Binary, Angles, and Coordinates, oh my!

What is 11101001 in base 10?

Step 1. Write down the value of each column above the number. In base 2, the values of each column represents a powers of 2.

128	64	32	16	8	4	2	1
1	1	1	0	1	0	0	1

Step 2. Calculate the value of the number in base 10 by adding all the columns with 1's in them.

$$128 + 64 + 32 + 8 + 1 = 233$$

Your Turn!

1. What is 101101 in base 10?

32	16	8	4	2	1
1	0	1	1	0	1

2. What is 110 in base 10?

3. What is 100011000 in base 10?

4. What is 11010 in base 10?

5. What is 1011011 in base 10?

What is 233 in base 2?

Step 1: Write out what the columns represent in base 2. Stop when you've reached a number bigger than the number you want to convert.

128	64	32	16	8	4	2	1

Step 2: Find the largest number in the table that is less than 233. In this case, that number is 128. Put a 1 in the 128 column. We still have 105 left so we need to keep going.

128	64	32	16	8	4	2	1
1							

Step 3: Find the largest number in that table that is less than the remaining amount. In this case, that number is 64 . Put a 1 in that column. If we filled in the rest of the columns with 0's, that would be the number 128 + 64 = 192. But we want to write 233, so we still have 41 remaining.

128	64	32	16	8	4	2	1
1	1						

Step 4: Continue filling in the chart by placing a 1 in the column with the largest value that is less than the remaining amount. Our remaining amount is 41, so the next step is to place a 1 in the 32 column. Now the remaining amount is 41 - 32 = 9. The largest column that is less than 9, is the 8 column so put a 1 in the 8 column. Now we have 9 - 8 = 1 remaining. Because our remainder is 1, the final step is to put a 1 in the 1's column.

128	64	32	16	8	4	2	1
1	1	1	0	1	0	0	1

Step 6: Rewrite the answer without the column values. 233 in binary is 11101001.

Your Turn!

Convert base 10 to base 2

1. What is 67 in binary?

64	32	16	8	4	2	1

2. What is 7 in binary?

3. What is 33 in binary?

4. What is 8 in binary?

5. What is 12 in binary?