Worksheet: Adding Binary Numbers

Adding Binary Numbers

1. Convert the denary value 86 to a binary value, writing the bits in the chart below.

bit value (denary)	128	64	32	16	8	4	2	1
denary 86 in binary								

2. Convert the denary value 23 to a binary value, writing the bits in the chart below.

bit value (denary)	128	64	32	16	8	4	2	1
denary 23 in binary								

3. Write the binary equivalent the denary numbers 86 and 21 into the appropriate row, then add the binary digits.

carry over								
denary 86 in binary								
denary 23 in binary								
sum								

4. Write the binary sum from part (3) into row (a), then write the denary sum of bit values in row (b).

	bit value (denary)	128	64	32	16	8	4	2	1
a)	binary sum of 86 and 23								
b)	sum of denary bit values								

Verify your work from questions 1 through 4. We should get the same result adding in binary as when we add in denary: 86 + 23 = 109. If you have a different answer, review your work to find your mistake.

Overflow

5. Given the binary numbers 147 and 119, add their binary digits.

carry over								
denary 147 in binary	1	0	0	1	0	0	1	1
denary 119 in binary	0	1	1	1	0	1	1	1
sum								

You likely noticed a problem. Remember (or if you don't remember, you should try to remember) that 8 bits can store the values 0 through 255 (2^8 = 256 values). However, 147 + 119 = 266. When we sum two 8-bit values, it is not unlikely that the result may require 9 bits to store.

When an operation requires more bits than is allocated to store the resulting value, it is referred to as *overflow*.

There are many cases where overflow is actually used to make an algorithm work.