OMEGA ACADEMY, NUMERICAL METHODS COURSE.

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Numerical Methods

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UNIT ONE

Converting decimal, octal, and hexadecimal to binary.

To start the conversion process in each of the different systems, must know each. This first section will examine the procedure for converting from one based to another.

Decimal numbers: are those containing integer and fractional part, in this term the ones on base 10.

Binary System Numbers: Numbering system used in computer science in which one (1) is on and zero (0) off.

Octal system: numbering system base eight (8) digits, using zero (0) to seven (7).

Hexadecimal System: Numbering system base sixteen (16), two (2) hexadecimal digits correspond to one (1) byte, using values between zero (0) to fifteen (15), where the values from ten (10) are represented by letters.

10 = A, 11 = B, 12 = C, 13 = D, 14 = E, 15 = F

To convert a decimal number in any of the systems used in the sciences of the previously mentioned, computer must divide the number of base ten (10) either between two (2) binary system, eight (8) to octal or sixteen (16) to hexadecimal.

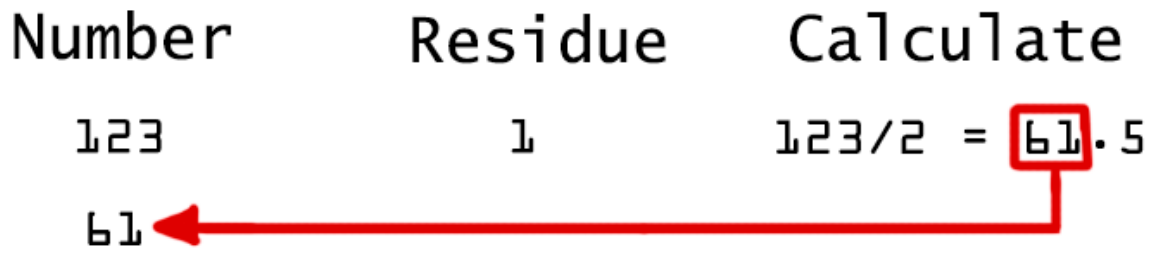
-Let's convert the decimal number 123 to binary, octal and hexadecimal.

1. From decimal number to binary number.

You should take the above that number (123) and divide by two until you reach zero (0) to make the process easier here is a chart.

Number	Residue	Calculation
123	1	123/2=61.5
61	1	61/2=30.5
30	0	30/2=15
15	1	15/2=7.5
7	1	7/2=3.5
3	1	3/2=1.5
1	1	½=0.5
0		

The result comes from dividing the number by two (2) as many times as possible until it can't be divided it anymore. Once with the result proceed to read the number from bottom up.



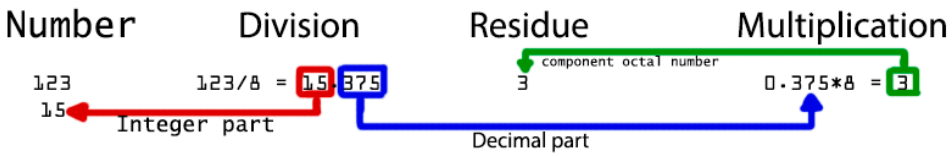
2. **From decimal form to octal form.**

To convert a decimal number to octal system, first divide the given number by eight (8). When the number you get as a result of the division not an integer this is the process to follow to solve the problem.

Integer part: it's used to divide until the result that comes I smaller than eight (8).

Fractional part: it's used to multiply it by eight, the result becomes part of the octal number.

Example to follow:



Number	Division	Fractional part	Multiplication
123	123/8=15.375	3	0.375*8=3
15	15/8=1.875	7	1.875*8=7
1	1/8=0.125	1	

Same as the binary system the result obtained from the calculus on the fractional part are read from bottom up, that way the result would be: 173 which is the octal form for 123.

3. **Decimal number to hexadecimal number**

Now to convert a decimal number to hexadecimal number, the same technique that was used to convert decimal to binary and decimal to octal is use here but instead of dividing by eight, it gets divided by sixteen (16).

Hexadecimal numbers includes values from zero (0) to fifteen (15); but after the number ten (10) the values change from numbers to letters: 10 = A, 11 = B, 12 = C, 13 = D, 14 = E, 15 = F.

Number	Division	Fractional part	Multiplication
123	123/16=7.6875	0.6875	0.6875*16=11= B
7	7/16=0.4375	0.4375	0.4375*16=7

This one works as well as the other two system, the gets read bottom up, getting as a result: 7B