Binary Addition

There are times when it’s necessary to add binary numbers together.

**0 + 0 = 0**

**0 + 1 = 1**

The problem comes when we want to add one and one together.

1 + 1 = 2 but the digit 2 doesn’t exist in binary. The quantity 2 can, however, be represented in binary.

**Two represented in binary is 102.**

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It gets worse when adding one, one and one together.

**1 + 1 + 1 = 310**

**Three can be represented as 112.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  | **Carry** | **Answer bit** |
|  |  | **0** | **+** | **0** | **=** | **0** | **0** | **0** |
|  |  | **0** | **+** | **1** | **=** | **1** | **0** | **1** |
|  |  | **1** | **+** | **0** | **=** | **1** | **0** | **1** |
|  |  | **1** | **+** | **1** | **=** | **10** | **1** | **0** |
| **1** | **+** | **1** | **+** | **1** | **=** | **11** | **1** | **1** |

## Adding 2, 8-bit numbers together.

**Complete this using the table above:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **0** | **1** | **0** | **1** | **0** | **0** | **1** | **0** |  |
| **0** | **1** | **1** | **1** | **0** | **1** | **1** | **0** | **+** |
|  |  |  |  |  |  | **0** | **0** | **Ans bit** |
|  |  |  |  |  | **1** | **0** |  | **Carry bit** |

**Did you get the answer 110010002 ?**

## Overflow errors

**Now try this:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | **1** | **0** | **1** | **1** | **0** | **1** | **1** |  |
| **0** | **1** | **1** | **1** | **0** | **1** | **1** | **0** | **+** |
|  |  |  |  |  |  |  |  | **Ans bit** |
|  |  |  |  |  |  |  |  | **Carry bit** |

**Opps!** Sometimes you can end up with too many digits. This is called an **overflow error.**