SUPPLEMENTARY NOTES GRADE 7

UNIT 4, TOPIC 4.3

DATA REPRESENTATION

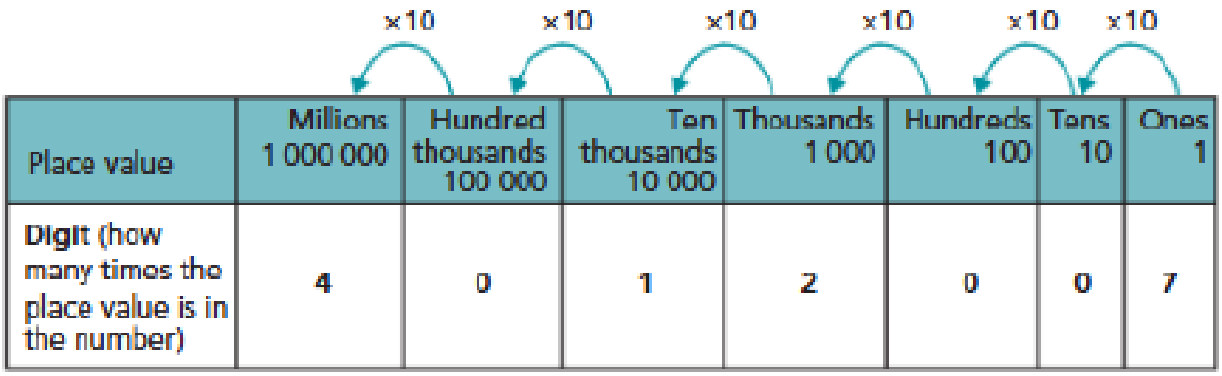
Denary numbers

Most human societies today use the denary number system (also known as a decimal system or base-10). This means that the number system has ten digits (single numbers) that we can put together to represent all numbers. The digits are:

0 1 2 3 4 5 6 7 8 9 These can be combined to make any number, however large. For example, 12, 107, 3571 or 98 979.

A digit's position in a number tells you what the value of that digit is. This is called place value. In 3571, the digit 7 is in the tens place, so its value is 70. If the 7 was in the hundreds place, its value would be 700. The smallest place value is the ones, which are on the far right-hand side of the number. The positions get bigger as you add more columns to the left.

For bigger numbers we need more columns. Because this is a base-10 number system, to get the next column to the left, you multiply the left- most column you already have by 10, as shown in the table below.



Place value	Millions 1 000 000	Hundred thousands 100 000	Ten thousands 10 000	Thousands 1 000	Hundreds 100	Tens 10	Ones 1
Digit (how many times the place value is in the number)	**4**	**0**	**1**	**2**	**0**	**0**	**7**

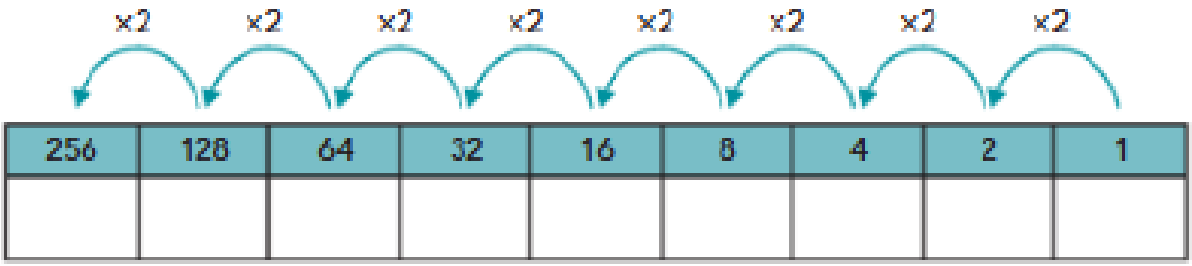
So, the number in the table is four million, twelve thousand and seven, because it has four millions, one ten thousand, two thousands and seven ones.

Binary numbers

Computers use a binary number system. This is a base-2 system, which means that only two digits can be used to create numbers:

O and 1

This time, you double (multiply by 2) the value of the left-most column to get each next place value column to the left. The smallest place value is 1.



When we count in binary, we start in the units column and count 0 to 1. Once we reach 1, we have run out of unique digits, so we put a 1 in the twos column and count 0 to 1 in the units column again. We keep doing this until we reach 1 again and then we put a 1 in the fours column and count 0 to 1 again in the units and twos columns, and so on.

256	128	64	32	16	8	4	2	1	Denary
								0	0
								1	1
							1	0	2
							1	1	3
						1	0	0	4
						1	0	1	5
						1	1	0	6
						1	1	1	7
					1	0	0	0	8
					1	0	0	1	9
					1	0	1	0	10

This is how numbers are coded into data that computers can understand. Whenever we type denary numbers into a computer, the computer converts them into binary so that it can store and process them.

Why do computers use binary?

Computers use the binary system because they can only understand data that is made up of two different states (ways of being).

Computers use electrical signals, which can either be high or low.

High creates a value of I and low creates a value of 0. This means that all data must be converted to binary for a computer to be able to process it.

All of these can be converted to binary numbers and stored as computer data:

denary numbers

letters and symbols

sounds

images.