**Binary conversion and addition in GCSE computer science**

**Handout 1 – Working with Binary**

**Part 1 Number Bases**

**Question 1**

The table below uses base 2 place values. Insert the missing place values

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 64 |  |  |  | 4 |  |  |

**Question 2**

What is the number base for

101000112 …………………

100110 …………………

142110 …………………

**Question 3**

What is the value of the MSB and LSB in a byte?

MSB …………………

LSB …………………

**Question 4**

What is the place value of the digit with the value 1 in the binary number 100002​? …………

**Part 2 Prefixes**

**Question 5**

The following list of units of measurement are not in order. Rearrange them into the correct ascending (low to high) order using the initials.

**Out of order**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| PB | MB | KB | Bit | Nibble | Byte | TB | GB |

**In ascending order**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |

**Question 6**

Mr Jones is researching broadband suppliers. A supplier advertises as having a maximum speed equal to 0.75 TB per minute. How many MB is this?

|  |
| --- |
|  |

**Part 3 Convert Binary to Denary**

**Question 7**

Convert the number line above from binary to denary

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **128** | **64** | **32** | **16** | **8** | **4** | **2** | **1** |
| 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |

|  |
| --- |
|  |

**Question 8**

Convert the following binary number into denary.

010101012

|  |
| --- |
|  |

**Question 9**

Is the denary value of the binary number line below odd or even?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | **0** | **0** | **1** | **1** | **1** | **0** | **0** |

|  |
| --- |
|  |

**Question 10**

All the place values in a byte have a value of 1 except for the LSB which has a value of 0. What is the denary value of the binary number?

|  |
| --- |
|  |

**Part 4 Convert Denary to Binary**

**Question 11**

Convert the denary value 73 into an 8-bit binary value

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **128** | **64** | **32** | **16** | **8** | **4** | **2** | **1** |
|  |  |  |  |  |  |  |  |

**Question 12**

Convert the denary value 9210 into a byte

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **128** | **64** | **32** | **16** | **8** | **4** | **2** | **1** |
|  |  |  |  |  |  |  |  |

**Question 13**

Convert 20510 into binary, use the table to support

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **128** | **64** | **32** | **16** | **8** | **4** | **2** | **1** |
|  |  |  |  |  |  |  |  |  |
| Remainder |  |  |  |  |  |  |  |  |

**Part 5 Binary Addition and Overflow**

**Question 14**

Complete the binary addition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **8** | **4** | **2** | **1** |
|  | **0** | **0** | **1** | **1** |
|  | **1** | **0** | **1** | **0** |
| **Result** |  |  |  |  |
| **Carry** |  |  |  |  |

**Question 15**

Add the 2 denary values as binary numbers. Complete the table

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **128** | **64** | **32** | **16** | **8** | **4** | **2** | **1** |
| **12310** | **0** | **1** | **1** | **1** | **1** | **0** | **1** | **1** |
| **9410** |  |  |  |  |  |  |  |  |
| **Result** |  |  |  |  |  |  |  |  |
| **Carry** |  |  |  |  |  |  |  |  |

**Question 16**

Take the following two 8-bit binary numbers and add them together.

Would an overflow error occur?

Show your working by completing this table:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **128** | **64** | **32** | **16** | **8** | **4** | **2** | **1** |
| **25110** |  | **1** | **1** | **1** | **1** | **1** | **0** | **1** | **1** |
| **2210** |  | **0** | **0** | **0** | **1** | **0** | **1** | **1** | **0** |
| **Result** |  |  |  |  |  |  |  |  |  |
| **Carry** |  |  |  |  |  |  |  |  |  |

Binary overflow Yes or No (highlight your answer)