

Addition and Subtraction in Binary

The following example shows two binary numbers being added:

Carry							
First number	0	0	1	1	1	1	0
Second number	1	0	0	1	0	1	1
Result of addition							1

Step 1:
0 + 1 gives 1

Carry					1		
First number	0	0	1	1	1	1	0
Second number	1	0	0	1	0	1	1
Result of addition						0	1

Step 2:
1 + 1 gives 0 carry 1

Carry				1	1		
First number	0	0	1	1	1	1	0
Second number	1	0	0	1	0	1	1
Result of addition					0	0	1

Step 3:
1 + 0 + 1 gives 0
carry 1

Carry			1	1	1		
First number	0	0	1	1	1	1	0
Second number	1	0	0	1	0	1	1
Result of addition				1	0	0	1

Step 4:
1 + 1 + 1 gives 1
carry 1

Proceeding in this way we get:

Carry			1	1	1	1	
First number	0	0	1	1	1	1	0
Second number	1	0	0	1	0	1	1
Result of addition	1	1	0	1	0	0	1

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105

Exercise in Addition

Add the following binary numbers. Then check your result by using decimal numbers.

- 1010001 and 0101110
- 1011011 and 1011100

The following example shows subtraction:

Borrow							
First number	1	0	1	1	0	1	1
Second number	0	1	0	1	1	1	0
Result of subtraction							1

Step 1:
1 - 0 gives 1

Borrow							
First number	1	0	1	1	0	1	1
Second number	0	1	0	1	1	1	0
Result of subtraction						0	1

Step 2:
1 - 1 gives 0

Borrow				2			
First number	1	0	1	1	0	1	1
Second number	0	1	0	1	1	1	0
Result of subtraction				1	0	1	1

Step 3:
0 - 1 means that we have to borrow

Proceeding in this way we get

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Borrow		2		2	2		
First number	1	0	1	1	0	1	1
Second number	0	1	0	1	1	1	0
Result of subtraction	0	1	0	1	1	0	1

Exercise in Subtraction

Perform the following binary subtractions. Then check your results by using decimal numbers:

- a. 10001101 - 00101100
- b. 10000101 - 01010111