Negative Numbers in Two's Complement Representation

We illustrate how negative numbers are represented using an example. Let us suppose we want to represent the number -22. For illustration purposes, we will discuss 8-bit integers.[1]

Step 1:

To find the binary representation of -22, we start with the base two representation of +22, shown below:

0	0	0	1	0	1	1	0	$_{\text{base 2}}$	$\equiv$	$22_{\text{base 10}}$

Step 2:

We form the complement of the bit pattern shown above. Here, "complement" means to change all the zeros into ones, and all the ones into zeros. We now have:

1	1	1	0	1	0	0	1

Step 3:

Add one to the complemented form.

$$\begin{array}{r} 1\ 1\ 1\ 0\ 1\ 0\ 0\ 1 \\ +\ 1 \\ \hline 1\ 1\ 1\ 0\ 1\ 0\ 1\ 0 \end{array}$$

<drum roll .... brrrrrrraarrraatatatata> **Tah-da !**

Our two's complement representation of -22 is the bit pattern:

1	1	1	0	1	0	1	0

[1] Your Lenovo or Macintosh computer is capable of handling 8-bit, 16-bit, 32-bit, and 64-bit integers.
In England, a "Macintosh" is a raincoat, named after a company that makes very popular coats. In the Beatles song, "Penny Lane", the phrase "... the banker never wears a Mac..." is a colloquial abbreviation of "Macintosh", and refers to the raincoat. The popular fruit (apple) is spelled "McIntosh", not "Macintosh". But, computer geeks often don't know how to spell, so the popular computer was accidentally named after a raincoat instead of a regional variety of apples.