

Adding Binary Numbers

Straight-forward Examples

- **Worked Example 1**

- Add the 2 8-bit binary numbers
- 1001 1001 & 0000 0100

1	0	0	1	1	0	0	1	
0	0	0	0	0	1	0	0	+
1	0	0	1	1	1	0	1	

- **Worked Example 2**

- Add the 2 8-bit binary numbers
- 0001 1100 & 1110 0010

0	0	0	1	1	1	0	0	
1	1	1	0	0	0	1	0	+
1	1	1	1	1	1	1	0	

Examples with Carrying Bits

- **Worked Example 3**

- Add the 2 8-bit binary numbers
- 1001 1001 & 0000 0101

Note: 1 + 1 = 10

Note: 1 + 1 + 1 = 11

						1		
1	0	0	1	1	0	0	1	
0	0	0	0	0	1	0	1	+
1	0	0	1	1	1	1	0	

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- **Worked Example 4**

- Add the 2 8-bit binary numbers
- 0001 1100 & 0110 0101

	1	1	1	1				
0	0	0	1	1	1	0	0	
0	1	1	0	0	1	0	1	+
1	0	0	0	0	0	0	1	

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More Examples with Carrying Bits

- **Worked Example 5**

- Add the 2 8-bit binary numbers

- 1001 1001 & 0001 1101

Bit being carried

		1	1			1		
1	0	0	1	1	0	0	1	
0	0	0	1	1	1	0	1	+
1	0	1	1	0	1	1	0	

- **Worked Example 6**

- Add the 2 8-bit binary numbers

- 0001 1100 & 0110 1110

	1	1	1	1				
0	0	0	1	1	1	0	0	
0	1	1	0	1	1	1	0	+
1	0	0	0	1	0	1	1	

Examples of Binary Addition- Creating An Overflow Bit

- Worked Example 7

- Add the 2 8-bit binary numbers

- 1101 1001 & 1101 1101

9th Bit
Overflow
bit

	1		1	1			1		
	1	1	0	1	1	0	0	1	
	1	1	0	1	1	1	0	1	+
	<u>1</u>	1	0	1	1	0	1	1	0

9th Bit
Overflow
bit

	1	1	1	1	1				
	0	1	1	1	1	1	0	0	
	1	1	1	0	1	1	1	0	+
	<u>1</u>	0	1	1	0	1	0	1	0

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Exercises

(1) Straight-forward addition

	0	0	1	0	0	0	0	1	
	1	0	0	1	0	1	1	0	+

(2) Straight-forward addition

	0	1	0	1	0	0	1	1	
	0	0	0	0	0	1	0	0	+

(3) Examples with Carrying

	0	1	0	1	0	1	1	1	
	0	0	0	0	0	0	1	0	+

(4) Examples with Carrying

	0	1	0	1	0	1	1	1	
	1	0	0	1	1	0	1	0	+

(5) Examples with Creating Overflow Bit

	1	1	0	1	0	1	1	1	
	1	0	0	1	1	0	1	0	+

(6) Examples with Creating Overflow Bit

	1	1	0	1	0	0	0	1	
	1	1	0	1	1	0	1	0	+

Exercises and Answers

(1) Straight-forward addition

	0	0	1	0	0	0	0	1	
	1	0	0	1	0	1	1	0	+
	1	0	1	1	0	1	1	1	

(2) Straight-forward addition

	0	1	0	1	0	0	1	1	
	0	0	0	0	0	1	0	0	+
	0	1	0	1	0	1	1	1	

(3) Examples with Carrying

					1	1			
	0	1	0	1	0	1	1	1	
	0	0	0	0	0	0	1	0	+
	0	1	0	1	1	0	0	1	

(4) Examples with Carrying

			1	1	1	1			
	0	1	0	1	0	1	1	1	
	1	0	0	1	1	0	1	0	+
	1	1	1	1	0	0	0	1	

(5) Examples with Creating Overflow Bit

			1	1	1	1			
	1	1	0	1	0	1	1	1	
	1	0	0	1	1	0	1	0	+
	<u>1</u>	0	1	1	1	0	0	0	1

(6) Examples with Creating Overflow Bit

	1	1							
	1	1	0	1	0	0	0	1	
	1	1	0	1	1	0	1	0	+
	<u>1</u>	1	0	1	0	1	0	1	1