**Higher Computing**

**Unit 1: Software Design and Development**

**Homework Sheets**

**Sheet 1: Languages and Environments**

1. Why do High Level languages have to be translated?

2

1. What are the main characteristics of High Level programming languages?

2

1. What are the main differences between natural languages and high level programming languages?

2

For each of these pseudocode segments, explain why they are examples of Sequence, Selection, Iteration or a combination of these command structures .

4.

SET total TO 0

RECEIVE userValue FROM KEYBOARD

SET total TO total + userValue 1

5.

RECEIVE userValue FROM KEYBOARD

IF userValue > 100 THEN

 SEND “Number too high” TO DISPLAY

END IF 1

6.

RECEIVE userValue FROM KEYBOARD

WHILE userValue < 0 OR userValue > 100 DO

 SEND “Number must be between 1 and 100” TO DISPLAY

END WHILE 1

7.

FOR counter FROM 1 TO 10 DO

 RECEIVE userValue[counter] FROM KEYBOARD

END FOR 1

Total 10 marks

**Sheet 2: Languages and Environments**

1. Name three **procedural** programming languages and say why they were originally developed

3

1. What kind of programming tasks are **declarative** programming languages associated with?

1

1. What is the difference between a **procedural** programming language and a **declarative** one?

2

1. What is an **Expert System**?

2

1. Why were **object-oriented** languages developed?

3

1. List three characteristics of **Object-oriented** programming languages and explain what they mean

3

1. What is the benefit of **inheritance** in object-oriented programming?

2

1. What are the advantages and disadvantages of using a **scripting** language do develop an application compared to using a **procedural** language.

3

Total 19 marks

**Sheet 3: Languages and Environments**

1. What helpful features would you expect to be available when writing code in a programming language environment ?

3

1. What is a **class library** and why is it useful?

2

Choose A, B or C to answer the next questions:

1. One of the main differences between a compiler and interpreter is:
2. An interpreter is faster than a compiler
3. A compiler is better for beginners
4. A compiler creates an independent machine code program
5. An interpreter is much harder to use

 1

1. One disadvantage of using an interpreter is:
2. Looping structures have to be interpreted each time they are executed answer
3. It stops execution when an error is encountered
4. It helps the user to debug programs
5. An interpreter is ideal for beginners

1

1. High level languages have to be translated because:
2. Computers can only understand machine code answer
3. Source code is faster to run than object code
4. Programs run faster when converted to binary
5. All of the above

1

1. Which one of these is NOT true

When distributing a completed piece of software the advantage of using a compiler is:

1. The compiled program does not need an interpreter to run
2. The compiled program runs faster than it would if running in an interpreter
3. A compiled program cannot be edited without access to the source code
4. A compiled program takes up less memory than an interpreted one answer

 total 8 marks

**Sheet 4: Low level operations: Storing Data**

1. Give **two** reasons why computers use the binary number system.

2. Convert each of the following decimal numbers to their binary equivalent.

* 1. 23
	2. 45
	3. 100
	4. 255 4

3. Convert each of the following binary numbers into their decimal equivalent.

1. 1010
2. 100000
3. 101011
4. 11111111 4
5. Give two reasons why using a sign bit to represent numbers is impractical.

2

5. Convert the following decimal numbers to 2’s complement form using an 8 bit string of digits.

1. –3
2. – 35 2

6. Floating point numbers are stored using a **mantissa** and an **exponent**.

1. What effect will increasing the number of bits used for the **mantissa** have? 1
2. What effect will increasing the number of bits used for the **exponent** have? 1
3. The 7 bit **ASCII** code can represent how many different characters? 1

8. Explain what method is used to encode **Unicode**. 1

9. Explain what is meant by the **resolution** of a graphic. 1

10. Explain what is meant by the term **bit-depth**. 1

11. Give one advantage and one disadvantage of using bit-mapped graphics. 1

12. Describe two advantages of using vector graphic representation. 2

Total 20 marks

**Sheet 5: Data types and structures**

1. What simple data type you would use to store the following values?

 Choose from INTEGER, REAL, CHARACTER, BOOLEAN

1. 304, B) 45.78, c) @, d) -4, e)5989.4, f)-56.3. g)!, h)true,,

9

1. What data type would you use to store the following information?

a)A UK telephone number, b)The price of a pair of trainers, c) Whether a character in a game has found a weapon or not, d)The colour of a sprite, e)The counter in a loop, f)A URL, g)A key-press

7

1. What structured data type would you use to store the following information?

a) A list of names, a set of test scores out of 50, b)The characters in a sentence, c)The average temperatures during last month, d)The last five Google searches you made, e)Whether or not a class of pupils have passed an exam. F) The weapons and danger values for a the characters in a game.

6

1. What would be the output from the following pseudocode?

a)
SET myNames TO ["Fred","Jim","Betty", "Justin","Greg"]

SEND myNames[4] TO DISPLAY 1

b)
SET myNames TO ["Fred","Jim","Betty", "Justin","Greg"]

SEND myNames[1] TO DISPLAY 1

c)
SET myVals TO [5, 12, 21, 35]

SEND myVals[1] + myVals[3] TO DISPLAY 1

d)

SET mySentence TO "Hello World"

SEND mySentence[6] TO DISPLAY 1

Total 26 marks

**Sheet 6: Development Methodologies 1**

1. List three ways to make code **readable**

3

1. Why is it important for code to be **readable**

2

1. At the end of the analysis stage of software development a Software Specification is produced. Why is it important for the Software Specification to be a legally binding document?

2

1. What is **Top Down Design and Stepwise Refinement**?

2

1. What are the advantages of **modular design** when writing software?

3

1. What does it mean when we say that the software development process in an **Iterative** process?

2

1. What is the difference between **alpha** testing and **beta** testing?

2

Total 16 marks

**Sheet 7: Development Methodologies 2**

1. What would you expect to find in the technical guide for a piece of software?

2

1. What are the characteristics of a good user interface?

2

1. What does **accessibility** mean when describing a characteristic of a piece of software?

2

1. A client asks for a new feature to be added to the software they have commissioned. What kind of maintenance is this? Who pays for it, the client or the developer?

2

1. What kind of software project would **RAD** (Rapid Application Development) be appropriate for?

2

1. What are the benefits of using **Agile** Software Development

2

Total 12 marks

**Sheet 8: Design Notations**

1. What is the difference between pseudocode and a structure diagram?

2

1. You have been asked to design a website selling sports clothing and footwear. Create a wireframe for the home page showing the navigation structure you would use, and the main sections of the page.

6

1. A client would like you to write a piece of software to create multiple choice quizzes for pupils. Draw a sketch of the user interface you would create for this software.

6

Total 14 marks

**Sheet 9 Standard Algorithms**

1. Why is input validation important when inputting data to a program?

2

1. Over the summer, a garden centre has been running a “tallest sunflower” competition. Entrants have completed an online entry form to provide their name and the height of their sunflower. These have been collated into two lists. Samples from these lists are shown below.
2. State the data structure and data type used to store the two lists.

2

1. Using pseudocode, design an algorithm to find and display the name of the person growing the tallest sunflower.

4

1. RightIT, a software company, is currently developing a cash machine program for a bank. The cash machine will offer five options to customers. The options selected during a day are stored as a list. The bank would like the software to calculate the number of times the mobile top-up option appears on this list. Use pseudocode to design an algorithm to carry out this calculation.

4

Total 12 marks

**Sheet 10 Computational Constructs**

1. What is the difference between a fixed loop and a conditional loop?

2

1. Explain what is meant by the **scope** of a variable.

2

1. What is the difference between a function and a procedure?

2

1. What is a user-defined function?

2

1. This code segment uses the integer array: numbers

**PROCEDURE printArray(*numbers*)**

 **FOR counter FROM 0 TO 9 DO**

 **SEND *numbers[counter]* TO DISPLAY**

 **END FOR**

**END PROCEDURE**

Use the code to explain the difference between **actual** and **formal** parameters.

2

1. What is the difference between passing a parameter by **value** and passing one by **reference**?

2

Total 12 marks

**Sheet 11 Testing and Documenting Solutions**

1. Which set of test data would be the best one to use to test an input routine asking for numbers between 1 and 100?

1. 0, 1,10,50, 99,100, 101, X
2. 1 5 20 40, 50, 60, 90 100
3. 5,9,2,,60,80 100, 101, a
4. 0, 1,5, 46, 67, 84, 90, 93

1

2. Which lines of code in this example should be indented to make it more readable?

Line 1 INTEGER FUNCTION getvalidItem()

Line 2 RECEIVE userInput FROM (INTEGER) KEYBOARD

Line 3 WHILE userInput < 1 OR userInput > 100 DO

Line 4 SEND [“Input must be between 1 and 100 ”)] TO DISPLAY

Line 5 RECEIVE userInput FROM (INTEGER) KEYBOARD

Line 6 END WHILE

Line 7 RETURN userInput

Line 8 END FUNCTION 2

1. What is the difference between a **syntax** and a **semantic** error in a program? 2
2. Which of these are not syntax errors?
3. Missing semi colon
4. Division by zero answer
5. IF without END IF
6. Overflow error answer
7. Average = 0 answer
8. WHILE without DO 3

1. Create a trace table for this algorithm

SET numbers TO [3, 15, 4, 7, 8] 4
PROCEDURE findMaximum(numbers)
SET maximumValue TO numbers[0]
FOR counter FROM 1 TO 5 DO
 IF maximumValue < numbers[counter] THEN
 SET maximumValue TO numbers[counter]
 END IF
END FOR
SEND [“The largest value was “& (STRING) maximumValue] TO DISPLAY
END PROCEDURE Total 12 marks

**Sheet 12 Computer Architecture**

1. Describe the role of the **control**, **address** and **data** buses when an instruction is read from memory.

4

1. List three functions of an interface

3

1. How does cache memory improve the performance of a processor?

2

1. Why is it useful to able to emulate one computer system in another one? Give an example of when this facility might be useful.

2

1. What are the differences between an application designed for a desktop machine and one designed for a mobile device?

3

Total 14 marks