

CHAPTER 1: NUMBER BASES

The whole numbers that we used in daily life is actually from the number base 10. It is derived from 10 different digits which is 0,1,2,3,4,5,6,7,8,9.

BASE NUMBER OF 10 IN OUR DAILY USE

$$\begin{array}{r} 1794 \\ + 2227 \\ \hline 4021 \end{array}$$

$$\begin{array}{r} 321 \\ - 123 \\ \hline 198 \end{array}$$

- The sum of $4 + 7 = 11$; and since 11 is exceeding 10, then 11 shall be deducted by 10 and the answer of 1 shall be written and 1 to be added to the sum of the other numbers on the left. The similar process shall take place on the following addition. Under this circumstances, it is proven that all of the numbers used are in fact of the base of 10.
- If we study the process of subtraction as shown on the top right side of this diagram, it is obvious that 3 cannot be deducted from 1 and as such it needs to borrow 1 from 2 (the number on the left side of 1). Though 1 is taken from 2, its value is in fact 10 and when added to 1 will gives us 11. This also proves that the numbers used are in fact of the base of 10.
- The same justification can be obtained when ones study the concept of multiplication

Below is the characteristic of each base number:

CHARACTERISTICS OF EACH BASE NUMBERS

Base number of 10

- Comprises of 10 individual digits of 0, 1, 2, 3, 4, 5, 6, 7, 8 & 9 only
- 10 shall be the maximum digit

Base number of 8

- Comprises of 8 individual digits of 0, 1, 2, 3, 4, 5, 6 & 7 only
- 8 shall be the maximum digit

Base number of 5

- Comprises of 5 individual digits of 0, 1, 2, 3, 4 & 5 only
- 5 shall be the maximum digit

Base number of 2

- Comprises of 2 individual digits of 0 & 1 only
- 2 shall be the maximum digit

Below shows how to convert numbers from one base to another base:

CONVERSION OF CERTAIN BASE NUMBERS TO THE BASE NUMBER OF 10

7236_8	$7(8^3) + 2(8^2) + 3(8^1) + 6(8^0)$ $= 3584 + 128 + 24 + 6$	3742_{10}
2341_5	$2(5^3) + 3(5^2) + 4(5^1) + 1(5^0)$ $= 250 + 75 + 20 + 1$	346_{10}
11001_2	$1(2^4) + 1(2^3) + 0(2^2) + 0(2^1) + 1(2^0)$ $= 16 + 8 + 0 + 0 + 1$	25_{10}

CONVERSION OF BASE NUMBER OF 10 TO THE OTHER BASE NUMBERS

3742_{10} →

$3742 \div 8 = 467 \text{ R } 6$	6
$467 \div 8 = 58 \text{ R } 3$	3
$58 \div 8 = 7 \text{ R } 2$	2
$7 \div 8 = 0 \text{ R } 7$	7

→ 7236_8

25_{10} →

$25 \div 2 = 12 \text{ R } 1$	1
$12 \div 2 = 6 \text{ R } 0$	0
$6 \div 2 = 3 \text{ R } 0$	0
$3 \div 2 = 1 \text{ R } 1$	1
$1 \div 2 = 0 \text{ R } 1$	1

→ 11001_2

346_{10} →

$346 \div 5 = 69 \text{ R } 1$	1
$69 \div 5 = 13 \text{ R } 4$	4
$13 \div 5 = 2 \text{ R } 3$	3
$2 \div 5 = 0 \text{ R } 2$	2

→ 2341_5