**AQA A-Level Computer Science – Paper 1 Style Questions**

**Section A: Short Answer Questions (Programming & Debugging)**

**Question 1 (4 marks)**

(a) Identify and describe the purpose of the ConvertToRPN function in the provided program. *(2 marks)*  
(b) What data structure is used in ConvertToRPN, and why is it suitable for this purpose? *(2 marks)*

**Question 2 (5 marks)**

The function EvaluateRPN evaluates expressions in **Reverse Polish Notation (RPN)**.

(a) Describe the algorithm used in EvaluateRPN to process an input expression. *(3 marks)*  
(b) Identify one possible **runtime error** that could occur in EvaluateRPN, explaining how it could be prevented. *(2 marks)*

**Question 3 (6 marks)**

Consider the RemoveNumbersUsed function.

(a) Explain what this function does and how it affects the NumbersAllowed list. *(3 marks)*  
(b) The function uses the ConvertToRPN function before removing numbers. Why is this necessary? *(3 marks)*

**Question 4 (4 marks)**

(a) The CheckIfUserInputValid function uses a **regular expression** to validate user input. Explain how this validation works. *(2 marks)*  
(b) Give one example of an invalid user input that this function would reject and explain why. *(2 marks)*

**Section B: Code Tracing & Algorithmic Thinking**

**Question 5 (5 marks)**

The function DisplayTargets prints the target values in a format such as:

CopyEdit

|23| |45|68| |

(a) What does the -1 value represent in the Targets list? *(1 mark)*  
(b) Suppose Targets = [12, -1, 34, 56, -1]. What would the function output? *(2 marks)*  
(c) Modify the DisplayTargets function so that it **displays an underscore \_ instead of a space** when a target is -1. *(2 marks)*

**Question 6 (6 marks)**

The PlayGame function controls the game loop. It calls UpdateTargets to update the Targets list.

(a) Explain how UpdateTargets modifies Targets during gameplay. *(3 marks)*  
(b) The current implementation of UpdateTargets always replaces the last element with a new target. Suggest a modification to **randomly replace any element** instead. *(3 marks)*

**Section C: Computational Thinking & Efficiency**

**Question 7 (6 marks)**

The CheckNumbersUsedAreAllInNumbersAllowed function checks whether the numbers used in the user’s input exist in NumbersAllowed.

(a) The function currently uses a **temporary list Temp**. Explain why this is needed. *(3 marks)*  
(b) Suggest a more efficient approach that does not require creating a new list. *(3 marks)*

**Question 8 (5 marks)**

The game uses **random numbers** for generating targets and allowed numbers.

(a) Explain how the GetTarget function ensures that targets are within the correct range. *(2 marks)*  
(b) Describe a situation where the randomly generated targets could make the game unbalanced or unfair. *(3 marks)*

**Section D: Extended Response – Improvements & Extensions**

**Question 9 (8 marks)**

The current program **removes spaces** from user input before processing expressions.

(a) Identify a scenario where this could cause an issue. *(2 marks)*  
(b) Suggest a modification to allow users to include spaces between numbers and operators while still ensuring the input is valid. *(3 marks)*  
(c) Explain how you would update the CheckIfUserInputValid function to accommodate this change. *(3 marks)*

**Question 10 (10 marks)**

You have been asked to **extend the game by introducing a difficulty system**:

* **Easy Mode**: Allows numbers between -5 and 10, targets between -30 and 50.
* **Hard Mode**: Allows numbers between -50 and 50, targets between -100 and 100.

(a) Identify which parts of the program need to be modified to implement this feature. *(4 marks)*  
(b) Write a function SelectDifficulty() that asks the user to choose between Easy and Hard mode and returns appropriate values for MaxNumber, MinNumber, MaxTarget, and MinTarget. *(6 marks)*

**Bonus Challenge Question (Advanced Thinking – 6 marks)**

The program currently **does not allow the use of parentheses** in expressions, meaning users must manually apply operator precedence.

(a) Explain how modifying ConvertToRPN could allow the program to support **parentheses in expressions**. *(3 marks)*  
(b) Suggest an approach to update CheckIfUserInputValid to allow expressions with parentheses. *(3 marks)*

**Exam Paper Breakdown**

| **Section** | **Focus** | **Marks** |
| --- | --- | --- |
| Section A | Programming Concepts & Debugging | 19 |
| Section B | Code Tracing & Algorithmic Thinking | 11 |
| Section C | Computational Thinking & Efficiency | 11 |
| Section D | Improvements & Extensions | 18 |
| Bonus | Advanced Thinking | 6 |
| **Total Marks** |  | **65** |