Converting positive denary whole numbers | Part A

Remember when you were in junior school, and you were only just learning how to use numbers to do basic calculations? Your teacher might have written H, T, U or "hundreds, tens and units" on the top of your calculation to help you know the place values of each number. Each column is worth ten times the column to the right. So you knew that 123 was one lot of hundred, two lots of tens (ie twenty) and three lots of units or 'ones'. Add them all together and you got the result – one hundred and twenty three.

This number system is *base 10* because it has ten symbols from 0 to 9 – this is sometimes described as *denary*. It is the number system you are used to, but it isn't the only one!

You already know that computers work using a number system called binary, and most people know that binary uses 'ones and noughts'. Let's see if we can convert a number from denary to binary. Binary is base 2 and has just two symbols 0 and 1. You've come across the term "bi" meaning two before, for example a *bi-cycle* has two wheels.

Imagine that instead of our hundreds tens and units, we have *four* places available. The right most place is worth 1. The next one is worth 2, the next after that is 4, and the left most place is worth 8.

8	4	2	1

With binary, we only have two options – if we want to use the place value we write a 1 and if we don't want to use it, we write a 0.

So let's make the number 1 in binary. Always start with the place that is furthest to the left. 8 is too big so we won't use this place, write a 0. 4 is also too big so a 0 here, and 2 is too big so another 0. This leaves the place worth 1 which is what we want, and the result is 0001.

8	4	2	1
0	0	0	1

Let's try to write the number 6 now. Look at the place values – 8 is still too big so we're not using that – write a 0 here. We can use a 4 so let's write a 1. Now, the number we've written so far adds up to 4, this means we need 2 more to make our target of 6. The next place is worth 2, so let's use that and write a 1. We now have reached our target so we don't need any more of the places, so the last place gets a 0. And there's the answer – 0110 is the number 6 in binary.

8	4	2	1
0	1	1	0