



# AQA GCSE Computer Science Exam Questions

Computer Science (Greenford High School)

# EXAM QUESTIONS FOR AQA GCSE COMPUTER SCIENCE

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This pack applies to the curriculum **prior to September 2016.** (2014-2016)

PLEASE NOTE: The actual exam questions are likely to differ from the below. However, the questions are designed to examine the skills and knowledge necessary to successfully complete an exam paper. In the interests of saving space and photocopying bills, I have omitted space for student answers and some of the formatting is atypical for an examination paper. It is worthwhile ensuring students sit at least one actual mock paper before the exam.

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## QUESTIONS

### 3.1.1 CONSTANTS, VARIABLES AND DATA TYPES

1. Explain the difference between **data** and **information**. [2]
2. Tick the box to indicate if the below item is 'data' or 'information' [5].

	Data	Information
5 apples		
01/04/2015		
John		
John is married to Sarah		
Cliff erosion has accelerated over the last five years.		

3. Explain the difference between a constant and a variable. [2]
  4. Name the constant in the following code and state what is meant by a constant. [2]
  5. Name a variable from the following code and state what is meant by a variable. [2]
- ```

PI = 3.14
OUTPUT 'Enter radius of circle'
r = INPUT
area = 3.14 * r * r
OUTPUT 'The area is ' & area
    
```
6. Jo is developing a computer program. Tick the box to indicate if the identifier should be a **constant** or a **variable**.

| Identifier   | Constant | Variable |
|--------------|----------|----------|
| highScore    |          |          |
| topSpeed     |          |          |
| currentSpeed |          |          |

7. Give one benefit of using a constant in a computer program (such as VAT) instead of typing in the value at every occurrence. [1]
8. State an appropriate data type for the following values: [5]

| Description                                                          | Data Type |
|----------------------------------------------------------------------|-----------|
| The average number of goals that a player has scored.                |           |
| The number of goals scored in a football match.                      |           |
| Whether a football player has scored a goal or not.                  |           |
| The time or date of a football match                                 |           |
| Three letters that are used as a code to identify a football ground. |           |

9. State the output from the code below: [1]

```

animals = ['monkey', 'lion', 'zebra']
OUTPUT animals[0]
    
```

10. State the output from the code below: [1]

```

animals = [['monkey', 'lion', 'zebra'], ['tortoise', 'snake', 'lizard']]
    
```

```

area = 1
animal = 1
OUTPUT animals[area][animal]
    
```

11. State the Boolean output of the following programs: [3]

|                                                       |                                                    |                                            |
|-------------------------------------------------------|----------------------------------------------------|--------------------------------------------|
| <pre>x = 3 y = 4 r = (x = 3 AND y = 4) OUTPUT r</pre> | <pre>x = 3 y = 3 r = x = 3 OR y = 4 OUTPUT r</pre> | <pre>X = 3 Y = 3 r = x != y OUTPUT r</pre> |
| ANSWER:                                               | ANSWER:                                            | ANSWER:                                    |

### 3.1.2 STRUCTURES

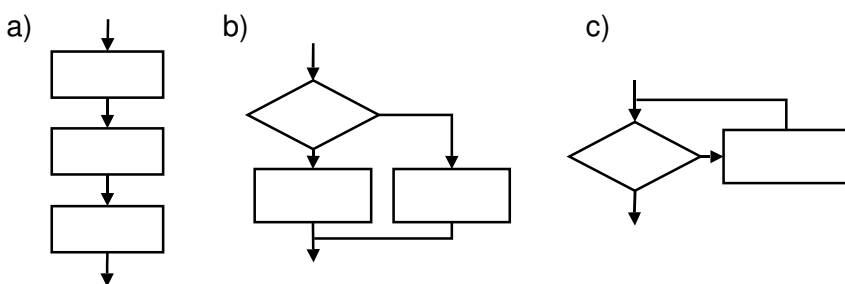
12. Explain what a data structure is. [2]
13. In pseudocode or a programming language of your choice, write code for a data structure to store the following information about a football player: Name, goals scored, average goal scored. [3].
14. Use the following example to give one reason why data structures can make coding a solution simpler. [1]

|                                                                |                                                      |
|----------------------------------------------------------------|------------------------------------------------------|
| <pre>Name1 = 'Peter' Age1 = 14 Name2 = 'Lucy' Name2 = 14</pre> | <pre>Names = ['Peter', 'Lucy'] Ages = [14, 14]</pre> |
|----------------------------------------------------------------|------------------------------------------------------|

15. State the name of a familiar programming language and two data structures that can be used in this language. [2]

### 3.1.3 PROGRAM FLOW CONTROL

16. Draw a structure diagram to illustrate three possible features of an email application. [3]
17. Draw a flowchart for the following: A billing function is as follows: The function asks for the number of units of power used. The program will only continue if the entered number is more than zero is entered. The 'units of power used' is multiplied by 0.25 to give the total amount owed. If the total amount is less than 50, then the total amount is set to 50. Finally, the program outputs the total amount to the screen.
18. Match the following diagrams to illustrate the basic building blocks of coded solutions [3]:



| Building Block | Diagram Letter |
|----------------|----------------|
| Iteration      |                |
| Selection      |                |
| Sequence       |                |

19. Use the following code to describe what is meant by iteration. [2]

```
DO
    Password = INPUT "What is the password?"
LOOP UNTIL password = "cheese"
```

20. Use pseudocode or a programming language of your choice to write a program where if the level number in a game is 3 and all monsters have been destroyed (0 left), except for the boss (boss is false), then set the bonus amount to 300, otherwise it should be 100. [3]

21. Label the following descriptions with the correct definition from sequence, selection, iteration. [3]

- One line of code executes after another
- Code will repeat, either until an expression is true or whilst an expression is true
- Different code runs depending on the evaluation of an expression.

| Construct | Selection | Iteration |
|-----------|-----------|-----------|
| IF        |           |           |
| UNTIL     |           |           |
| ELSE      |           |           |
| FOR       |           |           |

22. Tick the box to match the following commands to the programming construct: Selection / Iteration [4] >

23. Indicate which two of the following constructs can interrupt instructions from being executed one at a time in order. [2] >

| Construct           | Tick Two |
|---------------------|----------|
| Variable assignment |          |
| Procedure call      |          |
| While loop          |          |
| Input statement     |          |
| Print statement     |          |

24. Name two examples of iterative programming constructs. [2]

25. Highlight the nested construct in the following code and explain what is meant by a nested construct.

```
FOR a = 1 TO 10
    FOR b = 1 TO 10
        OUTPUT a * b
    NEXT b
NEXT a
```

### 3.1.4 PROCEDURES AND FUNCTIONS

26. Explain what is meant by a function. [2]

27. Explain the difference between an inbuilt function and a user function. [2]

28. Discuss how breaking up a program into routines can help simplify a coded solution. [3]

29. State the keyword, other than FUNCTION, that suggests that the following code is a function: [1]

```
FUNCTION get_price(day, tickets)
    IF day = 'SAT' THEN
        return tickets * 5
    ELSE
        return tickets * 4.5
    END IF
END FUNCTION
```

30. Use pseudocode or a programming language of your choice to write a function that returns the number of times that a given phrase contains the letter 'e'. [5]

31. State and describe three common built in functions. [6]

32. Explain the difference between a function and a procedure. [2]

33. Define what is meant by a parameter. [1]

34. State what is meant by a return value. [1]

35. State the name of the identifier used for the **argument** and identifier used for the **parameter** in the following code. [2] >

```
FUNCTION do_something(n)
    x = n * 1.2
    RETURN X
END FUNCTION

y = 25
do_something(y)
```

36. Explain the difference between an **argument** and a **parameter**. [2]

37. State the number of parameter there are in the following code and name one of them. [1]

```
PROC changeLevel(levelNumber, livesBonus)
    currentLevel = levelNumber
    lives = lives + livesBonus
END PROC
```

38. Explain how the following line of code works, making reference to **return value** and **argument**. [2]

```
OUTPUT convert_to_kilometres(INPUT("Enter number of miles:"))
```

### 3.1.5 SCOPE OF VARIABLES, CONSTANTS, FUNCTIONS AND PROCEDURES

39. State what is meant by a **global** variable. [1]

40. State what is meant by a **local** variable. [1]

41. State what happens to a **local** variable after it goes out of scope. [1]

42. Use the following code to explain the scope of variable 'i' [1]

```
FOR i = 1 TO 10
    OUTPUT i
NEXT i
```

43. State the name of a 'global' variable and a 'local' variable from the following code. [2]

```
row_data = ['apples', 'pears', 'oranges']

PROCEDURE output_data()
    FOR row_num = 0 TO LEN(row_data):
        OUTPUT row_num & "... " & row_data[row_num]
    NEXT row_num
END PROCEDURE
```

```
output_data()
```

44. Identify the value of the variable 'row\_num' from the above code, at the **second** time that the OUPUT is executed. [1]

45. Give one reason why the following code will result in an error, and state the type of error. [2]

```
row_data = ['apples', 'pears', 'oranges']

def output_data():
    for row_num in range(0, len(row_data)):
        print(str(row_num) + "... " + row_data[row_num])

output_data()

print(row_num)
```

### 3.1.6 ERROR HANDLING

46. Explain three different types of error that can occur in a computer program. [6]

47. Identify which line of code would cause a runtime error.[1]

48. Identify which line of code is syntactically incorrect. [1]

49. Identify which line of code would cause a logical error. [1]

```
1. passenger_data = [100, 300, -200, 150];
2. total = 0
3. max_number = '0'

4. FOREACH passengers IN passenger_data
5.     total = total + passengers
6.     IF total < max_number THEN
7.         max_number = total
8.     END IF
9. NEXT passenger

10. total_carriages = INT(max_number / 100)

11. OUTPUT total_carriages
```

50. Tick the box to match up the problem to the type of error [4].

51. Explain three different tools to help programmers detect and deal with errors. [6]

| Problem                          | Syntax | Runtime | Logical |
|----------------------------------|--------|---------|---------|
| Missing bracket error            |        |         |         |
| Program won't compile error      |        |         |         |
| Incorrect output error           |        |         |         |
| Missing file error               |        |         |         |
| Data type error                  |        |         |         |
| Programmer types > instead of <= |        |         |         |
| Misspelt keyword error           |        |         |         |

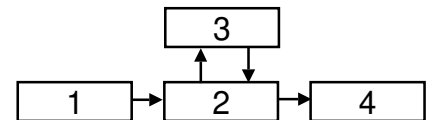
### 3.1.7 HANDLING EXTERNAL DATA

52. Explain one benefit of reading and writing data to an external text file. [2]

53. Explain one benefit of reading and writing data to an external database. [2]

### 3.1.8 COMPUTER STRUCTURE: > 3.1.8.1 SYSTEMS

54. Define numbers 1-4 to illustrate what is meant by a computer system. [4]



55. Place a tick in the box to identify the following actions as 'input', 'process', 'storage', or 'output': [5]

| Action                           | Input | Processes | Output | Storage |
|----------------------------------|-------|-----------|--------|---------|
| Work out the answer to a formula |       |           |        |         |
| Open a spreadsheet file          |       |           |        |         |
| Type numbers into a spreadsheet  |       |           |        |         |
| Put the answer on to a screen    |       |           |        |         |
| Print a spreadsheet out          |       |           |        |         |

56. Discuss how a computer system can be made reliable. [6]

57. Explain one example of how the **robustness** of how an Internet computer system could be improved. [2]

58. Give one example of a critical system that needs to be robust. [1]

59. State what is meant by the term '**data redundancy**'.

60. Discuss the importance of computer systems to **business communication**. [6]

### 3.1.8.2 HARDWARE

61. The CPU is one fundamental pieces of hardware required to make a functioning computer system. Describe and explain the purpose of two further required pieces of electrical hardware. [4]

62. Discuss **developments** in a hardware technology that is leading to exciting and innovative products being created in the gaming industry. [6]

63. Categorise the following devices as input and/or output. Accelerometer / Touchscreen / Camera / Gyroscope [4]

64. One characteristic of a smartphone is the ability to output sound. State two other physical output devices of a typical smartphone. [2]

### 3.1.8.3 CPU (CENTRAL PROCESSING UNIT)

65. Describe the purpose of the CPU (Central Processing Unit). [2]
66. Describe what is meant by a **bus**. [2]
67. State the names of three different buses that link the CPU to other components. [3]
68. State the method used by an I/O (Input/Output) device to get the attention of the processor. [1]
69. Explain the effect of the CPU (Central Processing Unit) clock speed on the performance of a processor. [2]
70. Give one benefit of having multiple cores on a processor. [1]
71. Explain the effect of having cache memory on the performance of the CPU. [2]
72. Explain why different levels of cache memory run at a different speed. [2]
73. State the name of two CPU (Central Processing Unit) characteristics that impacts on its overall performance. [2]
74. Explain why having multiple processor cores might not significantly improve the performance of a processor. [2]
75. State what is meant by 'clock speed'. [2]
76. A given processor has a characteristic of 800MHz. Describe what is meant by this. [2]
77. A given processor has a characteristic of 'dual core'. Describe what is meant by this. [2]

### 3.1.8.4 MEMORY

78. State the difference between non-volatile and volatile memory. [2]
79. Describe the purpose of ROM. [2]
80. Describe the purpose of RAM. [2]
81. Tick the box to match up the description to the type of memory. [7]

| Description                            | ROM | RAM | Cache |
|----------------------------------------|-----|-----|-------|
| Stores the computer's start up program |     |     |       |
| Read-only                              |     |     |       |
| Read-write                             |     |     |       |
| Stores programs                        |     |     |       |
| Exists inside of modern CPUs           |     |     |       |
| Volatile                               |     |     |       |
| Non-Volatile                           |     |     |       |

82. Explain when the use of virtual memory may be necessary. [2]
83. Explain why excessive use of virtual memory can degrade the performance of a computer. [2]



84. Explain the purpose of cache memory. [2]
85. Explain how a computer processes instructions. Make reference to the CPU (Central Processing Unit) and memory in your answer. [3]
86. A graphic designer uses multiple applications at the same time. Explain why it is important that the computer has sufficient RAM. [2]

### 3.1.8.5 SECONDARY STORAGE

87. State what is meant by secondary storage. [1]
88. Explain one suitable form of secondary storage for high-definition video. [2]
89. Explain two reasons why solid state media is a better choice than magnetic media for tablet computers. [2]
90. Explain how data is read from optical media such as a Blu-Ray disc. [5]
91. Explain how data is read and written to magnetic media such as a hard disk. [5]
92. Explain how data is read and written to solid state devices such as a USB memory stick. [2]

### 3.1.9 ALGORITHMS

93. Define what is meant by an **algorithm**. [2]
94. Explain what the following algorithm does. [3]

```
FUNCTION GET_CHARS()
  K = ''
  FOR I = 1 TO 10
    R = RANDOM(65, 91)
    K = K + CHAR(R)
  NEXT
  RETURN K
END FUNCTION
```

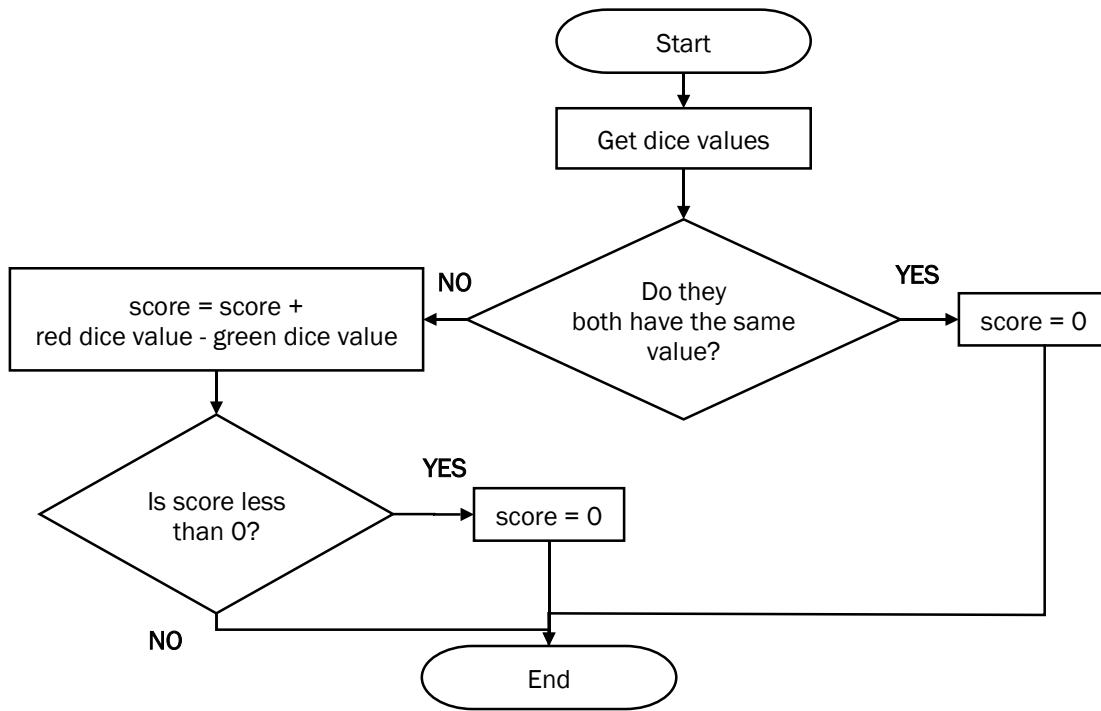
95. State the outputs of the following code. [2]

```
FUNCTION get_biggest(a_list)
  biggest = 0
  FOREACH item IN a_list
    IF item > biggest THEN
      biggest = item
    END IF
  NEXT item
  RETURN biggest
END FUNCTION
```

```
OUTPUT get_biggest([4, 44, 2])
OUTPUT get_biggest(get_biggest([4, 44, 2]), get_biggest([43,65,54]))
```

96. Use pseudocode or a programming language of your choice to create a program to calculate and output an overall ticket price. The program should ask for the number of adults and the number of children. Adult tickets are £5 and child tickets are £2.50. If the total is above £15, then set the total to £15.
97. Write an algorithm in programmatic form to calculate the 'human' age of a dog. If the input is 2 or less, the human age is  $10.5 * \text{dog\_age}$ . Otherwise if the input is more than two, the human age is 21 for the first two years and 4 years for every extra dog year. The program outputs the answer. [5]

98. Here is an algorithm expressed as a flowchart:



State the output value of 'score' from this algorithm when the following dice are rolled: [3]

| Red value | Green value | Score |
|-----------|-------------|-------|
| 5         | 6           |       |
| 6         | 6           |       |
| 6         | 5           |       |

### 3.1.10 DATA REPRESENTATION

99. State the two values that computers use to represent all data and instructions. [1]
100. Give a reason why high level code has to be encoded into machine code instructions. [1]
101. State the name of the smallest unit of storage. [1]
102. Calculate how many bits are in a kilobyte. [1]
103. State how many bits are in a nibble.[1]
104. Calculate how many bytes are in 8 kilobytes. [1]
105. Calculate how many kilobytes are in 2 megabytes. [1]
106. A file takes up 24,576 bits. Calculate the file size in kilobytes, show your working. [3]
107. Complete the sequence: bit > ? > byte > ? > ? > gigabyte > ? [4]
108. Place the following in order of size: [3]

| Quantity   | Order |
|------------|-------|
| 18 bits    |       |
| 2 bytes    |       |
| 3 nibbles  |       |
| 1 kilobyte |       |

109. Indicate with a tick then most suitable unit of storage for the following data:

| Quantity                           | Bytes | Kilobytes | Megabytes | Gigabytes |
|------------------------------------|-------|-----------|-----------|-----------|
| 4 minute MP3 audio file            |       |           |           |           |
| A page of ASCII text               |       |           |           |           |
| The name of a town                 |       |           |           |           |
| A 45 minute DVD-quality movie clip |       |           |           |           |

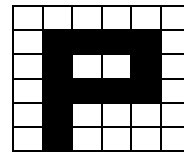
110. A robot has a 5-bit instruction set. State the maximum number of instructions that can be in the instruction set. [1]

111. Calculate the 8-bit binary representation of the denary number 73. [1]

112. Calculate the 8-bit binary representation of the denary number 242. [1]

113. Explain how a black and white image could be represented in binary. [2]

114. Explain the number of bits required to store this image: [3]



115. State the maximum number of colours that can be encoded in a bitmap image when using 4-bits for each pixel. [1]

116. State the minimum number of bits required for a bitmap image that needs to be encoded with 64 different colours. [1]

117. State one factor, other than the number of bits used to encode colours that can affect the quality of a bitmap image. [1]

118. State two consequences of increasing the number of bits used to encode each pixel in a bitmap image. [2].

119. Explain how using insufficient bits to store a sound sample will impact upon the quality of a WAVE sound. [2]

120. State one factor, other than sample rate, that can impact upon the quality of a sound. [1]

121. Calculate the file size in bits for a one minute sound recording that uses a sample rate of 1,000Hz (hertz) and a sample resolution of 8 bits. Show your working. [3]

122. Complete the table to show the binary value of the following ASCII character, and the ASCII character represented by the given binary number. [2]

| Character | Binary Representation |
|-----------|-----------------------|
| A         | 1000001               |
| C         |                       |
|           | 1001011               |

123. The ASCII code for 'a' is 97. State the letter that has the code 101. [1]

124. 'A' has the ASCII value of 65. State the word from using the following ASCII codes: 67, 65, 78 [1]

125. State the total number of characters that can be represented using ASCII. [1]

126. Explain a limitation of ASCII. [2]

127. Give one reason why programmers may represent numbers using hexadecimal instead of binary. [1]

128. State the denary representation of the binary number 01010111 [1]

129. State the denary representation of the hexadecimal number A3. [1]
130. State the binary representation of the hexadecimal number DE. [1]
131. State the hexadecimal value of the denary value 124. [1]
132. State the hexadecimal value of the binary number 10110111. [1]

### 3.1.11 SOFTWARE DEVELOPMENT LIFE CYCLE

133. Explain why the software development cycle is used to develop software. [2]
134. Put the following stages of the software development cycle into order (Evaluation, Implementation, Design, Requirements, Testing)
135. Identify at which state of the software development cycle the following steps would occur: (Analysis / Design / Implementation / Testing / Evaluation) [5]
- Writing functions and procedures
  - Reflecting on how well the project has progressed
  - Checking to see that the software meets the specification
  - Coming up with ideas about the look and feel of the proposed software
  - Finding out what the client wants
136. State the name of a classic software development methodology. [1]
137. One possible lifecycle model is the waterfall model. Compare the advantages and/or disadvantages of this model with another lifecycle model. [6]

#### 3.1.11.1 PROTOTYPING

138. Explain the purpose of prototyping. [2]
139. Discuss the advantages and disadvantages of prototyping when developing solutions. Include a definition of 'prototyping'. [6]

### 3.1.12 APPLICATION TESTING

140. Explain the need for rigorous testing of coded solutions. [2]

141. Unit testing is one type of testing that can be used. Explain the features of unit testing and compare this to another type of testing. [6]

142. Complete the following **trace table** for the code below. [4]

```

passenger_data = [100, 300, -200, 150];
total = 0
max_number = 0

FOREACH passengers IN passenger_data
    total = total + passengers
    IF total > max_number THEN max_number = total
NEXT passenger

total_carriages = INT(max_number / 100)

OUTPUT total_carriages
    
```

| passengers | total | max_number | total_carriages |
|------------|-------|------------|-----------------|
|            |       |            |                 |
|            |       |            |                 |
|            |       |            |                 |
|            |       |            |                 |

143. State three types of **test data** that should be used in a test plan. [3]

144. Complete the **test plan** for the following piece of code: [2]

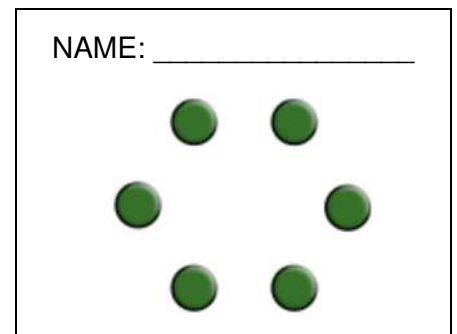
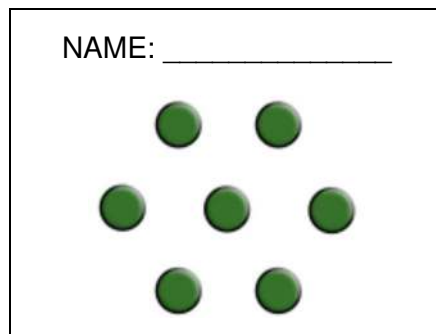
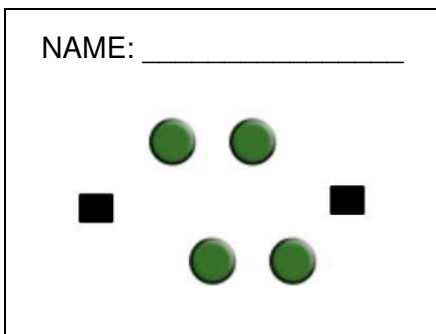
```

hours = INPUT "How many hours do you want to park for?"
IF hours < 0 OR hours > 5 THEN
    OUTPUT errorMessage()
ELSE
    OUTPUT ticket()
END IF
    
```

| Test No. | Purpose                                  | Test Data | Expected Result |
|----------|------------------------------------------|-----------|-----------------|
| 1        | Check procedure can handle invalid input |           |                 |
| 2        | Check procedure can handle valid input   |           |                 |

### 3.1.13 NETWORKING

145. State what is meant by a computer network. [2]
146. State what is meant by a **protocol**. [1]
147. State what is meant by an **IP address**. [1]
148. State one item of hardware that can be shared on a network. [1]
149. Discuss the advantages and disadvantages of using a computer network. [6]
150. Discuss security measures to combat potential network problems. [6]
151. Give two examples of **node devices** in a computer network. [2]
152. Name and complete the following topology diagrams. [6]



153. Describe what is meant by a 'bus' network topology. [2]
154. Describe what is meant by a 'ring' network topology. [2]
155. Describe what is meant by a 'star' network topology. [2]
156. Give one advantage and one disadvantages of a bus network. [2]
157. Give one advantage and one disadvantages of a ring network. [2]
158. Give one advantage and one disadvantages of a star network. [2]

### 3.1.13.1 CLIENT SERVER

159. Tick the row to show where the following would take place [5]

| Event                           | Client | Server | Both |
|---------------------------------|--------|--------|------|
| Request a web page              |        |        |      |
| Dynamically generate a web page |        |        |      |
| Render a web page               |        |        |      |
| Start the handshaking process   |        |        |      |
| Receive requests                |        |        |      |

160. State the name of two common services that may be provided by servers on the Internet. [2]

161. Explain, in simple terms, the handshake process used in most modern networking protocols. [3]

162. Give one reason why a developer may wish to develop a client-server program instead of a stand-alone application. [1]

163. Explain one reason why coding for a client-server model is different from coding for a stand-alone application. [2]

### 3.1.13.2 WEB APPLICATION CONCEPTS

164. Tick the row to show where the following would execute: [5]

| Event                    | Client | Server |
|--------------------------|--------|--------|
| HTML web page            |        |        |
| Cascading style sheet    |        |        |
| Dynamic web page         |        |        |
| Database query           |        |        |
| Javascript image gallery |        |        |

165. Explain the difference between validation and verification, giving an example of how each might apply to a web site registration form. [4]

166. Give one reason why a web form may be validated by a client before being sent to a server. [1]

### 3.1.14 USE OF EXTERNAL CODE SOURCES

167. Discuss the advantages and disadvantages of using external code sources. [6]

168. Give one reason why a developer may wish to use an external source of code for a web site. [1]

### 3.1.15 DATABASE CONCEPTS

169. Explain the purpose of a 'relational' database. [2]

170. Use the below to explain how a relationship is used to link two database tables. [2]

| Table Name: employees |              |              |            |
|-----------------------|--------------|--------------|------------|
| employeeId            | employeeName | employeeBoss | locationId |
| 1                     | Bertie       | Harvey       | 3          |
| 2                     | Saskia       | Quinton      | 2          |
| 3                     | Karis        | Jasminder    | 1          |

| Table Name: locations |              |
|-----------------------|--------------|
| LocationId            | locationName |
| 1                     | London       |
| 2                     | Manchester   |
| 3                     | Cambridge    |
| 4                     | Reading      |

171. State the name of the primary key from the locations table. [1]

172. State the number of records in the 'locations' table. [1]

173. State the number of fields in the 'employees' table. [1]

174. Define the term 'record'. [1]

175. Define the term 'field'. [1]

176. Define the term 'table'. [1]

177. Explain what a database query is. [2]

178. Explain the purpose of a primary key. [2]

179. Explain the purpose of a 'relationship'. [2]

180. Explain the purpose of an 'indexed field' [1]

181. Match the following definitions to these keywords: 1. Primary Key, 2. Field, 3. Record, 4. Table, 5. Query, 6. Relationship, 7. Index: [7]

|                                                   |  |
|---------------------------------------------------|--|
| A column heading in a database                    |  |
| Improves speed of searching and sorting           |  |
| Allows information to be selected from a database |  |
| A row in a database                               |  |
| A collection of related data                      |  |
| Uniquely identifies a record                      |  |
| Links two database tables                         |  |



### 3.1.15.1 QUERY METHODS (SQL)

| Table Name: employees |              |              |            |
|-----------------------|--------------|--------------|------------|
| employeeId            | employeeName | employeeBoss | locationId |
| 1                     | Bertie       | Harvey       | 3          |
| 2                     | Saskia       | Quinton      | 2          |
| 3                     | Karis        | Jasminder    | 1          |
| 4                     | Parker       | Jerry        | 2          |
| 5                     | Tyler        | Harvey       | 3          |
| 6                     | Yasmine      | Chesney      | 3          |

| Table Name: locations |              |
|-----------------------|--------------|
| LocationId            | locationName |
| 1                     | London       |
| 2                     | Manchester   |
| 3                     | Cambridge    |
| 4                     | Reading      |

182. Write a SQL statement to extract the employee name and employee boss for everyone located in Cambridge, in order of employee name. [3]

183. Write the output for the following SQL statement: [2]

```
SELECT employees.employeeName, locations.locationName FROM employees, locations WHERE locations.locationId=3 AND employees.employeeBoss <> "Chesney"
```

184. Write a SQL statement to update the boss of everyone working in Manchester to 'Dave' [3].

185. Write a SQL statement for a new employee. Name: Jon, Boss: Harvey. Location: 1. [2]

186. The following code has been written to get employee details for everyone working in Manchester and Cambridge. Explain and correct the error with the following SQL statement: [3]

```
SELECT * FROM employees WHERE employeeLocation = 3 AND employeeLocation = 2
```

### 3.1.16 THE USE OF COMPUTER TECHNOLOGY IN SOCIETY

187. Evaluate the impact of, and issues related to **social media** in society. [6]

188. Evaluate the impact of, and issues related to **the digital divide** in society. [6]

189. Evaluate the impact of, and issues related to **file-sharing** in society. [6]

190. Evaluate the impact of, and issues related to **employment** in society as a result of the use of computer technology. [6]

# ANSWERS

## 3.1.1 CONSTANTS, VARIABLES AND DATA TYPES

1. Explain the difference between **data** and **information**. [2]

**MUST** give definition of each for 2 marks. Data is unprocessed [1], does not have context [1]. Information: data that has been processed [1], data put into context [1].

2. Tick the box to indicate if the below item is 'data' or 'information' [5].

|                                                         | Data | Information |
|---------------------------------------------------------|------|-------------|
| 5 apples                                                | ✓    |             |
| 01/04/2015                                              | ✓    |             |
| John                                                    | ✓    |             |
| John is married to Sarah                                |      | ✓           |
| Cliff erosion has accelerated over the last five years. |      | ✓           |

3. Explain the difference between a constant and a variable. [2]

**Constant: does not change [1]. Variable: changes [1]**

4. Name the constant in the following code and state what is meant by a constant. [2]

**PI [1], does not change [1]**

```
PI = 3.14
OUTPUT 'Enter radius of circle'
r = INPUT
area = 3.14 * r * r
OUTPUT 'The area is ' & area
```

5. Name a variable from the following code and state what is meant by a variable. [2]

**r [1] OR area[1], changes [1]**

6. Jo is developing a computer program. Tick the box to indicate if the identifier should be a **constant** or a **variable**.

| Identifier   | Constant | Variable |
|--------------|----------|----------|
| highScore    |          | ✓        |
| topSpeed     | ✓        |          |
| currentSpeed |          | ✓        |

7. Give one benefit of using a constant in a computer program (such as VAT) instead of typing in the value at every occurrence. [1]

**Less likely to type it in incorrectly [1]. If the value needs to change, only need to change it once. [1]  
Doesn't take as long to type in the name as the value [1]**

8. State an appropriate data type for the following values: [5]

| Description                                                          | Data Type                  |
|----------------------------------------------------------------------|----------------------------|
| The average number of goals that a player has scored.                | Float, real OR decimal [1] |
| The number of goals scored in a football match.                      | Integer                    |
| Whether a football player has scored a goal or not.                  | Boolean                    |
| The time or date of a football match                                 | Date/time                  |
| Three letters that are used as a code to identify a football ground. | Character                  |

9. State the output from the code below: [1]

```
animals = ['monkey', 'lion', 'zebra']
OUTPUT animals[0]
```

**monkey [1]**

10. State the output from the code below: [1]

```
animals = [['monkey', 'lion', 'zebra'], ['tortoise', 'snake', 'lizard']]
area = 1
animal = 1
OUTPUT animals[area][animal]
```

**snake [1]**

11. State the Boolean output of the following programs: [3]

|                                                       |                                                    |                                            |
|-------------------------------------------------------|----------------------------------------------------|--------------------------------------------|
| <pre>x = 3 y = 4 r = (x = 3 AND y = 4) OUTPUT r</pre> | <pre>x = 3 y = 3 r = x = 3 OR y = 4 OUTPUT r</pre> | <pre>X = 3 Y = 3 r = x != y OUTPUT r</pre> |
| ANSWER:<br>True [1]                                   | ANSWER:<br>True [1]                                | ANSWER:<br>False [1]                       |

### 3.1.2 STRUCTURES

12. Explain what a data structure is. [2]

Stores related information [1] together [1].

13. In pseudocode or a programming language of your choice, write code for a data structure to store the following information about a football player: Name, goals scored, average goal scored. [3].

e.g.

```
player = {name: "", goals_scored:0, average_goal_scored:0}
```

e.g.

```
STRUCT player
```

```
    Name as string
```

```
    Goals_scored as integer
```

```
    Avg_goals_scored as float
```

```
END STRUCT
```

1 mark for defining the name of the structure, 1 mark for at least one correctly defined property, 2 marks for all correctly defined properties. Only award 3 marks for a fully *logically* correct answer.

14. Use the following example to give one reason why data structures can make coding a solution simpler. [1]

|                                                                   |                                                         |
|-------------------------------------------------------------------|---------------------------------------------------------|
| <pre>A) Name1 = 'Peter' Age1 = 14 Name2 = 'Lucy' Name2 = 14</pre> | <pre>B) Names = ['Peter', 'Lucy'] Ages = [14, 14]</pre> |
|-------------------------------------------------------------------|---------------------------------------------------------|

B Requires less code than A[1]. Data in B is easier to manipulate/process than A. [1]

15. State the name of a familiar programming language and two data structures that can be used in this language. [2]

e.g. Python: List, Class, Dictionary, Tuple (not Array)

Javascript: Array, Class (not object)

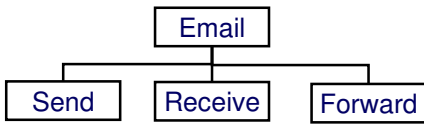
Visual Basic: Array, Class

2 marks for each data structure correctly identified.

### 3.1.3 PROGRAM FLOW CONTROL

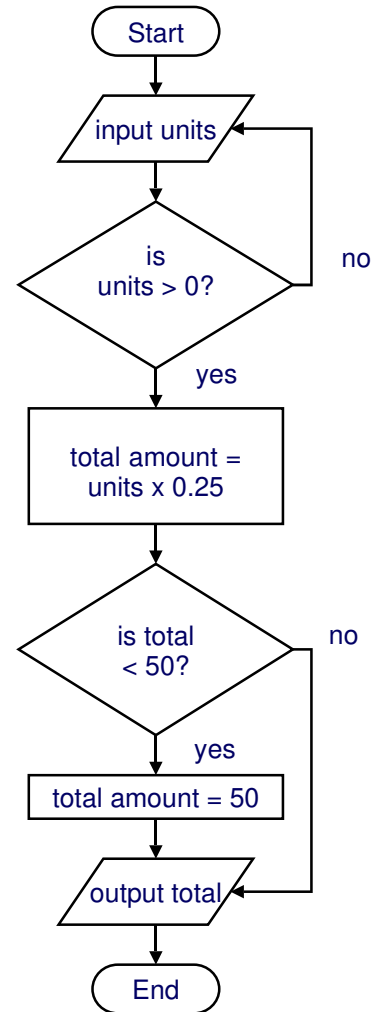
16. Draw a structure diagram to illustrate three possible features of an email application. [3]

e.g.

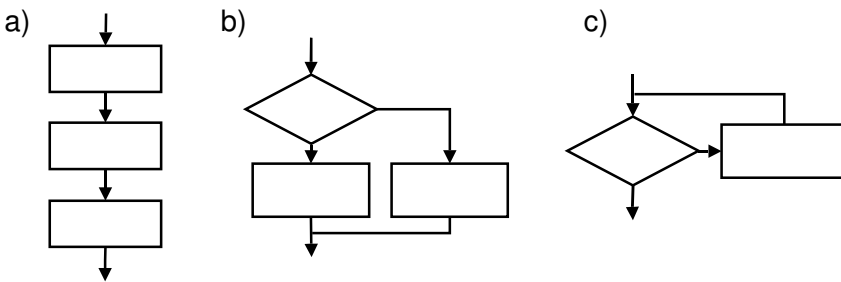


1 mark for correct structure. 2 marks for correct but incomplete diagram. 3 marks for *logically* fully correct diagram.

17. Draw a flowchart for the following: A billing function is as follows: The function asks for the number of units of power used. The program will only continue if the entered number is more than zero is entered. The 'units of power used' is multiplied by 0.25 to give the total amount owed. If the total amount is less than 50, then the total amount is set to 50. Finally, the program outputs the total amount to the screen.



18. Match the following diagrams to illustrate the basic building blocks of coded solutions [3]:



19. Use the following code to describe what is meant by iteration. [2]

| Building Block | Diagram Letter |
|----------------|----------------|
| Iteration      | C              |
| Selection      | B              |
| Sequence       | A              |

```

DO
    Password = INPUT "What is the password?"
LOOP UNTIL password = "cheese"
  
```

The same lines/code execute/runs multiple times [1], in the example until a condition has been met/password=cheese [1]

20. Use pseudocode or a programming language of your choice to write a program where if the level number in a game is 3 and all monsters have been destroyed (0 left), except for the boss (boss is false), then set the bonus amount to 300, otherwise it should be 100. [3]

Anything that makes programmatic sense, either using integers or Boolean, e.g.:

```

IF level_number==3 AND monsters==0 AND boss_destroyed==false THEN
    bonus = 300
ELSE
    bonus = 100
END IF
  
```

1 mark for correct if/else. 1 mark for correct operators, full marks for fully correct response. Alternatively, boss\_destroyed != true

21. Label the following descriptions with the correct definition from sequence, selection, iteration. [3]

- One line of code executes after another
- Code will repeat, either until an expression is true or whilst an expression is true
- Different code runs depending on the evaluation of an expression.

Sequence, iteration, selection [3]

22. Tick the box to match the following commands to the programming construct: Selection / Iteration [4]

| Construct | Selection | Iteration |
|-----------|-----------|-----------|
| IF        | ✓         |           |
| UNTIL     |           | ✓         |
| ELSE      | ✓         |           |
| FOR       |           | ✓         |

23. Indicate which two of the following constructs can interrupt instructions from being executed one at a time in order. [2]

| Construct           | Tick Two |
|---------------------|----------|
| Variable assignment |          |
| Procedure call      | ✓        |
| While loop          | ✓        |
| Input statement     |          |
| Print statement     |          |

24. Name two examples of iterative programming constructs. [2]

Any 2 of: WHILE, DO, FOR, REPEAT

25. Highlight the nested construct in the following code and explain what is meant by a nested construct.

```
FOR a = 1 TO 10
  FOR b = 1 TO 10
    OUTPUT a * b
  NEXT b
NEXT a
```

A nested construct is one construct inside of another. [1] E.g. a IF inside of an IF, a WHILE inside of a WHILE, a IF inside of a WHILE etc.

### 3.1.4 PROCEDURES AND FUNCTIONS

26. Explain what is meant by a function. [2]

Code designed to carry out a specific task. [1]. Returns a value [1].

27. Explain the difference between an inbuilt function and a user function. [2]

An in-built function comes with the programming language [1] (accept example). User-function is coded by the programmer. [1]

28. Explain how breaking up a program into routines can help simplify a coded solution. [3]

Reusable [1]...saves time [1]. Clearly structures the code [1]...makes it readable [1]  
The result/return value can change [1] depending on the arguments given [1]

29. State the keyword, other than FUNCTION, that suggests that the following code is a function: [1]

```
FUNCTION get_price(day, tickets) {  
    IF day = 'SAT' THEN  
        return tickets * 5  
    ELSE  
        return tickets * 4.5  
    END IF  
END FUNCTION
```

return [1 mark]

30. Use pseudocode or a programming language of your choice to write a function that returns the number of times that a given phrase contains the letter 'e'. [3]

```
FUNCTION e_count(phrase) {  
    RETURN phrase.COUNT ('e')           or    RETURN COUNT(phrase, 'e')  
}
```

OR

```
FUNCTION e_count(phrase) {  
    total = 0  
    FOR i = 1 TO LEN(phrase)           or    FOR I = 1 to phrase.LENGTH()  
        IF phrase[i] = 'e' THEN  
            total = total + 1           or    total +=1  
        END IF  
    NEXT i  
    RETURN total  
}
```

1 mark for correct function definition. 1 mark for returning the total. Full marks for *logically* correct function.

31. State and describe three common built in functions. [6]

Print, outputs a message to the screen

Input, gets a response from the user

Int, converts an object into an integer

Etc. Maximum 3 marks

32. Explain the difference between a function and a procedure. [2]

A function returns a value [1] whereas a procedure does not. [1] (Unless of course it is a stored procedure...)

33. Define what is meant by a parameter. [1]

An input variable of a function. [1]

34. State what is meant by a return value. [1]

An output from a function. [1]

35. State the name of the identifier used for the argument and identifier used for the parameter in the following code. [2]

```
FUNCTION do_something(n)
    x = n * 1.2
    RETURN x
END FUNCTION
```

```
y = 25
do_something(y)
argument: y [1]. parameter: n [1]
```

36. Explain the difference between an **argument** and a **parameter**. [2]

An argument is the value sent to a function/procedure [1] whereas a parameter is the variable that takes on the value of an argument. [1]

37. State the number of parameter there are in the following code and name one of them. [1]

```
PROC changeLevel(levelNumber, livesBonus)
    currentLevel = levelNumber
    lives = lives + livesBonus
END PROC
```

2, levelNumber [1]

38. Explain how the following line of code works, making reference to **return value** and **argument**. [2]

```
OUTPUT convert(INPUT("Enter number of miles:"))
```

The number entered is the argument to the convert function.[1]. The convert function must return a value that is outputted to the screen. [1]

### 3.1.5 SCOPE OF VARIABLES, CONSTANTS, FUNCTIONS AND PROCEDURES

39. State what is meant by a **global** variable. [1]

A variable that is accessible throughout a program.

40. State what is meant by a **local** variable. [1]

A variable that is only accessible from within the **scope** in which it is defined.

41. State what happens to a **local** variable after it goes out of scope. [1]

It is destroyed [1]

42. Use the following code to explain the scope of variable 'i' [1]

```
FOR i = 1 TO 10
    OUTPUT i
NEXT i
```

The variable 'i' is only accessible within the loop. [1]

43. State the name of a 'global' variable and a 'local' variable from the following code. [2]

```
row_data = ['apples', 'pears', 'oranges']

PROCEDURE output_data()
    FOR row_num = 0 TO LEN(row_data):
        OUTPUT row_num & "..." & row_data[row_num]
    NEXT row_num
END PROCEDURE
```

output\_data()

Global: row\_data [1]. Local row\_num [1]

44. Identify the value of the variable 'row\_num' from the above code, at the **second** time that the OUPUT is executed. [1]

1 [1]

45. Give one reason why the following code will result in an error, and state the type of error. [2]

```
row_data = ['apples', 'pears', 'oranges']

def output_data():
    for row_num in range(0, len(row_data)):
        print(str(row_num) + "..." + row_data[row_num])
```

output\_data()

print(row\_num)

Because row\_num is out of scope [1]. This is a runtime error. [1]



### 3.1.6 ERROR HANDLING

46. Explain three different types of error that can occur in a computer program. [6]

Syntax [1]: program does not compile [1], possibilities: missing bracket, misspelt keyword [1]

Logical: Program works but incorrect result [1], possibilities: programmer didn't understand, programmer error [1]

Runtime: Program crashes [1], possibilities: data type error, missing file etc [1]

Max Mark: 2 per error type.

47. Identify which line of code would cause a runtime error.[1]

3 or 6 (data type) [1]

48. Identify which line of code is syntactically incorrect. [1]

10 [1]

49. Identify which line of code would cause a logical error. [1]

6 (< instead of >) [1]

```

1. passenger_data = [100, 300, -200, 150];
2. total = 0
3. max_number = '0'

4. FOREACH passengers IN passenger_data
5.     total = total + passengers
6.     IF total < max_number THEN
7.         max_number = total
8.     END IF
9. NEXT passenger

10. total_carriages = INT(max_number / 100)

11. OUTPUT total_carriages
    
```

50. Tick the box to match up the problem to the type of error [4].

| Problem                          | Syntax | Runtime | Logical |
|----------------------------------|--------|---------|---------|
| Missing bracket error            | ✓      |         |         |
| Program won't compile error      | ✓      |         |         |
| Incorrect output error           |        |         | ✓       |
| Missing file error               |        | ✓       |         |
| Data type error                  |        | ✓       |         |
| Programmer types > instead of <= |        |         | ✓       |
| Misspelt keyword error           | ✓      |         |         |

51. Explain three different tools to help programmers detect and deal with errors. [6]

Step/step-through [1], execute one line of code at a time [1], to see if it is running in the right order [1]

Watch/Trace table [1], check the value of variables is as expected [1]

Breakpoint [1], stop the code on a particular line [1] or when a condition is met [1] to see if the program is running correctly [1]

IDE tools [1] such as keyword colours [1] to visually detect errors [1]

Translator diagnostics [1] view errors caused by syntax [1]

2 marks maximum for each tool written about.

### 3.1.7 HANDLING EXTERNAL DATA

52. Explain one benefit of reading and writing data to an external text file. [2]

Separates code from data [1] making the code neater [1]  
 Data can be changed easily [1] independently of the code [1], without having to recompile the program [1]  
 User data can be stored [1] and reloaded the next time the program is used [1]  
 File could be transferred [1] and used on another computer/by another person [1]  
 2 marks for ONE benefit and expansion of point.

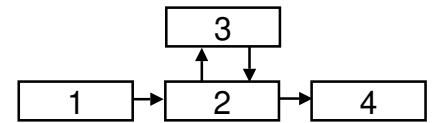
53. Explain one benefit of reading and writing data to an external database. [2]

*Any of the answers for the previous question, plus:*  
 Databases can be shared by many people [1], so others can access the data [1]

### 3.1.8 COMPUTER STRUCTURE: > 3.1.8.1 SYSTEMS

54. Define numbers 1-4 to illustrate what is meant by a computer system. [4]

1=inputs, 2 = processes, 3 = storage, 4 = outputs [4]



55. Tick the box to identify the following actions as 'input', 'process', 'storage', or 'output': [5]

| Action                           | Input | Processes | Output | Storage |
|----------------------------------|-------|-----------|--------|---------|
| Work out the answer to a formula |       | ✓         |        |         |
| Open a spreadsheet file          |       |           |        | ✓       |
| Type numbers into a spreadsheet  | ✓     |           |        |         |
| Put the answer on to a screen    |       |           | ✓      |         |
| Print a spreadsheet out          |       |           | ✓      |         |

56. Discuss how a computer system can be made reliable. Include a definition of reliability. [6]

Reliability: Code that works correctly given any imaginable/feasible input. [1]  
 A correct design...that is checked to see it meets user requirements. Designed with safety in mind. Considers all possible inputs into the system. Designed/built to a specific standard. Thorough testing. On-going monitoring and maintenance – making changes where necessary  
 [Up to 6 marks. Must include definition for full marks]

57. Explain one example of how the **robustness** of an Internet computer system could be improved. [2]

Install RAID setup [1] so if one storage device fails, another takes over. [1]. Data/hardware/software redundancy [1 each]. Keep firewall up-to-date [1] to avoid unauthorised traffic from entering/leaving a system [1] Etc  
 2 marks – must include one point and expansion

58. Give one example of a critical system that needs to be robust. [1]

e.g. life-support system, nuclear power station, modern airplane etc. [1]

59. State what is meant by the term 'data redundancy'.

A space copy/backup copy of data. [1]

60. Discuss the importance of computer systems to **business communication**. [6]

Smartphones used for instant communication/send messages quickly across the world, cost effectively.  
 Video-calling (e.g. Skype), saves travelling, see others face-to-face  
 Access new markets via e-commerce/internet [1], therefore grow the business [1]  
 Send/share documents online [1] e.g. using web apps [1] to work more collaboratively [1] Etc  
 6 marks total. Must include points and expansion, and use good quality English.

### 3.1.8.2 HARDWARE

61. The CPU is one fundamental pieces of hardware required to make a functioning computer system. Describe and explain the purpose of two further required pieces of electrical hardware. [4]

e.g. mainboard/motherboard...connects components together [2]

PSU (power supply unit)...provides power [2]

Memory...stores programs and data [2]

62. Discuss **developments** in a hardware technology that is leading to exciting and innovative products being created in the gaming industry. [6]

e.g. smaller/faster processors...leading to better graphics, faster gameplay, more realistic gameplay [up to 3]  
virtual development headsets...more immersive gaming experience. [2]

3d displays...more immersive gaming experience [2]

Feedback sensors/gaming chairs...more realism [2]

Input devices (i.e. use of accelerometers/gyroscopes/voice recognition etc)

63. Categorise the following devices as input and/or output. Accelerometer / Touchscreen / Camera / Gyroscope [4]

Input/input+output/input/input [4]

64. One characteristic of a smartphone is the ability to output sound. State two other physical output devices of a typical smartphone. [2]

Vibrate/solenoid, touchscreen/screen [2]

### 3.1.8.3 CPU (CENTRAL PROCESSING UNIT)

65. Describe the purpose of the CPU (Central Processing Unit). [2]

Control execution [1], fetch, decode and execute instructions [1]

66. Describe what is meant by a **bus**. [2]

Conductive path [1] that joins up components [1]

67. State the names of three different buses that link the CPU to other components. [3]

Control, address (of where the data goes from/to), data [3]

68. State the method used by an I/O (Input/Output) device to get the attention of the processor. [1]

Interrupt [1]

69. Explain the effect of the CPU (Central Processing Unit) clock speed on the performance of a processor. [2]

The faster the clock speed, the more actions it can perform per second [1]

70. Give one benefit of having multiple cores on a processor. [1]

The more cores, the capacity for parallel processing increases. [1]

71. Explain the effect of having cache memory on the performance of the CPU. [2]

It can increase performance [1] as instructions can be fetched from the cache instead of main memory [1], which is faster [1]. Max 2 marks.

72. Explain why different levels of cache memory run at a different speed. [2]

The closer it is to the processor, the faster it can perform. [2]

The technology used for each type of cache is different. [2]

73. State the name of two CPU (Central Processing Unit) characteristics that impacts on its overall performance. [2]

Cache size, number of cores, clock speed. Max 2 marks.

74. Explain why having multiple processor cores might not significantly improve the performance of a processor. [2]

Each core is like a processor [1]. The more there are, the more instructions can be ran in parallel. [1]

75. State what is meant by 'clock speed'. [2]

The number of operations the processor can complete every second.

76. A given processor has a characteristic of 800MHz. Describe what is meant by this.

Clock speed / frequency. Cycles per second. Indicates instructions executed per second.

77. A given processor has a characteristic of 'dual core'. Describe what is meant by this. [2]

Number of 'processing units'/processors within CPU, processor can execute instructions in parallel, each core can execute/work independently.

### 3.1.8.4 MEMORY

78. State the difference between non-volatile and volatile memory. [2]

Volatile: loses content without power. [1]. Non-volatile: remembers content without power. [1]

79. Describe the purpose of ROM. [2]

Stores computer start-up program [1] in read-only memory. [1] This program is loaded from ROM when the computer is turned on [1]

80. Describe the purpose of RAM. [2]

Random access memory [1], stores instructions and data [1]

81. Tick the box to match up the description to the type of memory. [7]

| Description                            | ROM | RAM | Cache |
|----------------------------------------|-----|-----|-------|
| Stores the computer's start up program | ✓   |     |       |
| Read-only                              | ✓   |     |       |
| Read-write                             |     | ✓   |       |
| Stores instructions                    | ✓   | ✓   | ✓     |
| Exists inside of modern CPUs           |     |     | ✓     |
| Volatile                               |     | ✓   | ✓     |
| Non-Volatile                           | ✓   |     |       |

One mark for each correct row

82. Explain when the use of virtual memory may be necessary. [2]

When there is no space left in RAM [1], a secondary storage device is used instead. [1]

83. Explain why excessive use of virtual memory can degrade the performance of a computer. [2]

Because the computer is constantly swapping data/instructions between RAM and a hard disk [1] which is very slow because secondary storage is slower than main memory/RAM [1]

84. Explain the purpose of cache memory. [2]

Temporarily stores instructions/data [1] because it is faster to retrieve them from cache than it is anywhere else. [1]

85. Explain how a computer processes instructions. Make reference to the CPU (Central Processing Unit) and memory in your answer. [3]

Instructions are fetched from memory [1], decoded [1] and executed [1] by the CPU

86. A graphic designer uses multiple applications at the same time. Explain why is it important that the computer has sufficient RAM. [2]

Sufficient space to store program instructions (and data) [1]. If there is insufficient space, it will affect performance/require use of slower virtual memory [1]

### 3.1.8.5 SECONDARY STORAGE

87. State what is meant by secondary storage. [1]

Non-volatile storage devices [1] (e.g. hard disk, USB memory stick etc)

88. Explain one suitable form of secondary storage for high-definition video. [2]

Blu-ray disc [1] ... large storage capacity [1] ... designed to be read linearly [1], relatively cheap to produce ...[1]. Easy to transport [1]. Hard disk [1]...large storage capacity [1]

89. Explain two reasons why solid state media is a better choice than magnetic media for tablet computers. [2]

No moving parts...less prone to damage if dropped [2]

Much lighter...improves portability [2]

Significantly smaller...improves portability [2]

DNA ('cheaper' as not presently the case)

90. Explain how data is read from optical media such as a Blu-Ray disc. [5]

Disc spins, laser is positioned under the disc, shines at disc, light reflected, measures time it takes for light to bounce back, decoded into a 0 or 1, signal sent to computer. [5 max]

91. Explain how data is read and written to magnetic media such as a hard disk. [5]

Disc spins, r/w head positioned on/under disc, head is magnetised/demagnetised to change magnetic state of disc in position. Head can also read the magnetic field around a point on a disc. Signals sent to/from computer. [5 max]

92. Explain how data is read and written to solid state devices such as a USB memory stick. [2]

Electrical signals sent to/from device. Transistors (switches) change state from 0 to 1 to store data.

### 3.1.9 ALGORITHMS

93. Define what is meant by an **algorithm**. [2]

A set of instructions [1] designed to solve a specific problem [1]

94. Explain what the following algorithm does. [3]

```
FUNCTION GET_CHARS()  
  K = ''  
  FOR I = 1 TO 10  
    R = RANDOM(65, 91)  
    K = K + CHAR(R)  
  NEXT  
  RETURN K  
END FUNCTION
```

Generates a string [1] of 10 random characters [1] and returns it [1]

95. State the outputs of the following code. [2]

```
FUNCTION get_biggest(a_list)  
  biggest = 0  
  FOREACH item IN a_list  
    IF item > biggest THEN  
      biggest = item  
    END IF  
  NEXT item  
  RETURN biggest  
END FUNCTION
```

OUTPUT get\_biggest([4, 44, 2])

OUTPUT get\_biggest(get\_biggest([4, 44, 2]), get\_biggest([43,65,54]))

44 [1 mark]

54 [1 mark]

96. Use pseudocode or a programming language of your choice to create a program to calculate and output an overall ticket price. The program should ask for the number of adults and the number of children. Adult tickets are £5 and child tickets are £2.50. If the total is above £15, then set the total to £15.

```
adults = INPUT "Number of adults?"  
children = INPUT "Number of children?"  
adult_cost = adults * 5  
child_cost = children * 2.5  
total = adult_cost + child_cost  
IF total > 15 THEN total = 15  
OUTPUT total
```

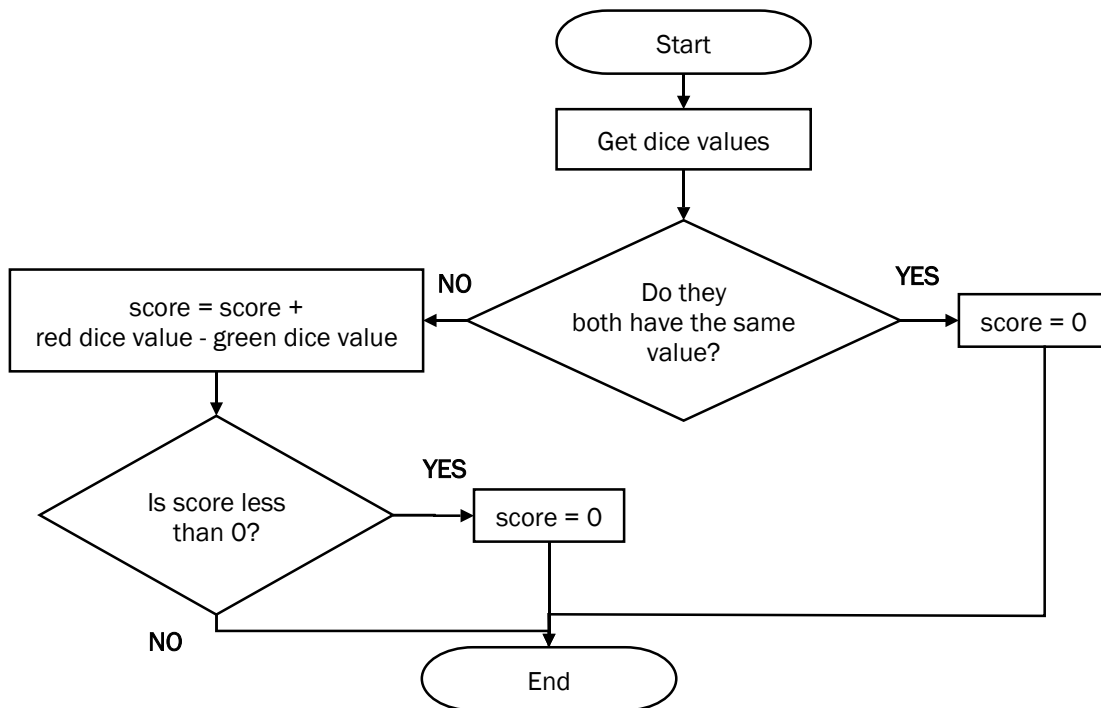
97. Write an algorithm in programmatic form to calculate the 'human' age of a dog. If the input is 2 or less, the human age is  $10.5 * \text{dog\_age}$ . Otherwise if the input is more than two, the human age is 21 for the first two years and 4 years for every extra dog year. The program outputs the answer. [5]

```

dog_age = INPUT
IF dog_age <= 2 THEN
    human_age = dog_age * 10.5
ELSE
    human_age = 23 + (dog_age - 2) #for equivalent
END IF
OUTPUT human_age
    
```

Marks as follows: input [1], if/else/end if [1], correct 'if' expression  $\leq 2$  OR  $< 3$  [1], correct calculations [1 each].

98. Here is an algorithm expressed as a flowchart:



State the output value of 'score' from this algorithm when the following dice are rolled: [3]

| Red value | Green value | Score |
|-----------|-------------|-------|
| 5         | 6           | 0     |
| 6         | 6           | 0     |
| 6         | 5           | 1     |



### 3.1.10 DATA REPRESENTATION

99. State the two values that computers use to represent all data and instructions. [1]

0, 1

100. Give a reason why high level code has to be encoded into machine code instructions. [1]

Computers only understand machine code [1] (1s and 0s)

101. State the name of the smallest unit of storage. [1]

bit

102. Calculate how many bits are in a kilobyte. [1]

$8 \times 1024 = 8192$  bits

103. State how many bits are in a nibble.[1]

4 bits

104. Calculate how many bytes are in 8 kilobytes. [1]

$1024 \times 8 = 8192$  bytes

105. Calculate how many kilobytes are in 2 megabytes. [1]

$1024 \times 2 = 2048$ KB

106. A file takes up 24,576 bits. Calculate the file size in kilobytes, show your working. [3]

$24,576 \text{ bits} / 8 = 3072 \text{ bytes} / 1024 = 3$ KB

107. Complete the sequence: bit > ? > byte > ? > ? > gigabyte > ? [4]

Nibble, kilobyte, megabyte, terabyte

108. Place the following in order of size: [3]

| Quantity   | Order                    |
|------------|--------------------------|
| 18 bits    | 3                        |
| 2 bytes    | 2 (2 bytes is 16 bits)   |
| 3 nibbles  | 1 (3 nibbles is 12 bits) |
| 1 kilobyte | 4                        |

109. Indicate with a tick then most suitable unit of storage for the following data:

| Quantity                           | Bytes | Kilobytes | Megabytes | Gigabytes |
|------------------------------------|-------|-----------|-----------|-----------|
| 4 minute MP3 audio file            |       |           | ✓         |           |
| A page of ASCII text               |       | ✓         |           |           |
| The name of a town                 | ✓     |           |           |           |
| A 45 minute DVD-quality movie clip |       |           |           | ✓         |

110. A robot has a 5-bit instruction set. State the maximum number of instructions that can be in the instruction set. [1]

32 (i.e.  $5^{\text{th}}$  bit is 16,  $16 \times 2 = 32$ )

111. Calculate the 8-bit binary representation of the denary number 73. [1]

01001001 (MUST be an 8-bit number)

112. Calculate the 8-bit binary representation of the denary number 242. [1]

11110010

113. Explain how a black and white image could be represented in binary. [2]

1 = black pixel, 0 = white pixel. [2]

114. Explain the number of bits required to store this image: [3]

36 bits [1], 1 for each pixel [1], e.g. 1 = black, 0 = white [1]

115. State the maximum number of colours that can be encoded in a bitmap image when using 4-bits for each pixel. [1]

16 colours

116. State the minimum number of bits required for a bitmap image that needs to be encoded with 64 different colours. [1]

6 bits per pixel

117. State one factor, other than the number of bits used to encode colours that can affect the quality of a bitmap image. [1]

Whether any compression techniques have been used, e.g. JPG [1]. The resolution of the image/total number of pixels in the image [1]. DNA: "How big it is" without justification.

118. State two consequences of increasing the number of bits used to encode each pixel in a bitmap image. [2].

Increase file size, maximum number of different colours, improved resolution

119. Explain how using insufficient bits to store a sound sample will impact upon the quality of sound. [2]

Sample not stored accurately enough [1] leading to distortion [1].

120. State one factor, other than sample rate, that can impact upon the quality of a WAVE sound. [1]

Bit rate

121. Calculate the file size in bits for a one minute sound recording that uses a sample rate of 1,000Hz (hertz) and a sample resolution of 8 bits. Show your working. [3]

$1,000 \times 8 = 8,000$ .  $8,000 \times 60$  (seconds in a minute) = 480,000 bits

122. Complete the table to show the binary value of the following ASCII character, and the ASCII character represented by the given binary number. [2]

| Character | Binary Representation |
|-----------|-----------------------|
| A         | 1000001               |
| C         | 1000011               |
| K         | 1001011               |

123. The ASCII code for 'a' is 97. State the letter that has the code 101. [1]

e (NB this must be LOWERCASE 'e')

124. 'A' has the ASCII value of 65. State the word from using the following ASCII codes: 67, 65, 78 [1]

CAN

125. State the total number of characters that can be represented using ASCII. [1]

128 (7-bit)

126. Explain a limitation of ASCII. [2]

It can only represent up to 128 different characters [1], insufficient for characters used in other languages. [1]

127. Give one reason why programmers may represent numbers using hexadecimal instead of binary. [1]

Easier to read. Quicker to convert to/from than denary. [Max 1 mark]

128. State the denary representation of the binary number 01010111 [1]

87

129. State the denary representation of the hexadecimal number A3. [1]

163

130. State the binary representation of the hexadecimal number DE. [1]

11011110

131. State the hexadecimal value of the denary value 124. [1]

7C

132. State the hexadecimal value of the binary number 10110111. [1]

B7

### 3.1.11 SOFTWARE DEVELOPMENT LIFE CYCLE

133. Explain why the software development cycle is used to develop software. [2]

A systematic/structured approach [1] to organise development/help ensure success/help meet requirements [1]

134. Put the following stages of the software development cycle into order (Evaluation, Implementation, Design, Requirements, Testing)

Requirements, design, implementation, testing, evaluation

135. Identify at which state of the software development cycle the following steps would occur: (Analysis / Design / Implementation / Testing / Evaluation) [5]

- Writing functions and procedures
- Reflecting on how well the project has progressed
- Checking to see that the software meets the specification
- Coming up with ideas about the look and feel of the proposed software
- Finding out what the client wants

Implementation, evaluation, testing, design, requirements

136. State the name of a classic software development methodology. [1]

Waterfall, spiral, cyclical, prototyping, agile [1 max]

137. One possible lifecycle model is the waterfall model. Compare the advantages and/or disadvantages of this model with another lifecycle model. [6]

Waterfall = clearly defined steps, suitable for small projects, suitable for projects with clearly defined objectives, relatively easy to manage – especially by more inexperienced project managers.

Alternative e.g. spiral, better for risky projects because of element of risk assessment. Better in that the requirements can evolve. Worse in that it generally takes longer to develop the project, worse in that it can be more complicated because requirements can change as the project is re-evaluated etc.

Mark based on quality of response – must COMPARE the models for maximum marks.

### 3.1.11.1 PROTOTYPING

138. Explain the purpose of prototyping. [2]

A sample/simulated version [1] of the intended software/solution [1]

139. Discuss the advantages and disadvantages of prototyping when developing solutions. Include a definition of 'prototyping'. [6]

Definition :A sample/simulated version of the intended software

Advantage: reduces chance of failure as in close contact with customer – constantly getting/responding to their feedback. Helps to get solid requirements if customer is unsure at the beginning. More likely to meet customer requirements than say using the waterfall model.

Disadvantage: prototypes can be costly to build. Customer might mistake a prototype for final version and get annoyed if too different from what expect. Adapting prototypes can get messy.

Max marks: 6 for quality response that includes both advantages and disadvantages.

### 3.1.12 APPLICATION TESTING

140. Explain the need for rigorous testing of coded solutions. [2]

Could be life-threatening in a critical system. Could cause loss to people/business/economy, people lose jobs, costly to put right the damage caused by poor software. (e.g. loss of personal data, inadvertently sharing personal data) etc.  
Max 2 marks.

141. Unit testing is one type of testing that can be used. Explain the features of unit testing and compare this to another type of testing. [6]

Unit testing = testing units of code in isolation from each other, possibly using trace tables to check values of variables, checking that output is correct in relation to the given inputs. Another: Integration testing. Different because it tests to make sure that all of the units work correctly when put together, e.g. the output data type from one unit is suitable for use in a related unit.

Max mark: 6 depending on quality of response. Must compare two valid types of testing.

142. Complete the following **trace table** for the code below.

```
passenger_data = [100, 300, -200, 150];
total = 0
max_number = 0

FOREACH passengers IN passenger_data
    total = total + passengers
    IF total > max_number THEN max_number = total
NEXT passenger

total_carriages = INT(max_number / 100)

OUTPUT total_carriages
```

| passengers | total | max_number | total_carriages |
|------------|-------|------------|-----------------|
| 100        | 100   | 100        | 4               |
| 300        | 400   | 400        |                 |
| -200       | 200   |            |                 |
| 150        | 350   |            |                 |

1 mark for each correct column

143. State three types of **test data** that should be used in a test plan. [3]

Valid, invalid and borderline/extreme

144. Complete the **test plan** for the following piece of code: [2]

```
hours = INPUT "How many hours do you want to park for?"
IF hours < 0 OR hours > 5 THEN
    OUTPUT errorMessage()
ELSE
    OUTPUT ticket()
END IF
```

| Test No. | Purpose                                  | Test Data | Expected Result |
|----------|------------------------------------------|-----------|-----------------|
| 1        | Check procedure can handle invalid input | 7         | Error message   |
| 2        | Check procedure can handle valid input   | 3         | Ticket          |

### 3.1.13 NETWORKING

145. State what is meant by a computer network. [2]

Two or more computers [1] connected together [1]

146. State what is meant by a **protocol**. [1]

A set of rules that govern communication. [1]

147. State what is meant by an **IP address**. [1]

A numerical code assigned to a network device (to identify it). [1]

148. State one item of hardware that can be shared on a network. [1]

Printer, fax machine, scanner, server etc.

149. Discuss the advantages and disadvantages of using a computer network. [6]

Advantages (must be explained): share files...work collaboratively, research using web...more productive, cloud storage...file security/online backup, video-conferencing...less travel, better communication, online calendars, e-commerce...buy and sell online, share peripheral devices, share internet connection etc

Disadvantages: viruses...delete/steal files, causes disruption, spam...unwanted email, phishing attacks...attempt to steal personal information, hackers..steal information etc. DDos (distributed denial of service attacks)

Max. 6 marks depending on quality o response.

150. Discuss security measures to combat potential network problems. [6]

Antivirus software...kept up-to-date [2]. Install firewall...disallow unauthorised network traffic [2]. Make sure users have a strong password (letters, numbers, minimum length, symbols.)...to prevent it being guessed. [2]. Educate users to prevent phishing attacks...seeking to extract personal information. [2]. Use encryption...to protect sensitive documents [2]. Enforce secure network connections...to prevent data leaking [2]. Set up user permissions carefully...to prevent users from accessing/changing anything they shouldn't.

151. Give two examples of **node devices** in a computer network. [2]

e.g. client computer, server, hub, switch, modem

152. Name and complete the following topology diagrams. [6]

Bus, star, ring [3]



153. Describe what is meant by a 'bus' network topology. [2]

Any 2 valid points, e.g. Nodes connect to a single backbone cable. [1] The cable has terminators to prevent signals 'bouncing'. [1]

154. Describe what is meant by a 'ring' network topology. [2]

Any 2 valid points, e.g. All nodes connect to a central node. [1] The central node could be a server, switch or hub. [1]

155. Describe what is meant by a 'star' network topology. [2]

Any 2 valid points, e.g. Nodes are connected in a ring formation. [1] Signals travel in one direction. [1]

156. Give one advantage and one disadvantages of a bus network. [2]

Disadvantage: If the backbone cable breaks, the whole network stop working. [1] Low security as all nodes receive all signals[1]

Advantage: Relatively easy to add/remove nodes [1]. Requires relatively little cable [1]. Adding additional nodes doesn't degrade performance so much as other topologies [1]

157. Give one advantage and one disadvantages of a ring network. [2]

Disadvantage: If any node breaks, the whole network is disrupted [1], Low security as many nodes receive all signals [1]

Advantage: Better performance than a bus as signals are not necessarily sent to every node [1]

158. Give one advantage and one disadvantages of a star network. [2]

Disadvantage: If the central node fails, the entire network will stop working [1]. The number of nodes that can be added is limited to the capacity of the central node. [1]

Advantage: Better performance than a bus as signals are not necessarily sent to every node [1]. Adding additional nodes doesn't degrade performance so much as other topologies. [1]

### 3.1.13.1 CLIENT SERVER

159. Tick the row to show where the following would take place[5]

| Event                           | Client | Server | Both |
|---------------------------------|--------|--------|------|
| Request a web page              | ✓      |        |      |
| Dynamically generate a web page |        | ✓      |      |
| Render a web page               | ✓      |        |      |
| Start the handshaking process   | ✓      |        |      |
| Receive packets of data         |        |        | ✓    |

160. State the name of two common services that may be provided by servers on the Internet. [2]

e.g. word-wide-web, email, voice over IP, file-transfer, http, https

161. Explain, in simple terms, the handshake process used in most modern networking protocols. [3]

Client requests to connect to server. [1] Server acknowledges request. [1] Client acknowledges the server's acknowledgement. [1]

162. Give one reason why a developer may wish to develop a client-server program instead of a stand-alone application. [1]

Share data/files with multiple users [1], use a web application from anywhere with a web connection. [1]

163. Explain one reason why coding for a client-server model is different from coding for a stand-alone application. [2]

Client-server: need to take account of multiple users/connections [1] whereas with a stand-alone application is typically written for a single user.

### 3.1.13.2 WEB APPLICATION CONCEPTS

164. Tick the row to show where the following would execute: [5]

| Event                    | Client | Server |
|--------------------------|--------|--------|
| HTML web page            | ✓      |        |
| Cascading style sheet    | ✓      |        |
| Dynamic web page         |        | ✓      |
| Database query           |        | ✓      |
| Javascript image gallery | ✓      |        |

165. Explain the difference between validation and verification, giving an example of how each might apply to a web site registration form. [4]

Validation: checking data complies with (one or more) rules [1]. Verification: Entering the data twice to make sure that it matches.[1] Validation example: e.g. checking email address contains @ symbol.[1]. Verification: Entering email address twice to make sure it matches. [1]

166. Give one reason why a web form may be validated by a client before being sent to a server. [1]

Saves the server from using up processing time to validate the form. [1] (NB the server should always validate the data)

### 3.1.14 USE OF EXTERNAL CODE SOURCES

167. Discuss the advantages and disadvantages of using external code sources. [6]

Advantage: saves time, external code can provide expert functionality/technical functionality that is beyond the programmer, standard libraries are reliable.

Disadvantages: might be poorly coded, could be security issue if don't know how it works, can make locating bugs problematic, might not be very efficient.

Mark depends on quality of response.

168. Give one reason why a developer may wish to use an external source of code for a web site. [1]

Saves time [1], rely on expertise of others [1], increase functionality/appeal of site [1], e.g. embedding YouTube video. etc

### 3.1.15 DATABASE CONCEPTS

169. Explain the purpose of a 'relational' database. [2]

Minimises repetitive data (minimises data redundancy) [1] maximises data accuracy (maximises data consistency) [2]

170. Use the below to explain how a relationship is used to link two database tables. [2]

| Table Name: employees |              |              |            |
|-----------------------|--------------|--------------|------------|
| employeeId            | employeeName | employeeBoss | locationId |
| 1                     | Bertie       | Harvey       | 3          |
| 2                     | Saskia       | Quinton      | 2          |
| 3                     | Karis        | Jasminder    | 1          |

| Table Name: locations |              |
|-----------------------|--------------|
| LocationId            | locationName |
| 1                     | London       |
| 2                     | Manchester   |
| 3                     | Cambridge    |
| 4                     | Reading      |

The locationId in the employees table is a foreign key [1]. This matches the primary key of the locationId field in the locations table [1].



171. State the name of the primary key from the locations table. [1]

locationId

172. State the number of records in the 'locations' table. [1]

4

173. State the number of fields in the 'employees' table. [1]

3

174. Define the term 'record'. [1]

A row in a table [1] of related data.

175. Define the term 'field'. [1]

A column heading / name given to a property of a record. [1]

176. Define the term 'table'. [1]

A collection of related records [1]

177. Explain what a database query is. [2]

Uses criteria [1] for searching for records [1] / also managing a database with commands [1]

178. Explain the purpose of a primary key. [2]

Uniquely identify any record [1] within a table [1]

179. Explain the purpose of a 'relationship'. [2]

Links two tables together [1] by linking a foreign key to a primary key [1]

180. Explain the purpose of an 'indexed field' [1]

Speeds up searching/sorting by that field .

181. Match the following definitions to these keywords: 1.Primary Key, 2. Field, 3. Record, 4. Table, 5. Query, 6. Relationship, 7. Index: [7]

|                                                   |   |
|---------------------------------------------------|---|
| A column heading in a database                    | 2 |
| Improves speed of searching and sorting           | 7 |
| Allows information to be selected from a database | 5 |
| A row in a database                               | 3 |
| A collection of related data                      | 4 |
| Uniquely identifies a record                      | 1 |
| Links two database tables                         | 6 |

### 3.1.15.1 QUERY METHODS (SQL)

| Table Name: employees |              |              |            |
|-----------------------|--------------|--------------|------------|
| employeeId            | employeeName | employeeBoss | locationId |
| 1                     | Bertie       | Harvey       | 3          |
| 2                     | Saskia       | Quinton      | 2          |
| 3                     | Karis        | Jasminder    | 1          |
| 4                     | Parker       | Jerry        | 2          |
| 5                     | Tyler        | Harvey       | 3          |
| 6                     | Yasmine      | Chesney      | 3          |

| Table Name: locations |              |
|-----------------------|--------------|
| LocationId            | locationName |
| 1                     | London       |
| 2                     | Manchester   |
| 3                     | Cambridge    |
| 4                     | Reading      |

182. Write a SQL statement to extract the employee name and employee boss for everyone located in Cambridge, in order of employee name. [3]

SELECT employeeName, employeeBoss FROM employees WHERE locationId=3 ORDER BY employeeName  
1 mark = 1 part correct. 2 marks = 2 parts correct. 3 marks = all parts correct

183. Write the output for the following SQL statement: [2]

```
SELECT employees.employeeName, locations.locationName FROM employees, locations WHERE locations.locationId=3 AND employees.employeeBoss <> "Chesney"
```

Bertie Cambridge

Tyler Cambridge

Max of 1 mark if 3 records listed.

184. Write a SQL statement to update the boss of everyone working in Manchester to 'Dave' [3].

UPDATE employees SET employeeBoss = 'Dave' WHERE locationId=2  
1 mark per part – NB must include quotation mark around 'Dave'

185. Write a SQL statement for a new employee. Name: Jon, Boss: Harvey. Location: 1. [2]

INSERT INTO employees(employeeName, employeeBoss, Location) VALUES('Jon', 'Harvey', 1)  
MUST include quotation marks around strings.

186. The following code has been written to get employee details for everyone working in Manchester and Cambridge. Explain and correct the error with the following SQL statement: [3]

```
SELECT * FROM employees WHERE employeeLocation = 3 AND employeeLocation = 2
```

AND should be OR [1] because employeeLocation can't be two values at the same time. [1]

### 3.1.16 THE USE OF COMPUTER TECHNOLOGY IN SOCIETY

The mark for the following questions will depend on the quality of response. Responses should be well informed, explained, give examples and CONCLUDE with an overall opinion.

187. Evaluate the impact of, and issues related to **social media** in society. [6]

Ideas for discussion: better communication, more connected, advertising (ethically correct to use personal information to advertising?), cyberbullying, sharing information (too much?), radicalisation, propaganda, misinformation. Exacerbates both positives and negatives. Quick way to share information, some regrettably in some cases etc.

188. Evaluate the impact of, and issues related to **the digital divide** in society. [6]

Wealthy families tend to have more money to spend on technology. This can improve education, lower bills through with price comparison, better informed through e-research/access to news, better ability to search for jobs quickly. Arguably more convenient. Those that don't have/want access don't get any on this. Public services in libraries/schools aim to lessen the impact, as too the lowering cost of technology. Not all parts of the country have access to broadband – some businesses/individuals are arguably worse off/less competitive.

189. Evaluate the impact of, and issues related to **file-sharing** in society. [6]

Increase in piracy owing to the ease of illegal file sharing/dark web/peer to peer networks. Copyright more difficult to impose. Easier for people to share/publicise their work online by sharing videos/music. People can work collaboratively by sharing files online via web apps or email attachments. Files can contain viruses which can damage/destroy files. Personal data is easy to share online – sometimes illegally or used for illegal purposes.

190. Evaluate the impact of, and issues related to **employment** in society as a result of the use of computer technology.

Increased jobs, e.g. Google mapping, e-commerce, changing jobs as processes are automated (e.g. robotics in car manufacturing), increased jobs in research and development, programming. Increased cyber threats leading to new jobs in cybersecurity. Older people made redundant can find it harder than youngsters to retrain in another industry. Changing high street as e-commerce takes over, e.g. demise of HMV, GAME. But increased opportunity for global e-commerce even for individuals.

**Low Range Mark 1 – 2**

- A few vague sentences, broadly relevant
- Ideas not expressed coherently
- Points made without explanation
- Sentences not connected, bullet points may have been used.
- No use of paragraphs
- Specialist vocabulary used inappropriately
- Most of the text is legible
- Spelling, punctuation and grammar errors

**Mid Mark Range 3 – 4**

- Some attempt to answer the question (e.g. compare, evaluate, describe, discuss)
- Mostly correct explanations
- Appropriate form of writing
- Ideas expressed coherently, perhaps with relevant example(s)
- Mostly correct use of specialist vocabulary
- Most of the meaning behind the text is clear
- Legible text
- Occasional spelling, punctuation and grammar errors

**High Mark Range 5 – 6**

- Detailed response
- Reasoned discussion/points explained
- Appropriate writing style
- Sentences and paragraphs flow in order and coherently
- Specialist vocabulary used appropriately
- Legible text
- Few, if any spelling, punctuation and grammar errors