Binary Numbers Name: Tutor Gp:

**All computer hardware works with two-state systems. An example of a two-state system is a light switch; it can either be on or off. Binary numbers are used by people to represent what is going on inside a computer.**

1) Convert the following base 10 numbers to binary (use the column headings to help you):

(a) 253

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

(b) 62

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

(c) 112

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

(d) 83

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

(e) **On the back of this sheet, do 2 more conversions of your own.**

2) Convert the following binary numbers to base 10 (use the column headings to help you):

(a) 10112

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

(b) 1111012

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

(c) 1100112

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

(d) 100001112

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

(e) **On the back of this sheet, do 2 more conversions of your own.**

3) (a) In the grid below, show all possible combinations for a 4-bit binary number (there are 16 in total, some are done already).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **0000** | **0001** |  |  |  |  |  |  |
| **1000** |  |  |  |  |  |  |  |

(b) How many combinations are there for a 5-bit number? How do you work it out?