Powers of numbers behave in surprising ways...

Take a look at the following and try to explain what's going on.

Work out 2^1, 2^2, 2^3, 2^4, 2^5, 2^6...
For which values of n will 2^n be a multiple of 10?

For which values of n is $1^n + 2^n + 3^n$ even?

Work out $1^n + 2^n + 3^n + 4^n$ for some different values of n.
What do you notice?

What about $1^n + 2^n + 3^n + 4^n + 5^n$?

What other surprising results can you find?
Here are some suggestions to start you off:

$4^n + 5^n + 6^n$
$2^n + 3^n$ for odd values of n
$3^n + 8^n$
$2^n + 4^n + 6^n$
$3^n + 5^n + 7^n$
$3^n - 2^n$
$7^n + 5^n - 3^n$

Can you justify your findings?