Worksheet: Number Systems 2 – Denary to Binary

Converting From Denary to Binary

The textbook (pages 112-114) has a pretty good explanation of one simple method of converting from denary to binary. Here is the calculation done in a single table converting the denary value 201 to binary.

bit position	8	7	6	5	4	3	2	1	0
exponential	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
bit value (denary)	256	128	64	32	16	8	4	2	1
difference	×	201 − 128 = 73	73 − 64 = 9	×	×	9 − 8 = 1	×	×	1 − 1 = 0
binary digits (bits)		1	1	0	0	1	0	0	1

The following is a more concise and compact version of the calculations in the table above.

denary		201	73			9			1
bit value	256	128	64	32	16	8	4	2	1
difference		73	9			1			0
binary digits (bits)		1	1	0	0	1	0	0	1

1. Given the denary number 182, complete the table.

a)

denary									
bit value	256	128	64	32	16	8	4	2	1
difference									
binary digits (bits)									

b) Write the final 8-bit binary value here: _____

2. Given the denary number 125, complete the table.

a)

denary									
bit value									
difference									
binary digits (bits)									

b) Write the final 8-bit binary value here: _____

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3. For Pearson, you will only be asked to convert numbers that result in a maximum of 8 bits; however it is not any more difficult to convert larger numbers. Given the denary number 801, complete the table.

a)

denary											
bit value											
difference											
binary digits (bits)											

b) Write the final 10-bit binary value here:

4. Back to numbers less than 8 bits. Given the denary number 255, complete the table.

a)

denary									
bit value									
difference									
binary digits (bits)									

b) Write the final 8-bit binary value here:

5. Back to numbers less than 8 bits. Given the denary number 127, complete the table.

a)

denary									
bit value									
difference									
binary digits (bits)									

b) Write the final 8-bit binary value here:

Notice the answers to question 4 and question 5. The value 2^8 is 256, and when we convert one fewer than this number, 255, the result is all 1's for the remaining 8 bits, so 1111_1111. The same happens with $2^7 = 128$, so 127 is 0111_1111. This is a good thing to remember to allow you to quickly convert certain numbers.

We will also study another algorithm for converting from denary to binary when we study bit shifting.