



National
Qualifications

CS(H)23AMS

Computing Science
Marking Instructions

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General Marking Principles for Higher Computing Science

Always apply these general principles. Use them in conjunction with the detailed marking instructions, which identify the key features required in candidates' responses.

- (a) Always use positive marking. This means candidates accumulate marks for the demonstration of relevant skills, knowledge and understanding; marks are not deducted for errors or omissions.
- (b) If a candidate response does not seem to be covered by either the principles or detailed marking instructions, and you are uncertain how to assess it, you must seek guidance from your team leader.
- (c) Award marks regardless of spelling, as long as the meaning is unambiguous
- (d) Candidates may answer programming questions in any appropriate programming language or pseudocode. Award marks regardless of minor syntax errors, as long as the intention of the coding is clear.
- (e) For a describe question, candidates must provide a statement or structure of characteristics and/or features. This will be more than an outline or a list. It may refer to, for example, a concept, process, experiment, situation, or facts, in the context of and appropriate to the question. Candidates must make the same number of factual/appropriate points as there are marks available in the question.
- (f) For an explain question, candidates must relate cause and effect and/or make relationships between things clear, in the context of the question or a specific area within the question.

Number			Question	Instructions	Marks
1			Convert the number -121 into 8 bit two's complement.	10000111 (1 mark)	1
2			Write the following binary number using floating point representation. -10 1110 1101.0111 There are 16 bits for the mantissa (including the sign bit) and 8 bits for the exponent.	Sign: 1 Mantissa: 1011 1011 0101 110 Exponent: 0000 1010 1 mark for each item	3
3			Explain why a processor with a wider data bus would outperform an identical processor with a narrower data bus.	- Wider data bus allows larger memory size so more data can be stored (and processed) per memory location. - Larger data bus means larger number of bits can be transferred to memory in one operation. - Increasing speed of reading/writing larger amounts of data from/to memory when compared to a narrower data bus. 1 mark for width of bus increasing capacity of memory locations. 1 mark for increase speed to write the same amount of data.	2
4			MyMovies is an online service where customers pay a fee to watch movies. The service recently suffered a denial of service (DOS) attack.		
	a		Security experts investigating the attack believe it was either a result of bandwidth consumption or resource starvation.		
		i	Describe how bandwidth consumption would affect the targeted computer system.	Flood of requests consumes available bandwidth to the targeted system preventing other traffic from being received. 1 mark	1
		ii	Describe how resource starvation would affect the targeted computer system.	Requests are allocated computer resources (e.g. processor/ram/disk) until the targeted system runs out of these resources and can no longer function correctly. 1 mark	1

Number			Question	Instructions	Marks
	b		The security experts investigating and preventing future attacks is one cost associated with the attack. State another cost of the denial of service attack.	Loss of revenue 1 mark	1
5			A designer is using software to create the following image. (see paper)		
	a		Explain why it may be easier to create this image as a vector graphic rather than a bit-mapped graphic.	• The image consists of shapes that can be represented as objects. • These objects can be layered. • Attributes of objects can be changed easily. • Objects can be edited/repositioned as needed. • Bit-mapped sets pixels so making changes requires editing all pixels involved (e.g. when moving part of graphic) which is more complex. 1 mark each bullet, max 2 marks	2
	b		Some further edits are added to the image. (see paper) Describe the effect on the file size of editing the image in (a) to be the image above. Describe this for both a vector graphic and a bit-mapped graphic.	Vector - increase in file size as additional objects added to the file. (1 mark) Bit-mapped - no change to file size as the number of pixels does not change. (1 mark)	2

Number			Question	Instructions	Marks
6			An online store carries out a search and saves the results to a text file. The text file contains the following data. • Product name • Star rating • Price • InStock A sample of the data in the text file is shown below. GameSir X3, 4.5, 79.99, true StreamDeck, 5.0, 116.95, false Magic Trackpad, 3.5, 118.95, true ... A program is required to find the cheapest, five star product which is in stock. A top-level algorithm for this is shown below: 1. Import product data for only for products in stock 2. Find the position of the cheapest five star product 3. Display the found product		
	a		The table below has the data flow completed for steps 1 and 3 of the algorithm. Complete the missing data flow for step 2. (see paper)	In: starRating[], price[] Out: position 1 mark for In 1 mark for Out <i>Any additional entries in a row, award 0 marks for that row.</i>	2
	b		The file to be imported is called "products.txt". Code to import the file data is shown below.		
		i	Explain the purpose of variable <code>maxProducts</code> assigned in line 03.	The variable <code>maxProducts</code> represents the size of the imported data (this would be the number of rows/records in the file). 1 mark This variable is used in line 07 to loop through the file, retrieving a row of data at a time. 1 mark	2

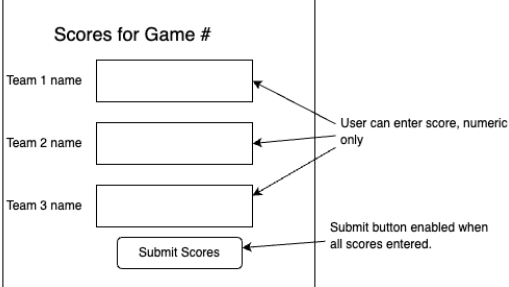
Number			Question	Instructions	Marks
		ii	Explain why the variable inStock is not written to an array.	inStock is not required as only the products that are in stock will be written to the arrays. (1 mark)	1
	c		Part of the design for Step 2, Find the position of the cheapest five star product, is shown below. <pre> position = -1 minPrice = 99999 for index 0 TO length(starRating[])-1 end for </pre> Complete the design using a recognised design technique.	- IF statement (with closing END IF) for selecting 5 star rating - comparison of price with minPrice - assignment of position using index - assignment of new minPrice using Price 1 mark for each bullet	4
			<pre> 2.1 SET position TO -1 2.2 SET minPrice TO 99999 2.2 FOR index 0 TO length(productName[])-1 DO 2.3 IF starRating[index] = 5 THEN 2.4 IF price[index] < minPrice THEN 2.5 SET position TO index 2.6 SET minPrice TO price[index] 2.7 END IF 2.8 END IF 2.9 END FOR </pre>		
	d		The incomplete design in (c) includes the line <pre>position = -1</pre> Explain why this value has been used as the initial value for position.	-1 used because this is not a possible value for index (which starts at 0) 1 mark If all products have been purchased and position is still -1 then no products have 5 stars. 1 mark	2
7			An airline stores the details of customers and operates a reward scheme where customers have their status upgraded, depending on rules set out by the company. The company have three levels of status: Blue, Silver and Gold The airline stores the following information for each customer. (see paper)		

Number			Question	Instructions	Marks
	a	i	Using a programming language of your choice, define a suitable record data structure to store the data.	RECORD customer IS { INTEGER customerNumber, STRING customerEmail, INTEGER totalMiles, INTEGER totalFlights, STRING status } - Record declaration 5 fields with given data types within record (all must be correct for mark) 1 mark each bullet	2
		ii	There are currently 35 000 registered customers for the airline. Using a programming language of your choice, declare a variable that can store the data for the 35 000 customers. Your answer should include the record data structure defined in part (i).	DECLARE customers AS ARRAY OF customer INITIALLY [NULL]*35 000 - Array of 35 000 records - Using data structure from (i) 1 mark each bullet	2
		iii	The program could have also used parallel 1D arrays to store the data. Explain why using an array of records is a better solution than parallel 1D arrays for this purpose.	- An array of records stores related data together within the same data structure. - Passing data to sub-programs is easier with an array of records as only one data structure (rather than multiple) need be passed. - There is a raised potential for errors when working with parallel arrays as all must be manipulated consistently. - Other valid 1 mark each bullet, max 2 marks	2

Number			Question	Instructions	Marks
	b		The airlines runs a promotion where everyone with Blue status will have their miles doubled. Using a programming language of your choice, write code to implement this. Your answer should use the record data structure from part(b)(i).	• Loop for array size • IF status = "Blue" • Assignment to double miles • Correct use of array name and fields names 1 mark each bullet	4
	<pre>FOR index FROM 0 TO 34999 DO IF customers[index].status = "Blue" THEN SET customers[index].totalMiles TO 2 * customers[index].totalMiles END IF END FOR</pre>				
	c		At the end of each month, the statuses for customers are updated. • All customers start with Blue as their status. • To gain Silver, a customer must have flown at least 10 flights and more than 5000 miles. • To gain Gold, a customer must have flown at least 20 flights and more than 7500 miles. The design for part of the program is shown below. (see paper)	The logic is incorrect to award silver status. Silver will be awarded if a customer has over 20 but less than 7500 miles (1 mark) or if the customer has 10 or more total flights (1 mark). It should be awarded when the customer has 10 flights and more than 5000 miles.	2
	d		The program is implemented using modular code which allows the sub-programs which are written to be reused in other programs. Describe two other benefits of creating modular code.	• each part of the solution can be tested independently. • errors are easier to locate. • different programmers can code different modules (independently). • variables only in memory during execution of subroutine. • limits accessibility of local variables. • aids maintainability 1 mark each bullet, max 2 marks	2
	e		A comprehensive test plan is used. Explain, with reference to the initial analysis of a problem, what the comprehensive test plan must do.	A comprehensive test plan must test the program to ensure that the functional requirements (established during the analysis) are met. 1 mark	1

Number			Question	Instructions	Marks
8			A computer game online store uses a security code generator as part of the process of logging in. Each user has a secret key value which is saved by the code generator and used to generate a unique code for a user. This secret key contains 10 ASCII characters. An example secret key is: AxYt!72\$Jw This is processed using the following algorithm to generate 5 integer values. These generated values are stored in an array called codeGen. (see paper)		
	a		Using a programming language of your choice, write code to complete step 2 of the plan above. When step two is completed the array secretKey would be (see paper)	<pre>secretKeyString = "AxYt!72\$Jw" FOR char 0 TO 9 DO secretKey[char] = substring(secretKeyString, char, 1) END FOR</pre> 1 mark for loop for each character 1 mark for substring predefined function and assignment to array 1 mark for correct parameters	3
	b		Line 9 of the pseudocode is a calculation using a predefined function.		

Number			Question	Instructions	Marks
		i	Using a programming language of your choice, show how line 9 would be implemented.	Python: <code>codeGen[char] = key1 % key2</code> Visual Basic <code>codeGen[char] = key1 Mod key2</code> Java: <code>codeGen[char] = key1 % key2;</code> JavaScript <code>codeGen[char] = key1 % key2;</code> 1 mark for correct predefined function or operator. 1 mark for assignment and correct order of variables or parameters.	2
		ii	Describe what the modulus predefined function does.	Modulus calculates the remainder of the whole number division of one number by another. (e.g. 14 mod 4 will give a modulus of 2 because $3 \times 4 = 12$ and $14 - 12 = 2$, 2 is the remainder). 1 mark (example is not required). <i>Remainder on its own is not sufficient</i>	1
	(c)		During development an enhancement is added which allows a user to enter one of 12 backup codes to recover their secret key. Some of the code is shown below (see paper) When a programmer types line 400, an error is reported. State the type of error and explain your answer.	Syntax error because the number of parameters supplied does not match the number of parameters required (by the user defined function). 1 mark <i>No mark for syntax on its own.</i>	1

Number			Question	Instructions	Marks
9.			An app is being designed to calculate the positions of three teams in an esports competition. The three teams play against each other and the scores for each game played are recorded. The team with the highest score is first, the next highest is second and the lowest is third. Once three games have been played, the average of the team positions in each game is calculated. The winner has the lowest average. Total points and the final positions are displayed at the end of the competition. Some example data is shown below. (see paper)		
	a		One boundary for this app is that the app is for three games. State two other boundaries for this app.	• There are three teams. • 3 scores for each team • Position is 1,2 or 3 for each game • Final positions must be 1,2 or 3 for each team. 1 mark for each bullet, max 2 marks	2
	b		A suitable user interface to capture the scores for each game is required. Use a wireframe to design a suitable interface for this part of the app.	 • Inputs for scores • Submit button or similar (Annotated to show functions) 1 mark each bullet, max 2 marks	2
	c		The top-level design of the main steps of the program is shown below. Complete the diagram to show the data flow for the program.	• Inputs/outputs for calculate final positions and total scores. • Inputs for Display final positions and total scores. 1 mark each	2

Number		Question	Instructions	Marks																																																						
		eSports Competition Get team names and scores teamNames[] team1scores[] team2scores[] team3scores[] Calculate final positions and total scores team1scores[] team2scores[] team3scores[] finalPositions[] totalScores[] Display final positions and total scores teamNames[] finalPositions[] totalScores[]																																																								
	d	A function is written to calculate and return the position for each team. The function receives an array of scores and returns an array of positions e.g. Input: scores [11829, 12028, 9112] Output: position [2, 1, 3] The code for the function is: (see paper) Complete the following trace table.	1 mark for each correct complete row of values. Max 3 marks <i>Assume blank values are carried forward from values in rows above.</i>																																																							
		<table><tr><th>Line</th><th>scores [game]</th><th>maxval</th><th>minval</th><th>maxpos</th><th>minpos</th><th>midpos</th><th>game</th><th>temp</th></tr><tr><td>07</td><td></td><td>11829</td><td>11829</td><td>0</td><td>0</td><td>0</td><td>1</td><td></td></tr><tr><td>08</td><td>12028</td><td>11829</td><td>11829</td><td>0</td><td>0</td><td>0</td><td>1</td><td></td></tr><tr><td>12</td><td>12028</td><td>12028</td><td>11829</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>08</td><td>9112</td><td>12028</td><td>11829</td><td>1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr><tr><td>18</td><td>9112</td><td>12028</td><td>9112</td><td>1</td><td>2</td><td>0</td><td>2</td><td>0</td></tr></table>	Line	scores [game]	maxval	minval	maxpos	minpos	midpos	game	temp	07		11829	11829	0	0	0	1		08	12028	11829	11829	0	0	0	1		12	12028	12028	11829	1	0	0	1	0	08	9112	12028	11829	1	0	0	2	0	18	9112	12028	9112	1	2	0	2	0		
Line	scores [game]	maxval	minval	maxpos	minpos	midpos	game	temp																																																		
07		11829	11829	0	0	0	1																																																			
08	12028	11829	11829	0	0	0	1																																																			
12	12028	12028	11829	1	0	0	1	0																																																		
08	9112	12028	11829	1	0	0	2	0																																																		
18	9112	12028	9112	1	2	0	2	0																																																		
10		A database table is shown below. (see paper) Complete the table below showing the expected output from the following SQL statement. SELECT format, MAX(price) AS "Most Expensive" FROM games WHERE online = True GROUP BY format	<table><tr><th>format</th><th>Most Expensive</th></tr><tr><td>Windows PC</td><td>24.99</td></tr><tr><td>XB-One</td><td>26.00</td></tr><tr><td>PSPlay-5</td><td>49.99</td></tr><tr><td>Nio-Switch</td><td>47.99</td></tr></table> 1 mark for rows for each of the four formats. 1 mark for correct most expensive of each. <i>Award 1 mark if answered without applying WHERE clause and correct.</i>	format	Most Expensive	Windows PC	24.99	XB-One	26.00	PSPlay-5	49.99	Nio-Switch	47.99																																													
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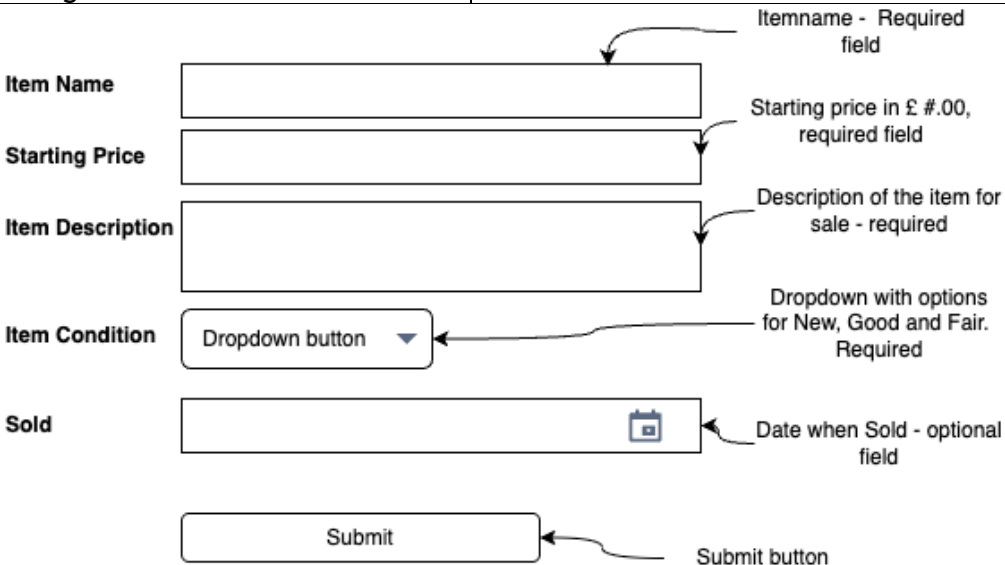
2

Number			Question	Instructions	Marks
11			A researcher is creating reports which show the number and species of birds observed in the morning at a particular location. The researcher is interested in the lowest and highest numbers of each type of bird seen. She would like the report to show the following information. (see paper)		
	a		The following SQL statement is executed. <pre>SELECT Species, MIN(numberRecorded) AS "Highest Number Seen", SUM(numberRecorded) AS "Lowest Number Seen " FROM observation WHERE Species LIKE "Common" GROUP BY Species</pre> When tested, the actual output did not match the expected output. Identify the three errors in the above SQL statement.	- The Aliases for the Lowest / Highest are in the wrong positions - SUM is used for the second value but should be MAX - Wildcards does not follow Common e.g. "Common*" to match species found. 1 mark each bullet, max 3 marks	3
	b		Explain why field length may be a suitable type of validation for the attribute <i>Species</i>.	- Length cannot be 0 (accept cannot be less than 3) - Length should be finite e.g. ~25 characters 1 mark each bullet	2

Number			Question	Instructions	Marks
12			Helga organises snowboarding classes for adults and children. She requires a relational database to: • Store details of classes, instructors, lessons and students. • Display contact information for selected instructors and students • Display the students in a particular class • Display the lessons booked for a class • Display the lessons on a selected date • Display the amount paid per lessons to each instructor • Display the total amount paid to each instructor • Display the total fees paid by students in a class.		
	a		State one functional requirement of the relational database.	Any one of the following: • (Create a query to) search for contact information for selected student or instructor. • (Create a query to) search for students in a specific class • (Create a query to) search for the lessons for a specific class • (Create a query to) search for all lessons on a specific date • (Create a query to) show the amounts paid to instructors per lesson • (Create a query to using SUM) to calculate the total to be paid to an instructor • (Create a query using SUM to) calculate the total fees paid by all students in a specific class.	1

Number		Question	Instructions	Marks								
	b	Helga has created a relational database that uses four tables. (see paper) Draw an entity-relationship diagram to show the relationships that exist in this database. Your answer should show the entity names and cardinality. Attributes are not required on the diagram.	student class instructor lesson 1 mark for each correct relationship	3								
	c	Data from student and class is shown below. (see paper) Design a query which will calculate the total student fees paid by members of the class with the classID of 1089.	<table><tr><td>Field(s) and calculation(s)</td><td>SUM(studentFee)</td></tr><tr><td>Table(s)</td><td>student, class</td></tr><tr><td>Search criteria</td><td>class.classID = 1089</td></tr><tr><td>Grouping</td><td>class.classID</td></tr></table> 1 mark for use of SUM function 1 mark for tables with search criteria 1 mark for grouping May also use student.classID in place of class.classID	Field(s) and calculation(s)	SUM(studentFee)	Table(s)	student, class	Search criteria	class.classID = 1089	Grouping	class.classID	3
Field(s) and calculation(s)	SUM(studentFee)											
Table(s)	student, class											
Search criteria	class.classID = 1089											
Grouping	class.classID											
	d	A partial data dictionary for the database is shown below. (see paper). State the values for A, B and C	A - lookup from class.classID (to maintain referential integrity). B - Text - 12 C - Restricted Choice (Beginner, Intermediate, Advanced) 1 mark each For B, size must be 12 (longest value is intermediate at 12 characters)	3								
13		A building company uses a relational database to store the following information in three tables. (see paper)										
	a	The original design for the Contract table had a compound key of customerID and salesRepID. Explain why this compound key would not have been fit for purpose.	• Customer limited to only one contract per sales rep. No repeat purchase from sales rep • Sales rep is limited to only sell a contract to one customer. No repeat business. • Date would also need to be added to key to uniquely identify contracts • Other valid 1 mark each, max 2 marks	2								

Number			Question	Instructions	Marks
	b		Sample data from the <code>Contract</code> table is shown below. (see paper) All projects that have a status of Planning or Scoping are to have their value increased by 10%. Write the SQL statement that would make these changes.	• <code>UPDATE Contract SET value = value + (value * 1/10)</code> • <code>WHERE status = "Planning" OR status = "Scoping"</code> 1 mark each bullet, max 2 marks	2
	c		A query calculates the average sales for the year 2022 for each sales representative. (see paper)		
		i	Part of the query to create this table is shown below. (see paper) Complete the missing parts of the query.	• <code>SalesRep. salesRepID</code> (or <code>Contract.salesRepID</code>) • <code>AVG(value) AS "Average"</code> • <code>SalesRep.salesRepID = Contract.salesRepID</code> 1 mark each bullet	3
		ii	State the name used to describe 'SaleYear' in the query.	Alias (1 mark)	1
14			The following HTML displays information in a web page. <pre><main> My score is <section id="myscore"> 110,000 </section> which is good! </main></pre> Two styles, shown as option A and option B below, could be used with the web page. Option A is: <code>#myscore { display: inline; }</code> Option B is: <code>#myscore { display: block; }</code> Show how the HTML would be rendered using each style option.	Option A: My score is 110,000 which is good! 1 mark Option B: My score is 110,000 which is good! 1 mark	2

Number		Question	Instructions	Marks
15		An online auction site allows users to provide information about the items they wish to sell. Once a user is logged in, they can update the items they have for sale or add new ones. The fields item name, starting price, item description, item condition (new, good, fair). Sold is only set when the item has sold online. An example, editing items for sale page, is shown below. (see paper) Draw a wireframe for a form that would allow users to edit an existing item or add a new item.	- Fields - item name, starting price, item description, item condition, sold - radio buttons/option controls for Item condition - submit button - required for all fields except sold 1 mark each bullet	4
		 The wireframe shows a form with the following elements: Item Name: A text input field. Starting Price: A text input field. Item Description: A large text area. Item Condition: A dropdown menu with a downward arrow. Sold: A date input field with a calendar icon. Submit: A button at the bottom. Annotations on the right side of the wireframe: - Itemname - Required field - Starting price in £ #.00, required field - Description of the item for sale - required - Dropdown with options for New, Good and Fair. Required - Date when Sold - optional field - Submit button		
16		Vanessa has a luxury cat care business where she has holiday rooms for cats to stay in while their owners are on holiday. She wants a website where she can show details the types of stays: short stays and long stays and, from the appropriate page, the short-stay rooms (called Wiggles and Viola) and the long-stay rooms (called Cheska and Flo). The website should also include a "book now" page and a contact us page. The multi-level structure below was proposed. (see paper)		

Number			Question	Instructions	Marks
	a		Explain why this structure did not meet the requirements.	Two from: - There is no “contact us” page - Flo and Cheska rooms are not linked to long stay. - Wiggles and Viola rooms are not linked to short stay. - The rooms are incorrectly linked beneath “Book Now”	2
	b		A menu for the site is in development.		
		i	Describe the role of descendant selectors in the CSS code above.	- Style will apply to the elements which are descended from those above only e.g. only those within #menu - Anchor/hover styles will only apply to elements with parent li 1 mark each, max 2 marks	2
		ii	Add a CSS rule, #active, that can be applied to a menu item to show it with white text and a black background.	<pre>#active { background: black; color: white; }</pre> <i>Accept alternatives that use descendent selections if valid.</i>	1
	c		An initial design for the Booking page is shown below. (see paper) A low fidelity prototype was created from the wireframe above. State two issues that should be identified from usability testing.	- No navigation on page - Page is orphaned, no navigation away from page - No submit button 1 mark each	2
17			A web designer is working from the wireframe design shown below. (see paper)		
	a		The page makes use of the following HTML (see paper)		

Number			Question	Instructions	Marks
		i	Complete the CSS below to create the expected layout for the two images in the first <div>.	<pre>#image1 { float: right; padding: 20px }</pre> <pre>#image2 { float:left padding:20px }</pre> 1 mark for float: right, #image1 1 mark for float: left, #image2 1 mark for use of padding (in both)	3
		ii	The CSS rule for the second <div> is shown below. (see paper) When implemented, the page does not appear as expected. (see paper) Rewrite this rule so that the page displays correctly.	<pre>#construction { text-align: center; background-color:lightgray; padding: 30px; clear: both; }</pre> Clear: both added to CSS rule (1 mark for clear property, 1 mark for both value)	2
	b		A button is added to the site. (see paper) Rewrite the line of code which will use a JavaScript event to call the function <code>buttonText</code> when the button is clicked.	<pre><button onClick="buttonText()" style="margin:auto"></pre> 1 mark for rewriting <div> or <button> element 1 mark for adding onClick event with correct call to buttonText()	2
	c		The developers want to add a form to the site to collect the email addresses of users so they can message them when the site goes live. The code for the form is shown below: (see paper) Re-write the line of HTML code to ensure that an email address cannot be blank when the form is submitted.	<pre><input type="email" name="email" required /></pre> 1 mark for adding required property	1
	d		Once the developers have completed their new web site, they carry out compatibility testing.		

Number			Question	Instructions	Marks
		i	Explain why the developers should test their site using different web browsers.	Any 2 from: • Different web browser may render HTML using different engines. HTML may be visually different. • Web browsers may process interactive elements of pages such as JavaScript differently. • Developers do not want to alienate a specific group of users by not supporting their browser. • Other valid	2
		ii	Describe another type of compatibility testing that the developers should carry out.	Developers should complete testing on different device types e.g. smartphone, tablet and desktop. 1 mark This is required because there are: • Wide array of screen widths • Different rendering engines on devices • Different input methods on devices • Other valid 1 mark each bullet for reason why <i>Accept valid alternatives, if given e.g. gaming console, smart home device etc.</i>	2

Detail of Sources / Mark Allocations and Balance

Qu	Section	Type	Skills	Content	Marks	QuType	CAS Item	A type justification
1	1	short answer	Application of knowledge of computer systems	Computer systems (CS)	1	C	Conversion of two's complement numbers from binary to denary and vice versa.	
2	1	short answer	Application of knowledge of computer systems	Computer systems (CS)	3	A	Describe and exemplify floating-point representation of positive and negative real numbers, using the terms mantissa and exponent.	Use of the exponent within floating point representation
3	1	short answer	Application of knowledge of computer systems	Computer systems (CS)	2	C	Factors affecting performance: width of data bus	
4ai	1	short answer	Application of knowledge of computer systems	Computer systems (CS)	1	C	DOS: type of fault: bandwidth consumption	
4aii	1	short answer	Application of knowledge of computer systems	Computer systems (CS)	1	C	DOS: type of fault: resource starvation	
4b	1	short answer	Application of knowledge of computer systems	Computer systems (CS)	1	C	DOS: costs: lost revenue	
5a	1	short answer	Application of knowledge of computer systems	Computer systems (CS)	2	C	Vector and bit-mapped graphics	
5b	1	short answer	Application of knowledge of computer systems	Computer systems (CS)	2	C	Vector and bit-mapped graphics	

Qu	Section	Type	Skills	Content	Marks	QuType	CAS Item	A type justification
6a	1	extended answer	Design	Software Design and Development (SDD)	2	C	Design: data flow	
6bi	1	extended answer	Implementation (read and write code)	Software Design and Development (SDD)	2	C	DescrRead and explain code that makes use of the above constructs: file-handling	
6bii	1	extended answer	Implementation (read and write code)	Software Design and Development (SDD)	1	C	Read and explain code that makes use of the above constructs.	
6c	1	extended answer	Design	Software Design and Development (SDD)	4	A	Standard algorithm, find minimum	refinements when designing solutions to a problem that matches to one of the standard algorithms
6d	1	extended answer	Design	Software Design and Development (SDD)	2	A	Standard algorithm, find minimum	refinements when designing solutions to a problem that matches to one of the standard algorithms
7ai	1	extended answer	Implementation (read and write code)	Software Design and Development (SDD)	2	C	Describe, exemplify and implement appropriately the following structures: records	

Qu	Section	Type	Skills	Content	Marks	QuType	CAS Item	A type justification
7aii	1	extended answer	Implementation (read and write code)	Software Design and Development (SDD)	2	A	Describe, exemplify and implement appropriately the following structures: array of records	implementation of more complex algorithms that combine - arrays of records
7aiii	1	extended answer	Implementation (read and write code)	Software Design and Development (SDD)	2	A	Describe, exemplify and implement appropriately the following structures: array of records	implementation of more complex algorithms that combine - parallel 1D arrays, arrays of records
7b	1	extended answer	Implementation (read and write code)	Software Design and Development (SDD)	4	A	Describe, exemplify and implement appropriately the following structures: array of records	implementation of more complex algorithms that combine - parallel 1D arrays, arrays of records
7c	1	extended answer	Design	Software Design and Development (SDD)	2	A	Evaluation : fitness for purpose	Complex conditions
7d	1	extended answer	Evaluation	Software Design and Development (SDD)	2	C	Evaluation: all - as related to modularity	
7e	1	extended answer	Testing	Software Design and Development (SDD)	1	C	Comprehensive test plan	

Qu	Section	Type	Skills	Content	Marks	QuType	CAS Item	A type justification
8a	1	extended answer	Implementation (read and write code)	Software Design and Development (SDD)	3	C	pre-defined functions: substrings	
8bi	1	extended answer	Implementation (read and write code)	Software Design and Development (SDD)	2	C	pre-defined functions: modulus	
8bii	1	extended answer	Implementation (read and write code)	Software Design and Development (SDD)	1	C	pre-defined functions: modulus	
8c	1	extended answer	Testing	Software Design and Development (SDD)	1	C	Identify syntax at this level.	
9a	1	extended answer	Analysis	Software Design and Development (SDD)	2	C	Analysis: boundaries	
9b	1	extended answer	Design	Software Design and Development (SDD)	2	C	Design: UI - wireframe	
9c	1	extended answer	Design	Software Design and Development (SDD)	2	C	Design: refinements	

Qu	Section	Type	Skills	Content	Marks	QuType	CAS Item	A type justification
9d	1	extended answer	Testing	Software Design and Development (SDD)	3	A	Testing: tracetable	the use of trace tables after initialisation of variables or the first iteration of a loop, especially where a condition is involved
10	2	short answer	Implementation (read and write code)	Database Design and Development (DDD)	2	C	Read and explain code that makes use of SQL.	
11a	2	short answer	Testing	Database Design and Development (DDD)	3	A	SQL operations work correctly at this level	use of Group By particularly when more than one field is required
11b	2	short answer	Design	Database Design and Development (DDD)	2	C	Data dictionary: Validation - field length	
12a	2	extended answer	Analysis	Database Design and Development (DDD)	1	C	Functional Requirements	
12b	2	extended answer	Design	Database Design and Development (DDD)	3	C	ERD	

Qu	Section	Type	Skills	Content	Marks	QuType	CAS Item	A type justification
12c	2	extended answer	Design	Database Design and Development (DDD)	3	A	Query Design	any problem that requires data from multiple tables requiring the use of join(s)
12d	2	extended answer	Design	Database Design and Development (DDD)	3	C	Data dictionary	
13a	2	extended answer	Evaluation	Database Design and Development (DDD)	2	C	Compound key	
13b	2	extended answer	Implementation (read and write code)	Database Design and Development (DDD)	2	A	queries using SQL with multiple clauses in the WHERE statement	queries using SQL with multiple clauses in the WHERE statement
13ci	2	extended answer	Implementation (read and write code)	Database Design and Development (DDD)	3	C	queries using SQL with multiple clauses in the WHERE statement	
13d	2	extended answer	Implementation (read and write code)	Database Design and Development (DDD)	1	C	Alias	
14	3	short answer	Implementation (read and write code)	Web Design and Development (WDD)	2	C	CSS: display (block, inline)	

Qu	Section	Type	Skills	Content	Marks	QuType	CAS Item	A type justification
15	3	short answer	Design	Web Design and Development (WDD)	4	C	Wireframe - page design	
16a	3	extended answer	Evaluation	Web Design and Development (WDD)	2	C	Fitness for purpose	
16bi	3	extended answer	Implementation (read and write code)	Web Design and Development (WDD)	2	A	CSS: descendant selectors	explanation of CSS code using grouping and descendant selectors
16bii	3	extended answer	Implementation (read and write code)	Web Design and Development (WDD)	1	C	CSS:	
16c	3	extended answer	Evaluation	Web Design and Development (WDD)	2	C	Usability	
17ai	3	extended answer	Implementation (read and write code)	Web Design and Development (WDD)	3	A	CSS: Float, Padding	using CSS to control appearance and positioning to match a wireframe design
17aii	3	extended answer	Implementation (read and write code)	Web Design and Development (WDD)	2	A	CSS: Clear	using CSS to control appearance and positioning to match a wireframe design

Qu	Section	Type	Skills	Content	Marks	QuType	CAS Item	A type justification
17b	3	extended answer	Implementation (read and write code)	Web Design and Development (WDD)	2	A	JavaScript: onClick	coding of Javascript functions for complex (assignment) problems to control how media content displays
17c	3	extended answer	Implementation (read and write code)	Web Design and Development (WDD)	1	C	Describe, exemplify and implement form data validation: presence	
17di	3	extended answer	Testing	Web Design and Development (WDD)	2	C	Compatibility testing: browsers	
17dii	3	extended answer	Testing	Web Design and Development (WDD)	2	C	Compatibility testing: device (tablet, smartphone, desktop)	

	Paper	Section 1	Section 2	Section 3	Section 1 (Actual)	Section 2 (Actual)	Section 3 (Actual)
Short Response Questions	18	12	6	6	13	7	6
Extended Reponse Questions	62	19	19	18	42	18	19
	Totals	31	25	24	55	25	25

Proportion of A and C questions	Section 1	Section 2	Section 3	Section 1 + 2	Section 1 + 3
A Marks	22	9	9	31	31
C Marks	33	16	16	49	49
			Total	80	80

		Analysis	Design	Implementation (read and write code)	Testing	Evaluation	Application of knowledge of computer systems	Totals
Software Design and Development (SDD)	Approx. 40	2	14	19	5	2	0	42
Database Design and Development (DDD)	Approx. 25	1	11	8	3	2	0	25
Web Design and Development (WDD)	Approx. 25	0	4	13	4	4	0	25
Computer systems (CS)	Approx. 15	0	0	0	0	0	13	13
Paper Totals		3	29	40	12	8	13	
Notional		~5%	~30%	~40%	~10%	~5%	~10%	
Actual		3%	28%	38%	11%	8%	12%	