



Mark Scheme

Summer 2024

Pearson Edexcel International GCSE
In Computer Science (4CP0/02)

Paper 02: Application of Computational Thinking

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question	mp	Answer	Additional Guidance	Mark
1(a)	A1	The only correct answer is D <i>A is not correct because it is the definition of decomposition</i> <i>B is not correct because it is a task undertaken during evaluation</i> <i>C is not correct because it describes a method for expressing algorithms</i>		1

Question	mp	Answer	Additional guidance	Mark
1b		Award one mark for each of:		
	B1	Initialisation of myName to "" (1)	- String myName = ""; - String myName = ""; - myName = "" Allow null Allow single space between quotes " "	
	B2	Add a line to create myAge and initialise it to 0 (1)	- int myAge = 0; - int myAge = 0; - myAge = 0 Allow any method	
	B3	Complete the test by inserting < (1)	- if (myAge < 30) - if (myAge < 30) - if (myAge < 30): Allow <= Can award reverse test only if welcome message contained within an 'else' part	
	B4	Add a line to display "Welcome" (1)	- Console.WriteLine ("Welcome"); - System.out.println ("Welcome"); - print ("Welcome") ignore indentation Allow any method	
				4

C#

```
1 // Q01bFINISHED
2
3 // Complete the line to initialise myName to an empty string
4 String myName = "";
5
6 // Add a line to create an integer variable called myAge and
7 //     initialise myAge to 0
8 int myAge = 0;
9
10 Console.WriteLine ("Enter your name: ");
11 myName = Console.ReadLine();
12 Console.WriteLine ("Enter your age: ");
13 myAge = Convert.ToInt32 (Console.ReadLine());
14
15 // Complete the test to check if the age is less than 30
16 if (myAge < 30)
17 {
18     // Add a line to display a message that says "Welcome"
19     Console.WriteLine ("Welcome");
20 }
21
```

Java

```
1 // Q01bFINISHED
2
3 import java.util.Scanner;
4 public class Q01bFINISHED
5 {
6     public static void main (String[] args)
7     {
8         Scanner myKeyboard = new Scanner (System.in);
9
10        // Complete the line to initialise myName to an empty string
11        String myName = "";
12
13        // Add a line to create an integer variable called myAge and
14        //     initialise myAge to 0
15        int myAge = 0;
16
17        System.out.println ("Enter your name: ");
18        myName = myKeyboard.nextLine();
19        System.out.println ("Enter your age: ");
20        myAge = Integer.parseInt (myKeyboard.nextLine());
21
22        // Complete the test to check if the age is less than 30
23        if (myAge < 30)
24        {
25            // Add a line to display a message that says "Welcome"
26            System.out.println ("Welcome");
27        }
28    }
29 }
```

Python

```
1  | # Q01bFINISHED
2
3  | # Complete the line to initialise myName to an empty string
4  | myName = ""
5
6  | # Add a line to create an integer variable called myAge and
7  | #     initialise myAge to 0
8  | myAge = 0
9
10 | myName = input ("Enter your name: ")
11 | myAge = int (input ("Enter your age: "))
12
13 | # Complete the test to check if the age is less than 30
14 | if (myAge < 30):
15 |
16 |     # Add a line to display a message that says "Welcome"
17 |     print ("Welcome")
18
```

Question	mp	Answer	Additional guidance	Mark
1c(i)		Award one mark for any of the following:		
	C1	C#: • // Q01c (1) • Q01c (1) • // Loop for 50 times (1) • Loop for 50 times (1) Java: • // Q01c (1) • Q01c (1) • // Loop for 50 times (1) • Loop for 50 times (1) Python: • # Q01c (1) • Q01c (1) • # Loop for 50 times (1) • Loop for 50 times (1)	Ignore transcription errors	1

Question	mp	Answer	Additional guidance	Mark
1 c(ii)		Award one mark for any of the following:		
	C2	C#: - int count = 0; (1) - int total = 0; (1) - int subtotal = 0; (1) Java: - int count = 0; (1) - int total = 0; (1) - int subtotal = 0; (1) Python: - count = 0 (1) - total = 0 (1) - subtotal = 0 (1)	Ignore transcription errors	1
Question	mp	Answer	Additional guidance	Mark
1 c(iii)		Award one mark for:		
	C3	if (1)	Applies to all programming languages Ignore capitalisation	1

Question	mp	Answer	Additional guidance	Mark
1c(iv)		Award one mark for:		
	C4	C#: • && (1) Java: • && (1) Python: • and (1)	Ignore capitalisation	1

Question	mp	Answer	Additional Guidance	Mark
1(d)	D1	The only correct answer is B <i>A is not correct because the data can be stored in an array as it is all the same data type (string)</i> <i>C is not correct because the data can be stored in an array as it is all the same data type (integer)</i> <i>D is not correct because the data can be stored in an array as it is all the same data type (real)</i>		1

Question	mp	Answer	Additional Guidance	Mark						
1(e)	E1	One mark for each correct cell:	Ignore capitalisation Do not accept string for True							
	E2									
	<table><tr><th>Item</th><th>Data type</th></tr><tr><td>45.82</td><td>All programming languages: • real/float C#: • decimal/double Java: • Double/double/BigDecimal Python: • decimal </td></tr><tr><td>True</td><td>All programming languages: • Boolean/bool </td></tr></table>				Item	Data type	45.82	All programming languages: • real/float C#: • decimal/double Java: • Double/double/BigDecimal Python: • decimal	True	All programming languages: • Boolean/bool
	Item				Data type					
45.82	All programming languages: • real/float C#: • decimal/double Java: • Double/double/BigDecimal Python: • decimal									
True	All programming languages: • Boolean/bool									

Question	mp	Answer	Additional Guidance	Mark
2(a)(i)	A1	The only correct answer is A B is not correct because computational thinking are skills used in creating algorithms and programs C is not correct because decomposition is breaking down a problem into smaller parts D is not correct because pseudocode is a notation for expressing an algorithm		1

Question	mp	Answer	Additional Guidance	Mark
2(a)(ii)	A2	Award one mark for: Variable (1)	Allow parameter Ignore local/global	1

Question	mp	Answer	Additional Guidance	Mark
2(b)(i)	B1	Award one mark for any of the following: - An instruction is impossible to execute (1) - The program stops executing unexpectedly / crashes (1)	Do not award an example, as that is the next question Don't award repeat of question e.g. "Stopping during execution" without clarifying reason or that stop was unexpected	1

Question	mp	Answer	Additional Guidance	Mark
2(b)(ii)	B2	Award one mark for any of the following: - Division by zero (1) - Accessing memory outside the range of an array (1) - Attempting an operation on incompatible types (1) - File not found (1) - An exception is raised that cannot be/is not handled (1)	Award other examples, if they can be mapped to a bullet	1

Question	mp	Answer	Additional guidance	Mark
2(c)		Award one mark for each of:		3
	C1	Add or remove a semicolon on initialisation of the length variable (1)	• <code>int length = 4;</code> • <code>int length = 4;</code> • <code>length = 4</code>	
	C2	Add a comma between the arguments to the subprogram call to generate a random number (1)	• <code>width = randGenerator.Next (1, 6);</code> • <code>width = randGenerator.nextInt(1, 6);</code> • <code>width = random.randint (1, 5)</code>	
	C3	Replace modulus operator (%) with multiplication operator (*) (1)	• <code>perimeter = (2 * width) + (2 * length);</code> • <code>perimeter = (2 * width) + (2 * length);</code> • <code>perimeter = (2 * width) + (2 * length)</code>	

C#

```
1 // Q02cFINISHED
2
3 int width = 0;
4 int length = 4;
5 int perimeter = 0;
6 Random randGenerator = new Random();
7
8 width = randGenerator.Next(1, 6);
9 perimeter = (2 * width) + (2 * length);
10
11 Console.WriteLine (width.ToString() + " " +
12                    length.ToString() + " " +
13                    perimeter.ToString());
14
```

Java

```
1 // Q02cFINISHED
2
3 import java.util.Random;
4
5 public class Q02cFINISHED
6 {
7     public static void main (String[] args)
8     {
9         int width = 0;
10        int length = 4;
11        int perimeter = 0;
12        Random randGenerator = new Random();
13
14        width = randGenerator.nextInt(1, 6);
15        perimeter = (2 * width) + (2 * length);
16
17        System.out.println (String.valueOf(width) + " " +
18                            String.valueOf(length) + " " +
19                            String.valueOf(perimeter));
20    }
21 }
```

Python

```
1  # Q02cFINISHED
2
3  import random
4
5  width = 0
6  length = 4
7  perimeter = 0
8
9  width = random.randint (1, 5)
10 perimeter = (2 * width) + (2 * length)
11
12 print (width, length, perimeter)
13
```

Question	mp	Answer	Additional Guidance	Mark						
2(d)	D1	<table><tr><td rowspan="3">Erroneous</td><td>Award one mark for any of the following up to a maximum of two marks: - Contains incorrect data type (1) <2 letters (1) 9+ letters (1) </td></tr><tr><td>Normal</td><td>A string between 2 and 8 in length that includes only letters (1)</td></tr><tr><td>Boundary</td><td>Award one mark for any of the following: - A string of exactly 8 letters (1) - A string of exactly 2 letters (1) </td></tr></table>	Erroneous	Award one mark for any of the following up to a maximum of two marks: - Contains incorrect data type (1) <2 letters (1) 9+ letters (1)	Normal	A string between 2 and 8 in length that includes only letters (1)	Boundary	Award one mark for any of the following: - A string of exactly 8 letters (1) - A string of exactly 2 letters (1)	Award any correct example (not description) Do not award an empty cell as equivalent to empty string Do not accept same test twice for erroneous	4
	Erroneous			Award one mark for any of the following up to a maximum of two marks: - Contains incorrect data type (1) <2 letters (1) 9+ letters (1)						
				Normal	A string between 2 and 8 in length that includes only letters (1)					
			Boundary	Award one mark for any of the following: - A string of exactly 8 letters (1) - A string of exactly 2 letters (1)						
D2										
D3										
D4										

Question	mp	Answer	Additional Guidance	Mark																									
3(a)	A1 A2 A3 A4	Award one mark for correct column (A OR B) Award one mark for correct column (NOT B) Award one mark for first set of two cells in third column Award one mark for second set of two cells in third column <table><tr><th>A</th><th>B</th><th>A OR B</th><th>NOT B</th><th>(A OR B) AND (NOT B)</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr></table>	A	B	A OR B	NOT B	(A OR B) AND (NOT B)	0	0	0	1	0	0	1	1	0	0	1	0	1	1	1	1	1	1	0	0	Award follow through on last column only 5th column can be judged - On columns 1 and 2 for MP3 and MP4 - or - as FT from columns 3 and 4 for MP3 and MP4 - award highest mark	4
A	B	A OR B	NOT B	(A OR B) AND (NOT B)																									
0	0	0	1	0																									
0	1	1	0	0																									
1	0	1	1	1																									
1	1	1	0	0																									

Question	mp	Answer	Additional guidance	Mark
3(b)		Award one mark for each of:		3
	B1	Correct output taken from array (1)	Must be from array i.e. Indexing used	
	B2	Use of iteration to loop over every item in the array (1)	Award foreach loops Accept any array	
	B3	Use of appropriate method to step accurately, i.e. every other item starting at position 0 (1)	Any appropriate step method Not hard coded index	

C#

```
1 // Q03bFINISHED
2
3 String[] starNames = {"Alasia", "Beid", "Castor", "Denebola",
4                       "Electra", "Fafnir", "Gudja", "Haedus",
5                       "Izar", "Jishui", "Kang", "Lich",
6                       "Maia", "Nahn", "Ogma", "Peacock"};
7
8
9 // Write your code here
10 int start = 0;
11 int stop = starNames.Length;
12 int step = 2;
13
14 for (int index = start; index < stop; index = index + step)
15 {
16     Console.WriteLine (starNames[index]);
17 }
18
19 // Alternative
20 for (int i=0; i<starNames.Length; i=i+2)
21 {
22     Console.WriteLine (starNames[i]);
23 }
24
```

Java

```
1 // Q03bFINISHED
2
3
4 public class Q03bFINISHED
5 {
6     public static void main (String[] args)
7     {
8         String starNames[] = {"Alasia", "Beid", "Castor", "Denebola",
9                                "Electra", "Fafnir", "Gudja", "Haedus",
10                               "Izar", "Jishui", "Kang", "Lich",
11                               "Maia", "Nahn", "Ogma", "Peacock"};
12
13         // Write your code here
14         int start = 0;
15         int stop = starNames.length;
16         int step = 2;
17
18         for (int index = start; index < stop; index = index + step)
19         {
20             System.out.println (starNames[index]);
21         }
22
23         // Alternative
24         for (int i=0; i<starNames.length; i=i+2)
25         {
26             System.out.println (starNames[i]);
27         }
28     }
29 }
30 }
```

Python

```
1  # Q03bFINISHED
2
3  starNames = ["Alasia", "Beid", "Castor", "Denebola",
4               "Electra", "Fafnir", "Gudja", "Haedus",
5               "Izar", "Jishui", "Kang", "Lich",
6               "Maia", "Nahn", "Ogma", "Peacock"]
7
8  # Write your code here
9
10 start = 0
11 stop = len (starNames)
12 step = 2
13
14 for index in range (start, stop, step):
15     print (starNames[index])
16
17 # Alternative
18 for index in range (0, len (starNames), 2):
19     print (starNames[index])
20
```

Question	mp	Answer	Additional guidance	Mark
3(c)		Award one mark for each:		6
	C1	Take a string input (1)	• <code>aString = Console.ReadLine ();</code> • <code>aString = myKeyboard.nextLine();</code> • <code>aString = input ("Enter a number: ")</code>	
	C2	Complete the selection with 'if' (1)		
	C3	Convert string to integer (1)	• <code>aNum = Convert.ToInt32 (aString);</code> • <code>aNum = Integer.parseInt (aString);</code> • <code>aNum = int (aString)</code>	
	C4	Any one correct set of relational operators (1) ignore logical operator first two tests ignore test dealing with <code>>= 1</code>	Python • <code>(aNum <= 20) or (aNum >= 60)</code> • <code>(aNum < 21) or (aNum > 59)</code> • <code>(aNum > 30) and (aNum < 40)</code> • <code>(aNum >= 31) and (aNum <= 39)</code>	
	C5	Both logical operators used correctly in each test (1) Ignore relational operators First test: or (must attempt to address 20 and 60 with relational, even if C4 not awarded) Second test: and	C# and Java • <code>((aNum <= 20) (aNum >= 60))</code> • <code>(aNum < 21) (aNum > 59))</code> • <code>((aNum > 30) && (aNum < 40))</code> • <code>((aNum >= 31) && (aNum <= 39))</code>	
	C6	Complete the third test (1)	All Languages: <code>(aNum == 30)</code>	

C#

```
1  // Q03cFINISHED
2
3  String aString = "";
4  int aNum = 0;
5
6  Console.WriteLine ("Enter a number:");
7
8  // Complete the line to take a string input
9  aString = Console.ReadLine ();
10
11 // Complete the selection statement
12 if (aString != "")
13 {
14     // Convert the string to an integer
15     aNum = Convert.ToInt32 (aString);
16     if (aNum > 0)
17     {
18         // Complete the test
19         if ((aNum <= 20) || (aNum >= 60))
20         {
21             Console.WriteLine ("Acceptable");
22         }
23         // Complete the test
24         else if ((aNum >30) && (aNum < 40))
25         {
26             Console.WriteLine ("Centre");
27         }
28         // Complete the test
29         else if (aNum == 30)
30         {
31             Console.WriteLine ("Perfect");
32         }
33         else
34         {
35             Console.WriteLine ("No message");
36         }
37     }
38     else
39     {
40         Console.WriteLine ("The number must be greater than zero");
41     }
42 }
43 else
44 {
```


Java

```
1 // Q03cFINISHED
2
3 import java.util.Scanner;
4
5 public class Q03cFINISHED
6 {
7     public static void main (String[] args)
8     {
9         String aString = "";
10        int aNum = 0;
11        Scanner myKeyboard = new Scanner (System.in);
12
13        System.out.println ("Enter a number:");
14
15        // Complete the line to take a string input
16        aString = myKeyboard.nextLine();
17
18        // Complete the selection statement
19        if (aString != "")
20        {
21            // Convert the string to an integer
22            aNum = Integer.parseInt (aString);
23            if (aNum > 0)
24            {
25                // Complete the test
26                if ((aNum <= 20) || (aNum >= 60))
27                {
28                    System.out.println ("Acceptable");
29                }
30                // Complete the test
31                else if ((aNum >30) && (aNum < 40))
32                {
33                    System.out.println ("Centre");
34                }
35                // Complete the test
36                else if (aNum == 30)
37                {
38                    System.out.println ("Perfect");
39                }
40                else
41                {
42                    System.out.println ("No message");
43                }
44            }
45            else
46            {
47                System.out.println ("The number must be greater than zero");
48            }
49        }
50    }
51 }
```

Python

```
1  # Q03cFINISHED
2
3  # Complete the line to take a string input
4  aString = input ("Enter a number: ")
5
6  # Complete the selection statement
7  if (aString != ""):
8
9      # Convert the string to an integer
10     aNum = int (aString)
11
12     if (aNum > 0):
13
14         # Complete the test
15         if (aNum <= 20) or (aNum >= 60):
16             print ("Acceptable")
17         # Complete the test
18         elif (aNum > 30) and (aNum < 40):
19             print ("Centre")
20         # Complete the test
21         elif (aNum == 30):
22             print ("Perfect")
23         else:
24             print ("No message")
25     else:
26         print ("The number must be greater than zero")
27 else:
28     print ("You must provide a number")
```

Question	mp	Answer	Additional Guidance	Mark
4(a)(i)	A1	Award one mark for: (At the highest level) in the main scope/program/file (1)	Java and C#: allow answers that indicate inside namespace e.g. 'before main class'	1

Question	mp	Answer	Additional Guidance	Mark
4(a)(ii)	A2	Award one mark for: Only from within the scope/subprogram/code block in which it is created/declared (1)		1

Question	mp	Answer	Additional guidance	Mark
4(b)	B1 B2	Award two marks for a linked explanation such as: Figure 4 executes fewer comparisons/tests (1), because (the use of nested ifs/else ifs/ means that) as soon as a test evaluates to true, all the remaining tests are skipped (1) Figure 5 executes more comparison/tests (1), because every if statement must be executed, even if any test before has already evaluated to true (1)		2

Question	mp	Answer	Additional guidance	Mark
4(c)		Award one mark for each:		6
	C1	Subprogram must attempt to use both pString and pNum to generate Key (1)	Award attempted use, even if not correct	
	C2	1D indexing used to access chars in string (1)	Can be anywhere in code (main or subprogram) Any method e.g. pString[0]	
	C3	2 pairs of separated chars obtained (1)	First 2 and last 2 characters obtained from pString Any method Can be anywhere in code - pString[0] + pString[1] - pString[2] + pString[3] - pString[0:2] - pString[2:4]	
	C4	Key concatenated correctly (1)	Key must be correct Can be anywhere in code	
	C5	Subprogram must return their key to the calling line (1)	Do not award return without a value Value must be variable/value intended to be key	
	C6	Complete line to call new subprogram (1)	Must be fully correct myNewKey = genNewKey(myString, myNumber)	

C#

```
1 // Q04cFINISHED
2
3 namespace Q04cFINISHED
4 {
5     class Q04cFINISHED
6     {
7         static String genNewKey (String pString, int pNum)
8         {
9             String newKey;
10
11             // Write your code below this line
12             newKey = pString.Substring (0, 2);           // First two chars
13             newKey = newKey + pNum.ToString();           // Number
14             newKey = newKey + pString.Substring (2, 2);  // Last two chars
15
16             return (newKey);
17         }
18
19         static void Main(string[] args)
20         {
21             String myNewKey = "";
22             int myNumber = 0;
23             String myString = "";
24
25             Console.WriteLine ("Enter a string:");
26             myString = Console.ReadLine();
27             Console.WriteLine ("Enter a whole number: ");
28             myNumber = Convert.ToInt32 (Console.ReadLine());
29
30             if (myString.Length != 4)
31             {
32                 Console.WriteLine ("String must be four characters");
33             }
34             else
35             {
36                 Console.WriteLine ("Original: " + myString +
37                                     " " + myNumber.ToString());
38
39                 // Complete the call to the subprogram
40                 myNewKey = genNewKey (myString, myNumber);
41                 Console.WriteLine ("New: " + myNewKey);
42             }
43         }
44     }
45 }
46
```

Java

```
1 // Q04cFINISHED
2
3 import java.util.Scanner;
4
5 public class Q04cFINISHED
6 {
7     static String genNewKey (String pString, int pNum)
8     {
9         String newKey;
10
11         // Write your code below this line
12         newKey = pString.substring(0,2); // First two chars
13         newKey = newKey + String.valueOf (pNum); // Number
14         newKey = newKey + pString.substring (2, 4); // Last two chars
15
16         return (newKey);
17     }
18
19     public static void main(String[] args)
20     {
21         String myNewKey = "";
22         int myNumber = 0;
23         String myString = "";
24         Scanner myKeyboard = new Scanner (System.in);
25
26         System.out.println ("Enter a string:");
27         myString = myKeyboard.nextLine();
28         System.out.println ("Enter a whole number: ");
29         myNumber = myKeyboard.nextInt();
30
31         if (myString.length() != 4)
32         {
33             System.out.println ("String must be four characters");
34         }
35         else
36         {
37             System.out.println ("Original: " + myString +
38                                 " " + String.valueOf(myNumber));
39
40             // Complete the call to the subprogram
41             myNewKey = genNewKey (myString, myNumber);
42             System.out.println ("New: " + myNewKey);
43         }
44     }
45 }
46
```

Python

```
1  # Q04cFINISHED
2
3  def genNewKey (pString, pNum):
4      newKey = ""          # Make new word here
5
6      # Write your code below this line
7      newKey = pString[0:2]      # First two chars
8      newKey = newKey + str (pNum)    # Number
9      newKey = newKey + pString[2:4]  # Last two chars
10     return (newKey)
11
12 myString = input ("Enter a string: ")
13 myNumber = int (input ("Enter a whole number: "))
14
15 if (len (myString) != 4):
16     print ("String must be four characters")
17 else:
18     print ("Original: ", myString, myNumber)
19
20     # Complete the call to the subprogram
21     myNewKey = genNewKey (myString, myNumber)
22     print ("New word:", myNewKey)
23
```

Question	mp	Answer	Additional guidance	Mark
5(a)	A1	Award two marks for a linked explanation such as:		
	A2	- Replacing individual variables with an array (using a single name) (1) means that comparisons could be done in a loop (1) - The animals could be processed in a loop (1) because they could be stored in an array (under a single name) (1)		
				2

Question	mp	Answer	Additional guidance	Mark
5(b)		Award one mark for each of:	Ignore contents of fourth row if given.	
	B1	First row high index and low index (1) 9, 0	Accept 20, 10	
	B2	First row mid point (1) 4	Accept 15	
	B3	Second row (1) 3, 0, 1	Accept 14, 10, 12	
	B4	Third row (1) 0, 0, 0	Accept 10, 10, 10	
				4

Example: Using index

highIndex	lowIndex	midPoint
9	0	4
3	0	1
0	0	0

Example: Using Values

highIndex	lowIndex	midPoint
20	10	15
14	10	12
10	10	10

Question	mp	Answer	Additional guidance	Mark
5(c)		Award one mark for each of:		8
	C1	Opens the file for reading (1)		
	C2	Reads each line from the file (1)	Requires both read lines (prime, inside loop) for C# and Java. Requires a foreach for Python. Allow FT from C1	
	C3	Splits each line into individual strings (1)	Syntactically correct <anyString>.split(',') Does not need to be splitting correct line	
	C4	Individual values cast to int for processing (1)	Any method (index or foreach) allow float no FT allowed from C1 to C3 – must be full values between commas in file	
	C5	SubTotal += value and grandTotal += subTotal (1)	Any reasonable attempt at calculating both totals	
	C6	All given variable and constant names used throughout (1)	INPUT_FILE COMMA subTotal grandTotal	
	C7	Subtotals displayed / Grand total displayed (1)	Must be accurate as shown in QP Fig 8 Not hard-coded in any way	
	C8	The input file is closed, before exiting (1)	Syntactically correct Must be file name originally opened – FT from C1	

Q	mp	Code Examples
5(c)	C1	<code>StreamReader theFile = new StreamReader (inputFile);</code>
		<code>BufferedReader theFile = new BufferedReader (new FileReader (inputFile));</code>
		<code>theFile = open (INPUT_FILE, "r")</code>
	C2	<code>line = theFile.ReadLine (); // Prime loop</code>
		<code>line = theFile.ReadLine (); // Inside loop</code>
		<code>line = theFile.ReadLine (); // Prime loop</code>
		<code>line = theFile.ReadLine (); // Inside loop</code>
	C3	<code>for line in theFile:</code>
		<code>string[] stringSales = line.Split (comma);</code>
		<code>String[] stringSales = line.split (comma);</code>
	C4	<code>stringSales = line.split (COMMA)</code>
		<code>Convert.ToInt32 (sale);</code>
		<code>Integer.parseInt (stringSales[i]);</code>
	C5	<code>int (sale)</code>
		<code>subTotal = subTotal + sale</code>
		<code>subTotal = subTotal + sale</code>

		<code>subTotal = subTotal + sale</code>
		<code>grandTotal = grandTotal + subTotal;</code>
		<code>grandTotal = grandTotal + subTotal;</code>
		<code>grandTotal = grandTotal + subTotal</code>
	C6	INPUT FILE COMMA subtotal grandTotal

	C7	1000 2000 3000 4000 5000 Grand total: 15000
	C8	theFile.Close ();
		theFile.close ();
		theFile.close ()

C#

```
1 // Q05cFINISHED
2
3 using System.IO;
4
5 String inputFile = "Sales.txt"; // Output file name
6 String comma = ","; // Use as a constant
7
8 int subTotal = 0; // Subtotal for each line
9 int grandTotal = 0; // Running total
10 String line; // Line read from file
11
12 // Complete the code to open the file for reading
13 String fullPath = "C:\\Q05c";
14 inputFile = fullPath + "\\\" + inputFile;
15 StreamReader theFile = new StreamReader (inputFile);
16
17 // Complete the code to read the first line of the input file
18 line = theFile.ReadLine ();
19
20 // Loop as long as the line is not null
21 while (line != null)
22 {
23     // Complete the code to split the line into a set of five strings
24     string[] stringSales = line.Split (comma);
25
26     subTotal = 0;
27     // Add code to sum up each value in the set of five strings
28     foreach (string sale in stringSales)
29     {
30         subTotal = subTotal + Convert.ToInt32 (sale);
31     }
32
33     // Add code to display the subtotal for the line
34     Console.WriteLine (Convert.ToString (subTotal));
35
36     // Add code to calculate the running total
37     grandTotal = grandTotal + subTotal;
38
39     // Complete the code to read the next line of the file
40     line = theFile.ReadLine ();
41 }
42
43 // Add code to display the total of all lines in the file
44 Console.WriteLine ("Grand total: " + Convert.ToString (grandTotal));
45
46 // Complete the code to close the opened file
47 theFile.Close ();
48
```

Java

```

1  // Q05cFINISHED
2
3  import java.io.FileReader;
4  import java.io.BufferedReader;
5
6  public class Q05cFINISHED
7  {
8      public static void main(String[] args) throws Exception
9      {
10         String inputFile = "Sales.txt";    // Output file name
11         String comma = ",";                // Use as a constant
12
13         int subTotal = 0;                  // Subtotal for each line
14         int grandTotal = 0;                // Running total
15         String line;                       // Line read from file
16
17         // Complete the code to open the file for reading
18         String full_path = "C:\\Q05c";
19         inputFile = full_path + "\\ " + inputFile;
20         BufferedReader theFile = new BufferedReader (new FileReader (inputFile));
21
22         // Complete the code to read the first line of the input file
23         line = theFile.readLine();
24
25         // Loop as long as the line is not null
26         while (line != null)
27         {
28             // Complete the code to split the line into a set of five strings
29             String[] stringSales = line.split (comma);
30
31             subTotal = 0;
32             // Add code to sum up each value in the set of five strings
33             for (int i = 0; i < stringSales.length; i++)
34             {
35                 subTotal = subTotal + Integer.parseInt (stringSales[i]);
36             }
37
38             // Add code to display the subtotal for the line
39             System.out.println (String.valueOf (subTotal));
40
41             // Add code to calculate the running total
42             grandTotal = grandTotal + subTotal;
43
44             // Complete the code to read the next line of the file
45             line = theFile.readLine();
46         }
47
48         // Add code to display the total of all lines in the file
49         System.out.println ("Grand total: " + String.valueOf (grandTotal));
50
51         // Complete the code to close the opened file
52         theFile.close ();
53     }
54 }
55

```

Python

```
1  # Q05cFINISHED
2
3  INPUT_FILE = "Sales.txt"    # Output file name
4  COMMA = ","                # Use as a constant
5
6  subTotal = 0               # Subtotal for each line
7  grandTotal = 0            # Running total
8
9  # Complete the code to open the file for reading
10 theFile = open (INPUT_FILE, "r")
11
12 # Complete the code to read each line of the input file
13 for line in theFile:
14
15     # Complete the code to split the line into a set of five strings
16     stringSales = line.split (COMMA)
17
18     subTotal = 0
19     # Add code to sum up each value in the set of five strings
20     for sale in stringSales:
21         subTotal = subTotal + int (sale)
22
23     # Add code to display the subtotal for the line
24     print (str (subTotal))
25
26     # Add code to calculate the running total
27     grandTotal = grandTotal + subTotal
28
29 # Add code to display the total of all lines in the file
30 print ( "Grand total: " + str (grandTotal))
31
32 # Complete the code to close the opened file
33 theFile.close ()
34
```


Question	mp	Answer	Additional guidance	Mark
6		Award one mark for each of:		11
	A1	Put new group of words (newspaper, magazine) into last blank position in array (1)	Any method Do not award hard-coded changes to table Note: <i>if</i> the solution will not work for any length of array. This will impact LBMS functionality.	
	A2	Loop for processing every group of words in the array (1)	Allow hard-coded length	
	A3	Loop controlled by the length of the array (1)	Method/function to determine the number of groups in the array	
	A4	Mechanism for tracking group number to appear in output (1)	Any method	
	A5	Output includes row number and original group of words (1)	Ignore 'punctuation' Requires both a line number and each word pair	
	A6	Mechanism for finding longest word in each group (1)	Method/function to determine the length of each string	
	A7	Mechanism for determining if the words in the group are out of order (1)	Any method	
	A8	Mechanism for putting the words in the group into alphabetical order (1)	Any method	
	A9	Output includes longest word in each group and any group found to be out of order is displayed in order (1)		
	A10	Evidence of two-dimensional indexing (1)	Any method	

	A11	At least one instance of an informative comment (1)		
--	-----	---	--	--

Award up to a maximum of nine marks using the levels-based mark scheme below.				Mark
Band 0	Band 1 (1-3 marks)	Band 2 (4-6 marks)	Band 3 (7-9 marks)	
No rewardable content	Little attempt to decompose the problem into component parts	Some attempt to decompose the problem into component parts	The problem has been decomposed into component parts	(9)
	Some parts of the logic are clear and appropriate to the problem	Most parts of the logic are clear and mostly appropriate to the problem	The logic is clear and appropriate to the problem	
	Some appropriate use and manipulation of data types, variables, data structures and program constructs	The use and manipulation of data types, variables and data structures and program constructs is mostly appropriate	The use and manipulation of data types, variables and data structures and program constructs is appropriate	
	Parts of the code are clear and readable	Code is mostly clear and readable	Code is clear and readable	
	Finished program will not be flexible enough with other data sets or input	Finished program will function with some but not all other data sets or input	Finished program could be used with other data sets or input	
	The program meets some of the given requirements	The program meets most of the given requirements	The program fully meets the given requirements	

C#

```
1 // Q06FINISHED
2
3 String[,] tblWords = {{"apple", "banana"},
4                       {"wrist", "leg"},
5                       {"blue", "yellow"},
6                       {"speaker", "keyboard"},
7                       {"lavender", "tulip"},
8                       {"pencil", "chalk"},
9                       {"apartment", "house"},
10                      {"bottom", "top"},
11                      {"snow", "fog"},
12                      {"beach", "mountain"},
13                      {"", ""}};
14
15 String word1 = "newspaper";
16 String word2 = "book";
17
18 // -----
19 // Write your code below this line
20 int numRows = tblWords.GetLength(0);
21 String outString = "";           // For output
22 int indexMaxLength = 0;         // For checking lengths
23 String temp = "";              // For swapping
24
25 // Insert a new group of words into the blank row
26 tblWords[numRows - 1, 0] = word1;
27 tblWords[numRows - 1, 1] = word2;
28
```

```
29 // Loop for each individual group of words in the table
30 for (int i = 0; i < numRows; i++)
31 {
32     // Pick up an entire row
33     String[] words;
34     words = new String[2];
35     words[0] = tblWords[i, 0];
36     words[1] = tblWords[i, 1];
37
38     // Display the row number and the original content
39     outString = Convert.ToString (1 + i);
40     outString = outString + " " + words[0] + " " + words[1];
41     Console.WriteLine (outString);
42
43     // Find the length of the longest word and display the word
44     indexMaxLength = 0; // Longest is first word
45     if (words[1].Length > words[indexMaxLength].Length)
46     {
47         indexMaxLength = 1;
48     }
49     // Display indented
50     Console.WriteLine ("\t" + words[indexMaxLength]);
51
52     // Check if the words in this group are in order
53     if (words[0][0] > words[1][0])
54     {
55         // This group is out of order so needs ordering
56         temp = words[0];
57         words[0] = words[1];
58         words[1] = temp;
59
60         Console.WriteLine ("\t" + words[0] + " " + words[1]);
61     }
62 }
```

Java

```
1 // Q06FINISHED
2
3 public class Q06FINISHED
4 {
5     public static void main(String[] args)
6     {
7         String[][] tblWords = {"apple", "banana"},
8                                {"wrist", "leg"},
9                                {"blue", "yellow"},
10                               {"speaker", "keyboard"},
11                               {"lavender", "tulip"},
12                               {"pencil", "chalk"},
13                               {"apartment", "house"},
14                               {"bottom", "top"},
15                               {"snow", "fog"},
16                               {"beach", "mountain"},
17                               {"", ""}};
18
19         String word1 = "newspaper";
20         String word2 = "book";
21
22         // -----
23         // Write your code below this line
24         int numRows = tblWords.length;
25         String outString = "";           // For output
26         int indexMaxLength = 0;          // For checking lengths
27         String temp = "";                // For swapping
28
29         // Insert a new group of words into the blank row
30         tblWords[numRows - 1][0] = word1;
31         tblWords[numRows - 1][1] = word2;
32
```

```
33 // Loop for each individual group of words in the table
34 for (int i = 0; i < numRows; i++)
35 {
36     // Pick up an entire row
37     String[] words = tblWords[i];
38
39     // Display the row number and the original content
40     outString = String.valueOf(i + 1) + " " + words[0] + " " + words[1];
41     System.out.println (outString);
42
43     // Find the length of the longest word and display the word
44     indexMaxLength = 0; // Longest is first word
45     if (words[1].length() > words[indexMaxLength].length())
46     {
47         indexMaxLength = 1;
48     }
49
50     // Display indented
51     System.out.println ("\t" + words[indexMaxLength]);
52
53     // Check if the words in this group are in order
54     if (words[0].charAt (0) > words[1].charAt (0))
55     {
56         // This group is out of order so needs ordering
57         temp = words[0];
58         words[0] = words[1];
59         words[1] = temp;
60
61         System.out.println ("\t" + words[0] + " " + words[1]);
62     }
63 }
64 }
65 }
66 }
67 }
```

Python

```
1 # Q06FINISHED
2
3 tblWords = ["apple", "banana",
4             ["wrist", "leg"],
5             ["blue", "yellow"],
6             ["speaker", "keyboard"],
7             ["lavender", "tulip"],
8             ["pencil", "chalk"],
9             ["apartment", "house"],
10            ["bottom", "top"],
11            ["snow", "fog"],
12            ["beach", "mountain"],
13            ["", ""]]
14
15 word1 = "newspaper"
16 word2 = "book"
17
18 # -----
19 # Write your code below this line
20 row = 1 # Row number
21 numRows = len (tblWords)
22
23 # Insert a new group of words into the blank row
24 tblWords[numRows - 1][0] = word1
25 tblWords[numRows - 1][1] = word2
26
27 # Loop for each individual group of words in the table
28 for words in tblWords:
29     # Display the row number and the original content
30     print (str (row) + " " + words[0] + " " + words[1])
31
32     # Find the length of the longest word and display the word
33     indexMaxLength = 0 # Longest is first word
34     if (len (words[1]) > len (words[indexMaxLength])):
35         indexMaxLength = 1
36
37     # Display indented
38     print (" "*5 + words[indexMaxLength])
39
40     # Check if the words in this group are in order
41     if (words[0] > words[1]):
42         # This group is out of order so needs sorting
43         temp = words[0]
44         words[0] = words[1]
45         words[1] = temp
```

Output

```
1 apple banana
  banana
2 wrist leg
  wrist
  leg wrist
3 blue yellow
  yellow
4 speaker keyboard
  keyboard
  keyboard speaker
5 lavender tulip
  lavender
6 pencil chalk
  pencil
  chalk pencil
7 apartment house
  apartment
8 bottom top
  bottom
9 snow fog
  snow
  fog snow
10 beach mountain
```

