H

National Qualifications

Mark

2021/2022 Adapted

Computing Science

Duration — 2 hours

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forenames(s)

Surname

Number of seat

Total marks – 80

SECTION 1 — Software design and development and Computer systems — 55 marks
Attempt ALL questions

Attempt EITHER Section 2 OR Section 3

SECTION 2 — Database design and development — 25 marks

SECTION 3 — Web design and development — 25 marks

Read all questions carefully before attempting.

Write your answers in the spaces provided. Additional space for answers is provided at the end of this booklet. If you use this space, you must clearly identify the question you are attempting.

Use **black** or **blue** ink. Show all workings.

Before leaving the examination room you must give this booklet to the invigilator; if you do not, you may lose all marks for this paper.

SECTION 1
SOFTWARE DESIGN AND DEVELOPMENT AND COMPUTER SYSTEMS – 55 marks
Attempt ALL questions

Marks

DO NOT WRITE IN THIS MARGIN

1. State the name of a software development methodology where the client is involved throughout the process, giving constant feedback on prototypes of the software during development. **1**

2. Joe sends Susie an encrypted email message by adding a digital signature. Explain how a digital signature can be used to validate that the email message is from Joe and the message has not been tampered with. **2**

3. (a) Convert the 8-bit two's complement number 10010010 to its denary equivalent. **1**

(b) State the range of two's complement numbers that can represented using 8 bits. **2**

Marks

DO NOT WRITE IN THIS MARGIN

4. Explain how the use of local variables improves the efficiency of code **2**

5. Readings were taken on the water quality in 86 bathing waters around the coast of Scotland in May 2019. Each reading was assigned a rating.

The function below was used to validate the input of the number of bathing waters assigned each rating.

```
Line 120 FUNCTION validateNo(INTEGER noBW) RETURN A
Line 121   DECLARE validInput INITIALLY false
Line 122   IF noBW B THEN
Line 123           SET validInput TO true
Line 124   END IF
Line 125   RETURN validInput
Line 126 END FUNCTION
```

(a) Write the missing code. **3**

A _____

B _____

(b) State the scope of the variable `validInput` and justify your choice of scope. **2**

Scope: _____

Justification: _____

_____

_____

[Please turn over

		Marks	DO NOT WRITE IN THIS MARGIN
6.	Explain why tracking cookies are also known as third-party cookies.	**1**	

7. Describe the following type of DOS attack: **1**

Domain Name Service

Marks

DO NOT WRITE IN THIS MARGIN

8. Trace tables and watchpoints are often used when debugging code. A trace table has been created for the code below.

```
Line 1   SET scores TO [8.97, 3.48, 8.97, 2.91, 9.15, 6.03]
Line 2   SET winning to scores(0)
Line 3   FOR EACH score FROM scores DO
Line 4       IF score > winning THEN
Line 5             SET winning TO score
Line 6       END IF
Line 7   END FOR EACH
```

(a) State the values of the variables `winning` and `score` after the fourth iteration of the loop.

winning_____ score _____ **2**

(b) Describe the difference between how a trace table and watchpoints are used when debugging code. **2**

_____

_____

_____

_____

[Please turn over

Marks

DO NOT WRITE IN THIS MARGIN

9. The Hillhead Movie Club stores details about 1500 movies released over the past 75 years that it rates as worthy of viewing. Below are the details stored by the club about some of the movies released in 1969.

Title	Release Year	Country	Length (hours)	Colour	Genre
Have Sword Will Travel	1969	Hong Kong	1.25	true	Action-Drama-History
Italian Job, The	1969	UK	1.68	true	Crime-Comedy-Action
Frankenstein Must Be Destroyed	1969	UK	1.68	true	Horror-Science Fiction
Harry Munter	1969	Sweden	1.50	true	Drama
Whatever Happened to Aunt Alice?	1969	USA	1.68	true	Thriller
Hannibal Brooks	1969	UK	1.68	true	War-Comedy-Adventure
Rain People, The	1969	USA	1.34	true	Drama
Like Night and Day	1969	Sweden	1.68	true	Drama
Eye of the Cat	1969	USA	1.25	true	Horror
Downhill Racer	1969	USA	1.34	true	Sport

The movie details are stored in a text file called ourMovies.txt. An extract from this file is shown below.

```
Have Sword Will Travel, 1969, Hong Kong,1.25, true, Action-Drama-History
Italian Job, The, 1969, UK, 1.68, true, Crime-Comedy-Action
Frankenstein Must Be Destroyed, 1969, UK, 1.68, false, Horror-Science Fiction
Harry Munter, 1969, Sweden, 1.50, true, Drama
Whatever Happened to Aunt Alice?, 1969, USA, 1.68, true, Thriller
```

The club wants to use this data in a program to provide a number of outputs. The top-level design for the program is shown below.

```
1. Get details from file
2. Count the number of movies that were released before the year
   2000development process
3.
4. Display the number of movies that were released before the
   year 2000
5. Count the number of movies that are classified as belonging
   to more than one genre and output this value
```

9. continued

Marks

DO NOT WRITE IN THIS MARGIN

(a) Complete the table below to show the data flow in and out of steps 2 and 4. **3**

Step	In/Out	Data Flow
1.	IN	
	OUT	title(), year(), county(), length(), colour(), genre()
2.	IN	
	OUT	
3.	IN	noMovies
	OUT	
4.	IN	
	OUT	

(b) Using a recognised technique, complete a solution to step 1. The last line is given. **4**

```
LINE _____ RETURN title(), year(), country(), length(), colour(), genre()
```

[Please turn over

9. Continued

Marks

DO NOT WRITE IN THIS MARGIN

(c) Using pseudocode or a programming language of your choice, write the code for step 2. **5**

(d) Step 4 uses the function that checks if a string contains the hyphen character ('-'). The incomplete code for this function is shown below.

isComposite(Comedy) would return false.
isComposite(Drama-Comedy) would return true.

Line	
145	`FUNCTION isComposite(STRING entryToCheck)`
	`RETURNS BOOLEAN`
146	`SET entryLen TO length(entryToCheck)`
	Missing code
	`IF currentChar = 45 THEN`
	`RETURN true`
	`ELSE`
	`RETURN false`
	`END IF`
	`END FOR`
	`END FUNCTION`

9. *continued*

Marks

DO NOT WRITE IN THIS MARGIN

(d) (i) State the parameter type of `entryToCheck` **1**

(ii) The decimal ASCII code for the hyphen character is 45.

State the Unicode (UTF-16) value in binary for the hyphen character. **1**

(iii) Using a programming language of your choice, state the name of a pre-defined function that will convert a character to its ASCII value. **1**

(iv) Using pseudocode or a programming language of your choice, write the missing code from this function. **3**

(v) Describe what changes would be required in your solution to part (iv) if a count of the number of genres represented in the `entrytoCheck` variable was required. **2**

[Please turn over

9. continued

Marks

DO NOT WRITE IN THIS MARGIN

(e) This modular program uses both functions and procedures.

State one difference between a function and a procedure. **2**

(f) Another version of this program is written that uses an array of records.

(i) Complete the record structure below for the movie data. **2**

```
RECORD one Movie AS
```

(ii) Using a programming language of your choice, declare a variable that can store the data for the 1500 movies. **2**

9. continued

Marks

DO NOT WRITE IN THIS MARGIN

(f) (iii) Using the `movies` variable defined in part (ii), write the code that will find and output the names of all the movies that are 1.68 hours long. **3**

(g) Maintainability is a criterion that can be used to evaluate a program. Modularity is one feature that increases the maintainability of a program.

(i) Explain why modularity increases maintainability. **1**

(ii) State the criterion that can be used to evaluate a program in terms of how it copes with exceptional data. **1**

[Please turn over

		Marks	DO NOT WRITE IN THIS MARGIN
10.	A new van has been purchased by a shop. The van has a variety of environmentally-friendly management systems. Identify one of the systems and explain how it can reduce harm to the environment.	**2**	

11. A company have replaced the desktops in their office with newer models. The newer computers have a processor with 6 cores whereas the computers they replaced had processors with 4 cores.

Explain how an increase in the number of processor cores will affect the performance of a computer system. **2**

12. A program is required that will ask the user to input a positive integer and will output the square root of this value.

State one boundary of this program. **1**

[END OF SECTION 1]

SECTION 2 — DATABASE DESIGN AND DEVELOPMENT — 25 marks
Answer ALL questions

Marks

DO NOT WRITE IN THIS MARGIN

13. EBikes Galore sells bikes with frame sizes small, medium, large, x-large and xx-large. The business uses a relational database to store details of all bike sales. A separate order is required for every bike purchased. Contact details for suppliers and customers must be stored. The database has four tables shown below.

Bike	**Supplier**	**Customer**	**Order**
bikeRef	supplierID	customerID	orderID
model	supplierName	custFname	bikeRef
supplierID	supplierEmail	custSurname	orderDate
frameSize	contactTel	contactTel	deliveryDate
battery	country	custEmail	paid
noInStock		house	customerID
price		postcode	

(a) The Ebikes Galore staff have requested that they should be able to add details of new bike models to the database.

(i) Describe a functional requirement that is needed to meet this end-user requirement. **1**

(ii) Identify the type of SQL statement that would be required to fulfil this end-user requirement. **1**

(b) Identify two foreign keys and the name of the table where each is located. **2**

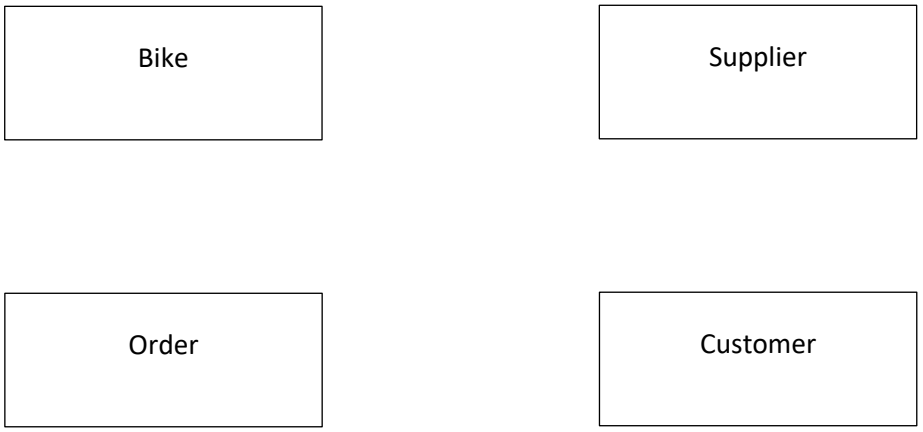
Foreign key	**Entity**

13. Continued

Marks

DO NOT WRITE IN THIS MARGIN

(c) Complete an entity relationship diagram below that shows the relationships between the four tables. Do not include the attrtibutes of the entities. **4**



(d) Four partially completed rows from the data dictionary of the database are shown below.

	Attribute	Key	Type	Size	Required	Validation
Order	orderID	PK			Y	
Order	bikeRef		Text	10	Y	**A**
Bike	frameSize					**B**
Supplier	contactTel		**C**			

State the following missing entries: **3**

A _____

B _____

C _____

[Please turn over

13. continued

Marks

DO NOT WRITE IN THIS MARGIN

(e) An extract from each table is shown below.

Bike

bikRef	*model*	*supplierID*	*frameSize*	*battery*	*noStock*	*price*
A210	Infinity	122	XX-large	418	0	2599
T366	Gain M30	351	large	248	2	2000
A229	Pulse LS	122	small	400	5	1949
X109	E+2 Pro	561	X-large	375	3	2799
A231	Pulse LS	122	large	400	1	3789

Supplier

supplierID	*supplierEmail*	*contactNo*	*country*
561	giant@gmail.co.uk	01378234178	Taiwan
122	voltbikes@gmail.co.uk	020 7378 4728	UK
237	solex@gmail.co.uk	01764 682845	France
351	orbea@gmail.co.uk	0141563002	Spain

Customer

customerID	*custFname*	*custSurname*	*contactTel*	*custEmail*	*house*	*postcode*
2314	Tom	Murphy	01738 67123	tmurps@gmail.co.uk	Solas	PH12 7QT
3288	Susie	Briggs	0766234128	sbriggs@hotmail.co.uk	6	KY15 6KS
1009	Elaine	Frost	0723186200	Frosty05@gmail.co.uk	Pines	EH11 7QS

Order

orderID	*bikeRef*	*orderDate*	*deliveryDate*	*paid*	*customerID*
CM345	A229	05/04/2021	28/06/2021	Y	3288

(i) A query is required to find and display the bike models sourced outside the UK. The countries of the suppliers should be output in alphabetical order.

Complete the design for this query. **2**

Field(s) and calculation(s)	*model, country*
Table(s) and query	*Bike, Supplier*
Search criteria	
Grouping	
Sort order	

13. Continued

Marks

DO NOT WRITE IN THIS MARGIN

(e) (ii) A query is written to display the total number of eBikes in stock for the different frame sizes they sell.

Frame size	Number in stock
large	13
medium	2
small	7
x-large	6
xx-large	1

The expected ordered output is shown.

When the SQL statement below is tested the actual output does not match the expected output.

```
SELECT frameSize As [Frame size, count(noInStock)
FROM Bikes
ORDER BY frameSize ASC
GROUP BY frameSize;
```

Re-write the SQL statement to produce the expected output. **3**

[Please turn over

13. continued

Marks

DO NOT WRITE IN THIS MARGIN

(f) Watt hours (wH) is used to measure the energy capacity of an eBike battery.

Ebikes Galore want to display the name(s) of the model(s) that has the highest wH battery. Two queries are used to achieve the correct output.

The results of Query 1 are used in Query 2.

Complete the SQL statements to produce the correct output.

Query 1: Find highest wH

1

```
SELECT _____________________________________ AS
[Highest wH]

FROM Bikes;
```

3

Query 2: Display eBike model(s) with the highest wH battery

```
SELECT

FROM

WHERE
```

[Please turn over

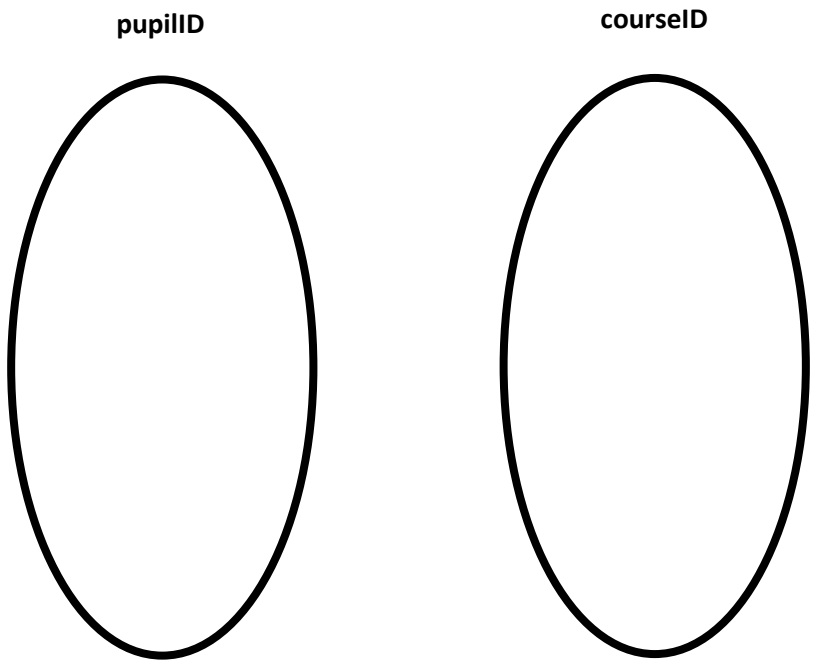
Marks

DO NOT WRITE IN THIS MARGIN

14. The following table and diagram show which pupils have enrolled in which courses:

pupilID	courseID
610483	FREN1
610571	SPAN2
610211	FREN1
610483	GERM2
610523	GERM2
610211	GERM1
610918	SPAN1
610918	FREN1

Complete the matching entity-occurrence diagram below **2**



15. Describe one item from the analysis stage that would be used to assess the fitness for purpose of the database. **1**

Marks

DO NOT WRITE IN THIS MARGIN

16. A database entity is shown below.

Entity: Stock				
category	**itemID**	**itemName**	**amount**	**unitPrice**
Chcolate	56	Whole Nut	34	2.99
Chocolate	18	Aero	21	2.79
Drinks	50	Coca Cola	12	0.99
Drinks	92	Irn-Bru	25	1.05
Chocolate	65	Praline	8	3.50
Drinks	25	Lemonade	30	0.97
Chocolate	60	Tiff1n	7	2.57

Complete the table below showing the output from the following SQL statement:

```
SELECT category, MIN(price) AS [Cheapest item]
FROM Stock
GROUP BY category;
```

2

Category	

[END OF SECTION 2]

SECTION 3 — WEB DESIGN AND DEVELOPMENT — 25 marks

Attempt ALL questions

Marks

DO NOT WRITE IN THIS MARGIN

17. Study the HTML code below and answer the questions which follow.

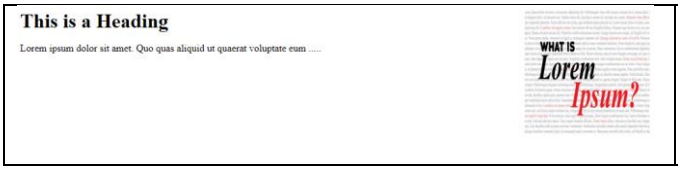
```
<!DOCTYPE html>
<html>

<head>
<style>
img {float: A;  }
h1{display: B}
</style>
<title>Page Title</title>
</head>

<body>
<h1>This is a Heading</h1>
<img src = "Lorem Ipsum.jpg" width = "200" height = "200" >
<p>Lorem ipsum dolor sit amet. Quo quas aliquid ut quaerat
voluptate eum .....
</p>
</body>

</html>
```

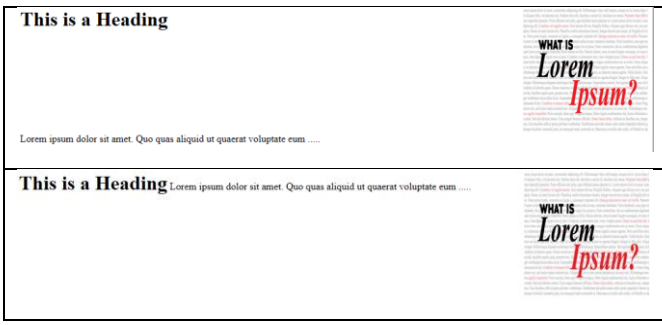
(a) State the values of **A** and **B** in the code to give the browser output as shown. **2**



A = _____

B = _____

(b) Complete the CSS rule below that, when added to the above code, would give the browser output shown. **2**



P {
_____
}

P {
_____
}

[Please turn over

Marks

DO NOT WRITE IN THIS MARGIN

18. WoofWoof manages a dog boarding business. They are creating a website to advertise their business and process bookings.

The website will consist of three pages:

- a home page which contains information about the boarding kennels including its location and the details about the staff.
- a booking page with a booking form which an existing or potential customer must complete if they wish to book their dog into their boarding kennels. A separate booking form must be completed for each dog they wish to book a place for.
- A gallery page with photos of some regular guests at 'Woof Woof' and videos of the interior and exterior of the premises.

Each page should have the following:

- The title 'WoofWoof Boarding' and the WoofWoof logo should be centred at the top of each page.
- A navigation bar with links the other pages on the site should appear on each page.
- A footer with the contact details of the business should appear on each page

(a) State two end-user requirements of the WoofWoof website and a corresponding functional requirement for each. **4**

End-user requirement 1	
Functional requirement 1	

End-user requirement 2	
Functional requirement 2	

[Please turn over

18. continued

Marks

DO NOT WRITE IN THIS MARGIN

(b) The browser view of the implemented footer code is shown below.

The HTML code and part of the CSS code are as follows.

Footer HTML code

```
<footer>
<p id="address">Address:<br>Drumlanrig<br>Dingwall<br>
Highlands<br>IV16 9RD</p>
<p id="phone">Phone Number: 07726 123456</p>
<p id="email">Email: WoofWoof@gmail.com</p>
</footer>
```

Extract from the CSS code

```
#footer{
      background-color:#7FFF00;
      height:150px;
}
#address{
      float:left;
      display:inline;
}
```

Describe the additional CSS code that was required to achieve the given footer layout. **2**

(c) When creating the navigation bar, the state of the anchor element was changed to allow the background colour and text colour of each link to change to black and white respectively when the mouse hovers over the element.

Complete the CSS code to achieve this outcome. **2**

```
nav ul li  _________________ {background-color:black;

                              _____________________________;)
```

18. continued

Marks

DO NOT WRITE IN THIS MARGIN

(d) Below is the browser view of the bookings webpage. Parts labelled A and B of the webpage are hidden.

(i) Explain why this webpage is not fully fit for purpose. **1**

(ii) Identify the missing form element labelled **B**. **1**

[Please turn over

18. continued

Marks

DO NOT WRITE IN THIS MARGIN

(e) Complete the HTML code within the form element for the following part of the form:

The width of the input box should be 35 characters. A length check (no greater than 25 characters) and a presence check should both be included. **3**

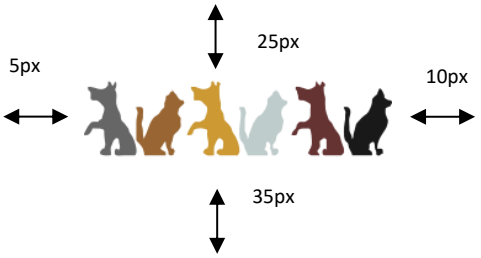
Dog Name

(f) Here is the code for the missing part A that exists within a form element.

```
Status <br> <input type="radio" name="status" value =
"Previous" checked>Has stayed at WoofWoof before
<input type="radio" name="status" value = "New">First
booking
```

Design the section of the wireframe that would have directed this code. **2**

(g) The logo has spacing around it on each side as shown.



Complete the one line of CSS code that will achieve this. **1**

```
#logo {margin:                                    }
```

18.. continued

Marks

DO NOT WRITE IN THIS MARGIN

(h) The 'Gallery' page on the WoofWoof website contains a number of images. One of the images is *sandy.jpg*.

When the mouse is placed over this image a hidden <article> element containing a testimonial by Emma and Paul (Sandy's owners) is revealed as shown.

Sandy boards at WoofWoof for five days every month and we couldn't wish for better care for our beloved pet. She is always extremely well looked after. We would highly recommend WoofWoof.
Emma and Paul

Part of the CSS and the HTML code for the gallery page is shown below.

```
CSS
#testimony1 { display:none}
HTML
<article id = testimony1> Sandy boards at WoofWoof for
five days every month and we couldn't wish for better
care for our beloved pet.  She is always extremely well
looked after.  We would highly recommend WoofWoof.
<br><i>Emma and Paul</i>
</article>
```

Complete the HTML code that will add this interactivity to the gallery page. **3**

```
<img id = "sandy" src="../images/sandy.jpg"_____"
```

19. Usability testing and compatibility testing are two type of testing that are conducted on a website.

Explain clearly how both types of testing can be done. **2**

Usability testing:

Compatibility testing:

[END OF SECTION 2]

[END OF QUESTION PAPER]

ADDITIONAL SPACE FOR ANSWERS

Marks

DO NOT WRITE IN THIS MARGIN

ADDITIONAL SPACE FOR ANSWERS

Marks

DO NOT WRITE IN THIS MARGIN

SECTION 1					
Number			**Question**	**Instruction**	**Marks**
1.			State the name of a software development methodology where the client is involved throughout the process, giving constant feedback on prototypes of the software during development.	Agile (**1 mark**)	**1**
2.			Joe wants to send Susie a document by email. Explain how a digital signature can be used to validate that this document is from Joe and has not been tampered with.	*Two from:* • the signature can only be decrypted with Joe's public key proves that it was sent by Joe (who used the corresponding private key to encrypt the hash.) • the signature was generated using the message so if the decrypted signature matches the hash value generated from the document received by Susie, this proves that the message itself has not been tampered with. **Max 2 marks** Digital signature = encrypted hashed document	**2**
3.	(a)		Convert the 8-bit two's complement number 10010010 to its denary equivalent.	-110 (**1 mark**)	**1**
3.	(b)		State the range of two's complement numbers that can represented using 8 bits.	1000000 (**1 mark**) to 0111111 (**1 mark**) **Max 2 marks** *Award 1 mark for -128 to 127*	**2**
4.			Explain how the use of local variables improves the efficiency of code.	• A local variable is only present in RAM during the execution of the sub-program where it is located. (**1 mark**) • Upon completion of the execution of the sub-program, the local variable memory is released. (**1 mark**) OR • When the interpreter or compiler comes across a variable,	**2**

				the local namespace is checked first (**1 mark**) before checking the global namespace thus reducing the amount of processor time required. (**1 mark**) **Max 2 marks** Reference to saving memory/processor time for second mark.	
5.			Readings were taken on the water quality in 86 bathing waters around the coast of Scotland in May 2019. Each reading was assigned a rating. The function below was used to validate the input of the number of bathing waters assigned to each rating. *See paper for code*		
	(a)		Write the missing code.	A = `Boolean` (**1 mark**) B >=`0 AND` (**1 mark**) noBW <=`86/ <87` (**1 mark**) **Max 3 marks**	**3**
	(b)		State the scope of the variable *validInput* and justify your choice of scope.	*Scope:* local (**1 mark**) *Justification:* validInput is declared and used only within the validateNo function/sub-program (**1 mark**) **Max 2 marks** *Award 1 mark for a description of local but global given for scope.*	**2**
6.			Explain why tracking cookies are also known as third-party cookies.	Tracking cookies do not originate from the website operator/owner but from a third party – such as an advertiser or social network. (**1 mark**)	**1**

7.			Describe the following type of DOS attack: Domain Name Service	*Domain Name Service:* A large volume of DNS queries to different DNS servers are made at the same time using a spoofed address of the target service. The DNS servers return responses overloading the attacked system and a denial of service to legitimate users. (**1 mark)**	**1**
8.	(a)		Trace tables and watchpoints are useful tools when debugging or trying to understand the working of code. A trace table has been created for the code below. *See paper for code*	*winning* 8.97 (**1 mark**) *score* 2.91(**1 mark**) **Max 2 marks**	**2**
	(b)		Describe the difference between how a trace table and watchpoints are used when debugging code.	A trace table is a list/log/table of all the variables used in the code and their changing values as the lines would be/are processed. (**1 mark**) A watchpoint pauses execution of the program when a particular condition such as a variable having a certain value is met. (**1 mark**) **Max 2 marks**	**2**

9.			The Hillhead Movie Club stores details about 1500 movies released over the past 75 years that it rates as worthy of a viewing. Below are the details stored by the club about some of the movies released in 1969.
			
			See paper for table
			
			The movie details are stored in a text file called ourMovies.txt. An extract from this file is shown below.
			
			`Have Sword Will Travel, 1969, Hong Kong,1.25, true, Action-Drama-History`
			`Italian Job, The, 1969, UK, 1.68, true, Crime-Comedy-Action`
			`Frankenstein Must Be Destroyed, 1969, UK, 1.68, false, Horror-Science Fiction`
			`Harry Munter, 1969, Sweden, 1.50, true, Drama`
			`Whatever Happened to Aunt Alice?, 1969, USA, 1.68, true, Thriller`
			
			The club wants to use this data in a program to provide a number of outputs. The top-level design for the program is shown below.
			
			1. Get details from file
			2. Count the number of movies that were released before the year 2000
			3. Display the number of movies that were released before the year 2000
			4. Count the number of movies that are classified as belonging to more than one genre and output this value	

9. (a)

Complete the table below to show the data flow in and out of steps 2 and 4.

Step	In/Out	Data Flow
1.	IN	
	OUT	*title(), year(), county(), length(), colour(), genre()*
2.	IN	year() (**1 mark**)
	OUT	noMovies (**1 mark**)
3.	IN	*noMovies*
	OUT	
4.	IN	genre()(**1 mark**)
	OUT	

Max 3 marks

3

9.	(b)		Using a recognised technique, complete a solution to step 1. The last line is given.	
				4

```
LINE 1  DECLARE title AS ARRAY OF STRING INITIALLY []
LINE 2  DECLARE year AS ARRAY OF INTEGER INITIALLY []
LINE 3  DECLARE country AS ARRAY OF STRING INITIALLY []
LINE 4  DECLARE length AS ARRAY OF INTEGER INITIALLY []
LINE 5  DECLARE colour AS ARRAY OF BOOLEAN INITIALLY []
LINE 6  DECLARE genre AS ARRAY OF STRING INITIALLY []
LINE 7  OPEN "ourMovies.txt"
LINE 8  FOR index FROM 0 TO 1499 DO
LINE 9      RECEIVE title[index] FROM (STRING) "ourMovies.txt"
LINE 10     RECEIVE year[index] FROM (STRING) "ourMovies.txt"
LINE 11     RECEIVE country[index] FROM (STRING) "ourMovies.txt"
LINE 12     RECEIVE length[index] FROM (INTEGER) "ourMovies.txt"
LINE 13     RECEIVE colour[index] FROM (BOOLEAN) "ourMovies.txt"
LINE 14     RECEIVE genre[index] FROM (STRING) "ourMovies.txt"
LINE 15 NEXT index
LINE 16 Close "ourMovies.txt"
LINE 17 RETURN title(), year(), country(), length(), colour(), genre()
```

- 1 mark for declaring/ initialising arrays
- 1 mark for opening and closing OurMovies.txt (or With …)
- 1 mark for fixed loop with 1500 iterations
- 1 mark for populating the six arrays using loop index

Max 4 marks

A conditional loop may also be used

9.	(c)		Using pseudocode or a programming language of your choice, write the code for step 2.	`Line 1 SET noMovies TO 0`
				`Line 2 FOR each year in year() DO`
				`Line 3  IF year <2000 THEN`
				`Line 4  SET noMovies TO noMovies + 1`
				`Line 5  END IF`
				`Line 6 END FOR EACH`
				`Line 7 RETURN noMovies`
				
				One mark each for:
				• Line 1 `SET noMovies TO 0`
				• Traversing year() array using a For loop (may use a counter variable ..index = 0 To 1499)
				• Line 3/ Line 3 IF year[index] < 2000 THEN (0 marks for <=2000)
				• Incrementing noMovies within the selection statement
				• Line 7 `RETURN noMovies`
				Max 5 marks
					5

9.	(d)		Step 4 uses the function that checks if a string contains the hyphen character ('-'). The incomplete code for this function is shown below. isComposite(Comedy) would return false. isComposite(Drama-Comedy) would return true. *See paper for code*		
9.	(d)	i	State the parameter type of `entryToCheck`.	Formal (**1 mark**)	**1**
9.	(d)	ii	The decimal ASCII code for the hyphen character is 45. State the Unicode (UTF-16) value in binary for the hyphen character.	00000000 00101101 (**1 mark**) 45 = 00101101 (ASCII)	**1**

9.	(d)	iii	Using a programming language of your choice, state the name of a pre-defined function that will convert a character to its ASCII value.	One from: • `ord()` in Python • `asc()` in VB • Other suitable **Max 1 mark**	**1**

9.	(d)	iv	Using pseudocode or a programming language of your choice, write the missing code from this function.	Pseudocode solution:
				
				`Line 147 FOR c = 0 TO entryLen DO`
				`Line 148  SET currentLetter TO entryToCheck.Substring(c)`
				`Line 149  SET currentChar TO ASCII code for currentLetter`
				
				One mark each for:
				• Line 1/Loop traversing through characters in entryToCheck
				• Extracting one character within loop/substring of one character
				• Assigning currentChar correctly/the correct use of function defined in part (iii)
				
				Max 3 marks
				
				Lines 148 and 149 may be combined.
					3

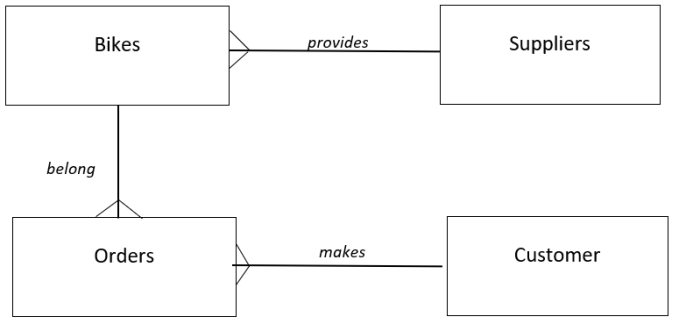
11.	(d)	v	Describe what changes would be required in your solution to part (iv) if a count of the number of genres represented in the `entrytoCheck` variable was required.	One mark each for: • Initialise a counter variable to 1 at line 146 or 147/ `SET noGenres to 1` • Increment a counter by 1 if a hyphen symbol is detected/ `SET noGenres TO noGenres + 1` (at Line 151 or 152). **Max 2 marks**	**2**
	(e)		This modular program uses both functions and procedures. State one difference between a function and a procedure.	• A function will return a single value (**1 mark**) • A procedure can return 0 or more values. (**1 mark**) OR • A function can be used in an expression (**1 mark**) • A procedure cannot be used in an expression (**1 mark**) **Max 2 marks**	**2**
	(f)		Another version of this program is written that uses an array of records.		
		i	Complete the record structure below for the movie data.	*RECORD oneMovie AS* `{STRING title, INTEGER year, STRING country, REAL length, BOOLEAN colour, STRING genre}` • six correct fields (**1 mark**) • six correct data types (**1 mark**) **Max 2 marks**	**2**
9.	(f)	ii	Using a programming language of your choice, describe a variable called `movies` that can store the data for the 1500 movies.	`DECLARE movies AS ARRAY OF customer INITIALLY [] * 1500` • 1 mark for an array of oneMovie • 1 mark for declaration of required size (1500 records) **Max 2 marks**	**2**

9.	(f)	iii	Using the `movies` variable defined in part (ii), write the code that will find and output the names of all the movies that are 1.68 hours long.	Pseudocode solution:
				`Line 1 FOR index = 0 TO 1499` **(1 mark)**
				`Line 2  IF movies[index].time = 1.68 THEN` **(1 mark)**
				`Line 3  SEND movies[index].time TO DISPLAY` **(1 mark)**
				`Line 4  END IF`
				`Line 5 END FOR`
				Accept number of number of movies instead of 1499
				Correct reference to time field required for second and third marks.
				Max 3 marks
					3

9.	(g)		Maintainability is a criterion that can be used to evaluate a program. Modularity is one feature that increases the maintainability of a program.		
	(g)	i	Explain why modularity increases maintainability.	One from: • The separate subprograms/modules can be tested and changed without causing unexpected consequences with other parts of the program. • It is easier to locate (and therefore correct) errors in a modular program. • Other suitable **Max 2 marks**	**1**
	(g)	ii	State the criterion that can be used to evaluate a program in terms of how it copes with exceptional data.	Robustness (**1 mark**)	**1**
10.			A new van has been purchased by a shop. The van has a variety of environmentally-friendly management systems. Identify one of the systems and explain how it can reduce harm to the environment.	*One from:* • A start-stop system (**1 mark**) automatically shuts down the engine when the car is not moving. This reduces the amount of time the engine spends idling and reduces emissions that are harmful for the environment. (**1 mark**) • An engine control unit (**1 mark**) which accurately control the engine's air/fuel ratio using sensors. This ensures optimum fuel consumption and a reduction of emissions that are harmful for the environment. (**1 mark**) • Other suitable **Max 2 marks**	**2**

11.			A company have replaced the desktops in their office with newer models. The newer computers have a processor with 6 cores whereas the computers they replaced had processors with 4 cores.	The more cores a processor has, the more sets of instructions the processor can receive and process at the same time (**1 mark**) Thus an increase in the number of processor cores will improve system performance. (**1 mark**) **Max 2 marks**	**2**
12.			A program is required that will ask the user to input an positive integer and will output the square root of this value. State one boundary of this program.	*One from:* • Input will be >= 0 • The positive square root will be output • Other suitable **Max 1 mark**	**1**
[END OF SECTION 1]					

SECTION 2					
Number			**Question**	**Instruction**	**Marks**
13 .			EBikes Galore sells bikes with frame sizes small, medium, large, x-large and xx-large. The business uses a relational database to store details of all bike sales. A separate order is required for every bike purchased. Contact details for suppliers and customers must be stored. The database has four tables shown below. *See paper for details.*		
	(a)		The Ebikes Galore staff have requested that they should be able to add details of new bike models to the database.		
		(i)	Describe a functional requirement that is needed to meet this end-user requirement.	One from: • A table is required to store the details of bikes in stock • A form will need to exist to allow new bike records.to be added • Other suitable **Max 1 mark** The functional requirement needs to correspond to the given end-user requirement.	**1**
		(ii)	Identify the type of SQL statement that would be required to fulfil this end-user requirement.	Insert (**1 mark**)	**1**
	(b)		Identify two foreign keys and the name of the table where each is located.	Two from: • supplierID, Bikes • bikeRef, Orders • customerID, Orders **Max 2 marks**	**2**

<table>
<tr><td>13.</td><td>(b)</td><td></td><td colspan="2">Complete an entity relationship diagram below that shows the relationships between the four tables. Do not include the attrtibutes of the entities.
 

One mark for:

Each correct cardinality with relationship label (3 marks)

Three suitable relationship labels (1 mark)

Max 4 marks</td><td>4</td></tr>
<tr><td></td><td>(d)</td><td></td><td>Four partially completed rows from the data dictionary of the database are shown below.
See QP</td><td>A Lookup from Bikes.bikeRef (1 mark)

B Restricted choice(small, medium, large, x-large, xx-large) (1 mark)

C Text (1 mark) 0 marks for Number

Max 3 marks
The order of options is not necessary for the mark for B.</td><td>3</td></tr>
<tr><td>13.</td><td>(e)</td><td></td><td rowspan="2">An extract from each table is shown below.
See paper for record details</td><td rowspan="2"><table><tr><td>Field(s) and calculation(s)</td><td>model, country</td></tr><tr><td>Table(s) and query</td><td>Bike, Supplier</td></tr><tr><td>Search criteria</td><td>country NOT LIKE ‘UK’/ country <>’UK’</td></tr><tr><td>Grouping</td><td></td></tr><tr><td>Sort order</td><td>country ASC</td></tr></table>
One mark each for the third and last row.

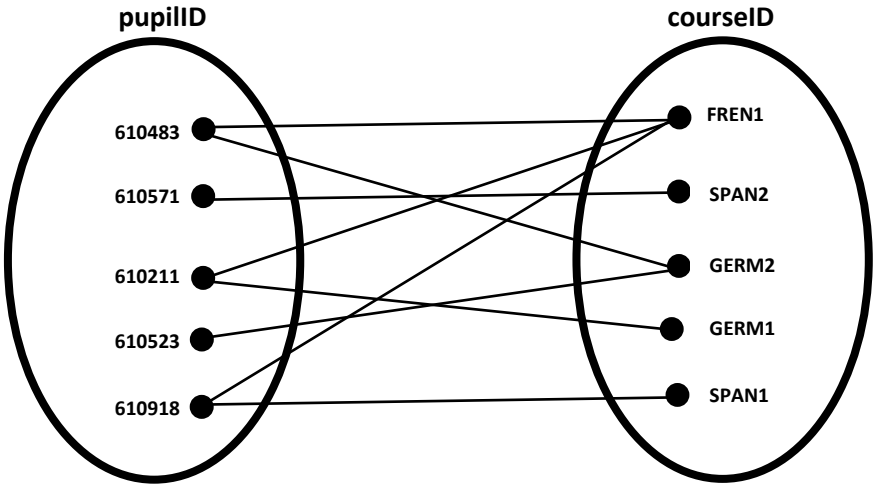
Max 2 marks</td><td rowspan="2">2</td></tr>
<tr><td>13.</td><td>(e)</td><td>i</td><td>A query is required to find and display the bike models sourced outside the UK. The countries of the suppliers should be output in alphabetical order.

Complete the design for this query.</td></tr>
</table>

13.	(e)	ii	A query is written to display the total number of eBikes in stock for the different frame sizes they sell
			
			The expected ordered output is shown.
			
			See paper for table.
			
			When the SQL statement below is tested the actual output does not match the expected output.
			
			`SELECT frameSize As [Frame size], count(noInStock)`
			`FROM Bikes`
			`ORDER BY frameSize ASC`
			`GROUP BY frameSize;`
			
			Re-write the SQL statement to produce the expected output
				`SELECT frameSize As [Frame size], sum(noInStock) As [Number in stock]`
				`FROM Bikes`
				`GROUP BY frameSize`
				`ORDER BY frameSize ASC;`
				Swap last two lines
				
				1 mark for each correction
				
				Max 3 marks
					3

13.	(f)		Watt hours (wH) is used to measure the energy capacity of an eBike battery.
			
			Ebikes Galore want to display the name(s) of the model(s) that has the highest wH battery. Two queries are used to achieve the correct output.
			
			The results of Query 1 are used in Query 2.
			
			Complete the SQL statements to produce the correct output.
				Query 1: Find highest wH
				
				`SELECT Max(battery)AS [Highest wH]`
				
				`FROM Bikes;`
				
				1 mark for Max(battery)
				
				`SELECT model`
				
				`FROM Bikes, Query 1 (/Bikes,[Find highest wH]`
				
				`WHERE battery = [Highest wH]`
				
				1 mark for each row
				
				Max 3 marks
				
				Max 4 marks
					4

14.			The following table and diagram show which pupils have enrolled in which courses *See paper for table*. Complete the matching entity-occurrence diagram below		



2 marks for 8 correct matches

-1 for each incorrect or missing match

Max 2 marks, min 0 marks

2

15. Describe one item from the analysis stage that would be used to assess the fitness for purpose of the database.

Functional requirements/ the tasks that the database system must perform (**1 mark**)

Accept end-user requirements or a description of end-user requirements

1

16. A database entity is shown below.
See paper for table

Complete the table below showing the output from the following SQL statement:

```
SELECT category, MIN(price) AS [Cheapest item]
FROM Stock
GROUP BY category;
```

Category	**Cheapest item**
Chocolate	2.57
Drinks	0.97

1 mark for each column, **max 2 marks**

Note second column heading required for second mark

2

[END OF SECTION 2]

SECTION 3					
Number			**Question**	**Instruction**	**Marks**
17.			Study the HTML code below and answer the questions which follow. *See paper for code*		
	(a)		State the values of **A** and **B** in the code to give the browser output as shown.	A = right (**1 mark**) B = inline (**1 mark**) **Max 2 marks**	**2**
	(b)		Complete the CSS rule below that, when added to the above code, would give the browser output shown.	`clear:right/clear:both` (**1 mark**) `display:inline` (**1 mark**) **Max 2 marks**	**2**
18.			WoofWoof manages a dog boarding business. They are creating a website to advertise their business and process bookings. The website will consist of three pages: • a home page which contains information about the boarding kennels including its location and the details about the staff. • a booking page with a booking form which an existing or potential customer must complete if they wish to book their dog into their boarding kennels. A separate booking form must be completed for each dog they wish to book a place for. • A gallery page with photos of some regular guests at 'Woof Woof' and videos of the interior and exterior of the premises. Each page should have the following: • The title 'WoofWoof Boarding' and the WoofWoof logo should be centred at the top of each page. • A navigation bar with links the other pages on the site should appear on each page. • A footer with the contact details of the business should appear on each page		

18.	(a)		State two end-user requirements of the WoofWoof website and a corresponding functional requirement for each.	• To be able to complete and submit a booking form for their dog (**1 mark**) AND • To display a booking form on the website (**1 mark**) **OR** • To view photos of dogs who often stay at the kennels (**1 mark**) AND • To display photos of dogs who often stay at the kennels (**1 mark**) **OR** • Other suitable **Max 4 marks** *Each end-user requirement and functional requirement should relate. (-1 if each pair valid but don't relate)*	**4**
18.	(b)		The browser view of the implemented footer code is shown below. *See QP for details.* Describe the additional CSS code that could be applied to the phone and address id selectors to achieve the given footer layout.	padding-left or margin-left for phone number (**1 mark**) float right for email (**1 mark**) **Max 2 marks** *Additional code may be described such as display inline.*	**2**
18.	(c)		When creating the navigation bar, the state of the anchor element was changed to allow the background colour and text colour of each link to change to black and white respectively when the mouse hovers over the element. Complete the CSS code to achieve this outcome.	`nav ul li a:hover {background-color:black; color:white;)` `a:hover` (**1 mark**) `color:white` (**1 mark**) **Max 2 marks**	**2**
18.	(d)		Below is the browser view of the bookings webpage. Parts labelled A and B of the webpage are hidden. *See paper for details.*		
18.	(d)	i	Explain why this webpage is not fully fit for purpose	The logo is not centred (**1 mark**)	**1**

18.	(d)	ii	Identify the missing form element labelled **B**.	Submit button (**1 mark**) Accept submit only	**1**
18.	(e)		Complete the HTML code within the form element for the following part of the form: *See paper for details.* The width of the input box should be 35 characters. A length check (no greater than 25 characters) and a presence check should both be included.	*Dog Name * `<input type="text" size="35" maxlength="25" required>` *1 mark each for:* • Dog Name • input type = "text" • size="30" maxlength="25" • required **Max 3 marks** *Name attribute not required for the mark*	**3**
18.	(f)		Here is the code for the missing part A that exists within a form element `Status   <input type="radio" name="status" value = "Previous" checked>Has stayed at WoofWoof before <input type="radio" name="status" value = "New">First booking` Design the section of the wireframe that would have directed this code.	Status Has stayed at WoofWoof before First booking *One mark each for:* • Status and selected first radio button • Two correct labels to the right of radio buttons **Max 2 marks** *Accept vertical alignment of the radio buttons.*	**2**
18.	(g)		The logo has spacing around it on each side as shown. Complete the one line of CSS code that will achieve this.	`#logo {margin: 25px 10px 35 px 5px;}` **1 mark** for `25px 10px 35 px 5px` (space delimiter, no commas) **Max 1 mark**	**1**

18	(h)		The 'Gallery' page on the WoofWoof website contains a number of images. One of the images is *sandy.jpg*. When the mouse is placed over this image a hidden <article> element containing a testimonial by Emma and Paul (Sandy's owners) is revealed as shown. Part of the CSS and the HTML code for the gallery page is shown below. *See paper for details.*		

18.	(i)		Complete the HTML code that will add this interactivity to the gallery page.	`<img id = "sandy" src="images/sandy.jpg"`
				
				`onmouseover="document.getElementById('testimony1').style.display='block'">`
				
				One mark each:
				• onmouseover
				• ="document.getElementById('testimony1').style
				• .display='block'"
				
				Max 3 marks
					3

19.			Usability testing and compatibility testing are two types of testing that were conducted on the WoofWoof website. Explain clearly how both types of testing could have been done.	Usability testing: Testers are issued a persona and use test cases and test scenarios (**1 mark**) to assess how easy the website is to use. Compatibility testing - one from: (**1 mark**) • The website is viewed across a range of different platforms and checks are made that it performs as expected on each platform. • The website is viewed on the main internet browsers and checks are made that it performs as expected on each browser. **Max 2 marks**	**2**
[End of Section 3 and Marking Instructions]					

Section 1	55	1	2	3a	3b	4	5a	5b	6	7	8a	8b	9a	9b	9c	9d i	9 d ii	9 d iii	9 d iv	9 d v	9e	9f i	9 F ii	9 f iii	9 G i	9 g ii	10	11	12
SDD Development methodologies	1	1																											
SDD Analysis	1																												1
SDD Design	13					2		2					3	4						2									
SDD Implementation (Data types and structures)	7						3															2	2						
SDD Implementation (Computational constructs)	7															1		1	3		2								
SDD Implementation (Algorithm specification)	8														5									3					
SDD Testing	4										2	2																	
SDD Evaluation	2																								1	1			
CS Data Representation	4			1	2												1												
CS Computer Structure	2																											2	
CS Environmental Impact	2																										2		
CS Security precautions	4		2						1	1																			
DDD Analysis																													
DDD Design																													
DDD Implementation																													
DDD Testing																													
DDD Evaluation																													
WDD Analysis																													
WDD Design																													
WDD Implementation (CSS)																													
WDD Implementation (HTML)																													
WDD Implementation (JavaScript)																													
WDD Testing																													
WDD Evaluation																													

Section 2	25	13 a i	13 a ii	13 b	13 c	13 d	13 e i	13 e ii	13 f	14	15	16
SDD Development methodologies												
SDD Analysis												
SDD Design												
SDD Implementation (Data types and structures)												
SDD Implementation (Computational constructs)												
SDD Implementation (Algorithm specification)												
SDD Testing												
SDD Evaluation												
CS Data Representation												
CS Computer Structure												
CS Environmental Impact												
CS Security precautions												
DDD Analysis	1	1										
DDD Design	13			2	4	3	2			2		
DDD Implementation	8		1					3	4			
DDD Testing	2											2
DDD Evaluation	1										1	
WDD Analysis												
WDD Design												
WDD Implementation (CSS)												
WDD Implementation (HTML)												
WDD Implementation (JavaScript)												
WDD Testing												
WDD Evaluation												

Section 3	25	17 a	17 b	18 a	18 b	18 c	18 d i	18 d ii	18 e	18 f	13 g	18 h	19
SDD Development methodologies													
SDD Analysis													
SDD Design													
SDD Implementation (Data types and structures)													
SDD Implementation (Computational constructs)													
SDD Implementation (Algorithm specification)													
SDD Testing													
SDD Evaluation													
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CS Computer Structure													
CS Environmental Impact													
CS Security precautions													
DDD Analysis													
DDD Design													
DDD Implementation													
DDD Testing													
DDD Evaluation													
WDD Analysis	4			4									
WDD Design	2									2			
WDD Implementation (CSS)	9	2	2		2	2					1		
WDD Implementation (HTML)	4							1	3				
WDD Implementation (JavaScript)	3											3	
WDD Testing	2												2
WDD Evaluation	1						1						