Tutorial Sheet - Topic 02

Programming Fundamentals 2

Revision (Arrays and Loops)

Part 1 – Arrays (Recap)

An **array** is a collection of variables of the same type, stored in contiguous memory locations. Each element in an array is accessed using an **index**, starting at **0**. Arrays have a **fixed size** once created.

Question 1

What is the main difference between an array of primitive types (e.g. int[]) and an array of object types (e.g. String[])?

Question 2

Consider the following code:

```
int[] numbers = new int[5];

numbers[2] = 10;
```

1. How many elements does the array contain?
2. What value is stored at index 2?
3. What value is stored at index 0?

Question 3

What value is stored in each position of a newly created String[] array before any objects are assigned to it? Explain your answer.

Question 4

Why does the following line of code cause a NullPointerException?

words[0].length();

Assume words is a String[] array and no value has been assigned to index 0.

Part 2 – Limitations of Arrays

Arrays are useful but have several limitations that can make programs harder to manage as they grow.

Question 5

List **two limitations of arrays** discussed in lectures and explain why they can cause problems in larger programs.

Part 3 – Iteration and While Loops

Iteration means repeating a set of instructions. In Java, one way to repeat instructions is by using a **while loop**.

A while loop continues to execute **while its condition is true**.

Question 6

Write a **while loop** that prints the numbers from **1 to 10 inclusive**, with each number on a new line.

You must:

- Declare and initialise a loop control variable
- Use a while loop
- Update the loop control variable inside the loop

Question 7

Consider the following requirement:

Print the message "Hello World" exactly **5 times** using a while loop.

Write the Java code needed to meet this requirement.

Question 8

The following while loop is intended to print the numbers from 1 to 5, but it contains an error.

```
int i = 1;

while (i <= 5) {

   System.out.println(i);

}
```

1. Identify the error in the code.
2. Rewrite the code so that it works correctly.

Part 4 – Arrays and Objects (Shop V2.0)

In Shop V2.0, a new Store class is introduced. This class is responsible for maintaining a collection of Product objects using an array.

Question 9

Write a line of Java code that:

1. Creates an array capable of storing **5 Product objects**
2. Stores the array in a variable called products

Assume a Product class already exists.

Question 10

In the context of the Store class, write the Java code for a **private method** called isEmpty() that:

- Takes no parameters
- Returns a boolean
- Returns true when there are no products stored in the array

You may assume a total variable exists.

Question 11

The add(Product product) method in the Store class returns a boolean value.

1. What does this boolean value represent?
2. How is this value used in the Driver class?
