li> </ul>	1  1		2.1b  2.1b		3

	<ul style="list-style-type: none"> <li>Quality</li> </ul> <p>1 mark for all properties within superclass MediaFile:</p> <ul style="list-style-type: none"> <li>ID</li> <li>Title</li> <li>FileSize</li> <li>MediaLength</li> </ul>	1		2.1b		
1f	<p>The method SetPosition would be used to change the internal property Position.</p> <p>Position is a private property and therefore to change this you would need a <b>publicly</b> available method such as SetPosition to change it.</p>	1		2.1a		2
1g	<p>1 mark for any 1 example:</p> <ul style="list-style-type: none"> <li>SetLanguage(Language)</li> <li>SetPosition(Position)</li> </ul> <p>When <b>passing by reference</b> to the method <code>SetLanguage(Language) / SetPosition(Position)</code> the <b>address of the parameter Language/Position</b> is passed to the method (rather than the actual value of the data)</p> <p>The other method is <b>by value</b>:  <b>a local copy of the contents of Language/Position is created for the method</b>  <code>SetLanguage(Language) / SetPosition(Position)</code>.</p> <p>Accepted for above point, not expected:  Passing by reference may lead to unintended side effects where the parameter has its value changed in the method named and another method within other classes.</p>	1		2.1a		5
		1		2.1b		
		1		2.1b		
		1		2.1b		
		1		2.1b		



Q	Answer	Mark	AO1	AO2	AO3	Tot																				
2a	2	1		2.1a		1																				
2b	<p>1 mark for each example x 2 1 mark for each correctly calculated check digit x 2</p> <p>For example: Customer number 1: 1234, Check digit 1: 0 Customer number 2: 2134, Check digit 1: 0</p> <p>If the two original customer account numbers contained the same digits in different orders the resulting check digits would be the same.</p>	<p>2 2</p> <p>1</p>		<p>3.1c 3.1c</p> <p>3.1c</p>		5																				
2c	<p>1 mark for each correctly completed row.</p> <table border="1" data-bbox="204 763 995 927"> <thead> <tr> <th>i</th> <th>A[i]</th> <th>Total</th> <th>CheckDigit</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>6</td> <td>12</td> <td>-1</td> </tr> <tr> <td>2</td> <td>7</td> <td>19</td> <td>-1</td> </tr> <tr> <td>3</td> <td>4</td> <td>27</td> <td>-1</td> </tr> <tr> <td>4</td> <td>8</td> <td>35</td> <td>5</td> </tr> </tbody> </table>	i	A[i]	Total	CheckDigit	1	6	12	-1	2	7	19	-1	3	4	27	-1	4	8	35	5	<p>1 1 1 1</p>			<p>3.1c 3.1c 3.1c 3.1c</p>	4
i	A[i]	Total	CheckDigit																							
1	6	12	-1																							
2	7	19	-1																							
3	4	27	-1																							
4	8	35	5																							



Q	Answer	Mark	AO1	AO2	AO3	Total
4ai 4bi 4ci	<b>Indicative content:</b> <ul style="list-style-type: none"> <li>• Reading contents</li> <li>• Comparing Genres to the list</li> <li>• Incrementing the contents of the genre</li> <li>• Outputting the correct number</li> </ul>	4			3.1b	4

Band	AO3.1b Max 4 marks
	<b>4 marks</b>
<b>3</b>	The candidate has: <ul style="list-style-type: none"> <li>• Implemented all the points required as stated in the indicative content</li> <li>• Used and fully exploited the programming facilities of the language</li> <li>• Demonstrated a sound understanding of the appropriate tools and techniques available to them</li> </ul>
<b>2</b>	<b>2-3 marks</b> The candidate has: <ul style="list-style-type: none"> <li>• Implemented the majority of the points required as stated in the indicative content. Majority is defined as a response that provides two or three items of the functionality signalled in the indicative content</li> <li>• Used and exploited the programming facilities of the language</li> <li>• Demonstrated an understanding of the tools and techniques available to them</li> </ul>
<b>1</b>	<b>1 mark</b> The candidate has: <ul style="list-style-type: none"> <li>• Implemented only one of the points required as stated in the indicative content</li> <li>• Used some of the programming facilities of the language</li> <li>• Demonstrated a limited understanding of the tools and techniques available to them</li> </ul>
<b>0</b>	<b>0 marks</b> Response not credit worthy or not attempted.

Q	Answer	Mark	AO1	AO2	AO3	Total
4aii 4bii 4cii	<p><b>Indicative content:</b></p> <ul style="list-style-type: none"> <li>• Input</li> <li>Validation methods of: <ul style="list-style-type: none"> <li>○ Range check</li> <li>○ Format check</li> <li>○ Length check</li> <li>○ Presence check</li> </ul> </li> <li>• Creates a data file called customerdetails.txt</li> <li>• Stores on disc in a text file called customerdetails.txt</li> <li>• Descriptive/useful feedback that file has been saved</li> <li>• Candidates may use custom data types / standard methods</li> <li>• Retrieves data from disc</li> <li>• Retrieves specified customer from disc <ul style="list-style-type: none"> <li>○ Candidates may use Random (direct), serial, or sequential file access</li> </ul> </li> <li>• HCI fit for purpose (Textual or GUI)</li> </ul>	12			3.1b	12

Band	AO3.1b Max 12 marks
	<b>9-12 marks</b>
3	<p>The candidate has:</p> <ul style="list-style-type: none"> <li>• Created a new program including all or the majority of the functionality as required in the question and stated in the indicative content. The majority of the functionality is defined as a response that provides nine to eleven items of the functionality signalled in the indicative content</li> <li>• Used and fully exploited the programming facilities of the language</li> <li>• Demonstrated a sound understanding of the appropriate tools and techniques available to them</li> <li>• Written code that is well structured</li> <li>• Provided evidence of a completed user interface which aids user interaction and is intuitive</li> </ul>
2	<p style="text-align: center;"><b>5-8 marks</b></p> <p>The candidate has:</p> <ul style="list-style-type: none"> <li>• Created a new program including most of the functionality as required in the question and stated in the indicative content. Most of the functionality is defined as a response that provides five to eight items of the functionality signalled in the indicative content</li> <li>• Made use of an appropriate range of the programming facilities of the language</li> <li>• Demonstrated an understanding of the tools and techniques available to them</li> <li>• Provided evidence of a completed user interface which aids user interaction</li> </ul>
1	<p style="text-align: center;"><b>1-4 marks</b></p> <p>The candidate has:</p> <ul style="list-style-type: none"> <li>• Created a new program with a limited range of the functionality as stated in the indicative content or improved the prototype provided by adding a limited range of the new functionality as stated in the indicative content. A limited range of functionality is defined as a response that provides one to four items of the functionality signalled in the indicative content</li> <li>• Used a limited range of the programming facilities of the language</li> <li>• Demonstrated a limited understanding of the tools and techniques available to them</li> <li>• Provided evidence of a user interface</li> </ul>
0	<p style="text-align: center;"><b>0 marks</b></p> <p>Response not credit worthy or not attempted.</p>

Q	Answer	Mark	AO1	AO2	AO3	Total
4aiii 4biii 4ciii	<p><b>Indicative content:</b></p> <ul style="list-style-type: none"> <li>• Clear annotation of steps within the following routines: <ul style="list-style-type: none"> <li>○ Validation</li> <li>○ Storage of data to file</li> <li>○ Retrieving specified data from file</li> </ul> </li> <li>• Use of self-documenting identifiers / explanation of variables</li> </ul>	4			3.1a	4

Band	AO3.1a Max 4 marks
<b>3</b>	<p><b>4 marks</b></p> <p>The candidate has:</p> <ul style="list-style-type: none"> <li>• Produced listings that are appropriately laid out and included sufficient annotation to demonstrate an understanding of <b>all</b> programming routines listed in the indicative content</li> <li>• Written code using self-documenting identifiers / explained variables</li> <li>• Used appropriate technical terminology referring to the indicative content confidently and accurately.</li> </ul>
<b>2</b>	<p><b>2-3 marks</b></p> <p><b>Three</b> marks can be awarded if the candidate has:</p> <ul style="list-style-type: none"> <li>• Produced listings that are appropriately laid out and included sufficient annotation to demonstrate an understanding of <b>all</b> programming routines listed in the indicative content</li> <li>• Not written code using self-documenting identifiers / not explained variables</li> <li>• Used appropriate technical terminology referring to the indicative content.</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• Produced listings that are appropriately laid out and included sufficient annotation to demonstrate an understanding of <b>two</b> of the programming routines listed in the indicative content</li> <li>• Written code using self-documenting identifiers / explained variables</li> <li>• Used appropriate technical terminology referring to the indicative content.</li> </ul> <p><b>Two</b> marks can be awarded if the candidate has:</p> <ul style="list-style-type: none"> <li>• Produced listings that are appropriately laid out and included sufficient annotation to demonstrate an understanding of <b>two</b> of the programming routines listed in the indicative content</li> <li>• Not written code using self-documenting identifiers / not explained variables</li> <li>• Used appropriate technical terminology referring to the indicative content.</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• Produced listings that are appropriately laid out and included sufficient annotation to demonstrate an understanding of <b>one</b> of the programming routines listed in the indicative content</li> <li>• Written code using self-documenting identifiers / explained variables</li> <li>• Used appropriate technical terminology referring to the indicative content.</li> </ul>
<b>1</b>	<p><b>1 mark</b></p> <p>The candidate has:</p> <ul style="list-style-type: none"> <li>• Produced listings that are appropriately laid out and include sufficient annotation to demonstrate an understanding of <b>one</b> programming routine listed in the indicative content</li> <li>• Used limited technical terminology referring to the indicative content.</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• Written code using self-documenting identifiers</li> <li>• Used limited technical terminology referring to the indicative content.</li> </ul>
<b>0</b>	<p><b>0 marks</b></p> <p>Response not credit worthy or not attempted.</p>