

A Level Computer Science

JavaScript Programming

Bridging Project

2021

[5 – 6 Hours]



Introduction

The aim of this bridging project is to build your programming skills and project report writing skills, ready to start Year 12.

In order to complete the project you will first need to know how to program in JavaScript. You will be given an introduction to this during the taster days in June, but will need to teach yourself the rest, using the resources detailed below.

What you need to do

On the following page are TWO programming tasks:

- Task 1 – Binary / Denary Converter
- Task 2 – Vending Machine

You are to design and create a JavaScript program for ONE of these. In addition to the program you also need to write a short report explaining your:

- **Program Design** – including success criteria, algorithms and test plans
- **Development** – including annotated screenshots showing how you developed the solution
- **Testing** – evidence of testing, including your completed test plan and screenshots showing the results of testing
- **Evaluation** – a full evaluation of each solution, explaining how well it meets each of the success criteria and suggestions for how you could improve it

What you are expected to submit

On the first lesson back after the summer holiday, you will be expected to submit the following:

- Your completed program
- Report

Marking

This project will be marked using the mark scheme at the end of this document. Please make sure that you read this carefully before starting the project.

Resources

W3Schools website (JavaScript tutorials): <https://www.w3schools.com/js/default.asp>

CodeAcademy (JavaScript interactive course): <https://www.codecademy.com/>

NotePad++ (text editor): <https://notepad-plus-plus.org/download/v6.9.2.html>

Task – Binary / Denary Converter

Design, code, test and evaluate a program in JavaScript that will convert between binary and decimal.

For the decimal to binary converter the program should accept a positive value and output the binary equivalent. The system need only be tested for values up to 255.

One method for converting from decimal to binary is shown below.

To convert the decimal value 43 to binary:

$$43 \div 2 = 21 \text{ Remainder } 1$$

$$21 \div 2 = 10 \text{ Remainder } 1$$

$$10 \div 2 = 5 \text{ Remainder } 0$$

$$5 \div 2 = 2 \text{ Remainder } 1$$

$$2 \div 2 = 1 \text{ Remainder } 0$$

$$1 \div 2 = 0 \text{ Remainder } 1$$

Once the result is 0 the remainder values form the binary equivalent of our decimal number 43 decimal = 101011 binary.

For the binary to decimal converter the program should only accept valid inputs (a series of 0s and 1s), and output the decimal equivalent. The program need only be tested for inputs of up to 8 binary digits.

One method for converting from binary to decimal is shown below.

To convert the binary value 1101 to decimal:

Take each value in the binary string starting at the right-hand end, the least significant bit, and

multiply by 1 then 1×2 , then $1 \times 2 \times 2$, then $1 \times 2 \times 2 \times 2$ etc.

$$1 \times 1 = 1$$

$$0 \times 1 \times 2 = 0$$

$$1 \times 1 \times 2 \times 2 = 4$$

$$1 \times 1 \times 2 \times 2 \times 2 = 8$$

Add the decimal values to get the decimal equivalent of 1101, which is 13.

Task 2 – Vending Machine

Design, code, test and evaluate a program in JavaScript to simulate the following food vending machine.

- The vending machine should accept 10p, 20p, 50p and £1 coins.
- One or more coins are inserted and the current credit is calculated and displayed.
- A product is selected from those available. The system checks to see if there is enough credit to purchase the product chosen.
- If there is not enough credit the system displays an error message.
- If there is enough credit it dispenses the product, updates the credit available and displays the remaining credit. Further selections can be made if there is enough credit.
- The vending machine simulation should have five products and prices.

Year 12 Computer Science - Bridging Project Mark sheet

	Lower Mark Band	Mid Mark Band	Upper Mark Band
Use of programming techniques	<p>There is an attempt to solve parts of the task using few of the techniques identified.</p> <p>0 = no response or responses not worthy of credit</p> <p>[0 - 2]</p>	<p>There is an attempt at most parts of the task using several techniques.</p> <p>[3 - 4]</p>	<p>There is an attempt to solve all of the task using most of the techniques listed.</p> <p>[5 - 6]</p>
Efficient use of Programming Techniques	<p>The techniques used produce partially working solutions to a small part of the problem.</p> <p>0 = no response or responses not worthy of credit</p> <p>[0 - 4]</p>	<p>The techniques are used appropriately giving working solutions to most of the parts of the problem.</p> <p>Some sections of the solution are inefficiently coded.</p> <p>[5 - 8]</p>	<p>The techniques are used appropriately in all cases giving an efficient, working solution for all parts of the problem.</p> <p>[9 - 12]</p>
Design	<p>There are comments on what the task involves and a limited outline describing the intended approach to some parts of the problem.</p> <p>There are brief comments on how this might be tested but with no mention of success criteria.</p> <p>0 = no response or responses not worthy of credit</p> <p>[0 - 3]</p>	<p>There is a brief analysis of the tasks indicating what is required for each of the tasks.</p> <p>There is a set of basic algorithms outlining a solution to most parts of the problem.</p> <p>There is some discussion of how this is tested and how this compares to the identified outcomes in the tasks.</p> <p>There is discussion of the variables to be used and some general discussion of validation.</p> <p>[4 - 6]</p>	<p>There is a detailed analysis of what is required for these tasks justifying their approach to the solution.</p> <p>There will be a full set of detailed algorithms representing a solution to each part of the problem.</p> <p>There is detailed discussion of testing and success criteria. The variables and structures are identified together with any validation required</p> <p>[7 - 9]</p>

	Lower Mark Band	Mid Mark Band	Upper Mark Band
Development	<p>There is some evidence to show a solution to part of the problem with some evidence to show that it works. Code is presented with little or no annotation, the variable names not reflecting their purpose and with little organisation or structure.</p> <p>0 = no response or responses not worthy of credit</p> <p>[0 - 3]</p>	<p>There is evidence to show how the solutions were developed. There is some evidence of testing during development showing that many parts of the solution work. The code is organised with sensible variable names and with some annotation indicating what sections of the code does.</p> <p>[4 - 6]</p>	<p>There is detailed evidence showing development of the solution with evidence of systematic testing during development to show that all parts work as required. The code is well organised with meaningful variable names and detailed annotation indicating the function of each section.</p> <p>[7- 9]</p>
Testing and Evaluation	<p>There is evidence to show that the system has been tested for function but the test plan is limited in scope with little structure. There is limited evidence to show how the result matches the original criteria. The evidence of written communication is limited with little or no use of specialist terms. Errors in spelling, punctuation and grammar may be intrusive. Information may be ambiguous or disorganised.</p> <p>0 = no response or responses not worthy of credit</p> <p>[0 - 3]</p>	<p>There is a test plan covering many parts of the problem with some suggested test data. There is evidence that the system has been tested using this data. There is some evidence to show how the results of testing have been compared to the original criteria. There is a brief discussion of how successful or otherwise the solutions are. The quality of written communication is good using some specialist terms. There are few errors in spelling, grammar and punctuation. Information for the most part is presented in a structured format.</p> <p>[4 - 6]</p>	<p>The test plan covers all major success criteria for the original problem with evidence to show how each of these criteria have been met, or if they have not been met, how the issue might be resolved. There is a full evaluation of the final solution against the success criteria. A high level of written communication is obvious throughout the task and specialist terms/ technology with accurate use of spelling will have been used. Grammar and punctuation are used correctly and information is presented in a coherent and structured format.</p> <p>[7 - 9]</p>