

## CONVERSIONS

### DECIMAL TO OTHER

#### 1. DECIMAL TO BINARY

##### Decimal Number System to Other Base

To convert Number system from **Decimal Number System** to **Any Other Base** is quite easy; you have to follow just two steps:

**A)** Divide the Number (Decimal Number) by the base of target base system (in which you want to convert the number: Binary (2), octal (8) and Hexadecimal (16)).

**B)** Write the remainder from step 1 as a Least Signification Bit (LSB) to Step last as a Most Significant Bit (MSB).

Decimal to Binary Conversion		Result	
Decimal Number is : <b>(12345)<sub>10</sub></b>		Binary Number is <b>(11000000111001)<sub>2</sub></b>	
2	12345		1 <b>LSB</b>
2	6172		0
2	3086		0
2	1543		1
2	771		1
2	385		1
2	192		0
2	96		0
2	48		0
2	24		0
2	12		0
2	6		0
2	3		1
	1	1 <b>MSB</b>	

#### 2. DECIMAL TO OCTAL

Decimal to Octal Conversion	Result
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Decimal Number is : <b>(12345)<sub>10</sub></b>			Octal Number is <b>(30071)<sub>8</sub></b>	
8	12345	1		LSB
8	1543	7		
8	192	0		
8	24	0		
	3	3	MSB	

### 3. DECIMAL TO HEXADECIMAL

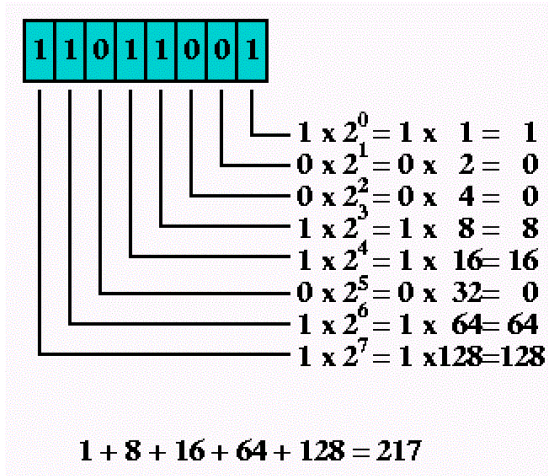
4.

Decimal to Hexadecimal Conversion	Result																
<p><b>Example 1</b> Decimal Number is : <b>(12345)<sub>10</sub></b></p> <table border="1"> <tr> <td>16</td> <td>12345</td> <td>9</td> <td>LSB</td> </tr> <tr> <td>16</td> <td>771</td> <td>3</td> <td></td> </tr> <tr> <td>16</td> <td>48</td> <td>0</td> <td></td> </tr> <tr> <td>8</td> <td>3</td> <td>3</td> <td>MSB</td> </tr> </table>	16	12345	9	LSB	16	771	3		16	48	0		8	3	3	MSB	Hexadecimal Number is <b>(3039)<sub>16</sub></b>
16	12345	9	LSB														
16	771	3															
16	48	0															
8	3	3	MSB														
<p><b>Example 2</b> Decimal Number is : <b>(725)<sub>10</sub></b></p> <table border="1"> <tr> <td>16</td> <td>725</td> <td>5</td> <td>5</td> <td>LSB</td> </tr> <tr> <td>16</td> <td>45</td> <td>13</td> <td>D</td> <td></td> </tr> <tr> <td></td> <td>2</td> <td>2</td> <td>2</td> <td>MSB</td> </tr> </table>	16	725	5	5	LSB	16	45	13	D			2	2	2	MSB	Hexadecimal Number is <b>(2D5)<sub>16</sub></b> Convert 10, 11, 12, 13, 14, 15 to its equivalent... A, B, C, D, E, F	
16	725	5	5	LSB													
16	45	13	D														
	2	2	2	MSB													

### BINARY TO OTHER

A) Multiply the digit with 2(with place value exponent). Eventually add all the multiplication becomes the Decimal number.

#### 1. BINARY TO DECIMAL



## 2. BINARY TO OCTAL

An easy way to convert from binary to octal is to group binary digits into sets of three, starting with the least significant (rightmost) digits.

Binary: 11100101 =	11 100 101	
	011 100 101	Pad the most significant digits with zeros if necessary to complete a group of three.

Then, look up each group in a table:

Binary:	000	001	010	011	100	101	110	111		
Octal:		0	1	2	3	4	5	6	7	

Binary =	011	100	101	
Octal =	3	4	5	= 345 oct

## 3. BINARY TO HEXADECIMAL

An equally easy way to convert from binary to hexadecimal is to group binary digits into sets of four, starting with the least significant (rightmost) digits.

Binary: 11100101 = 1110 0101

Then, look up each group in a table:

Binary:	0000	0001	0010	0011	0100	0101	0110	0111
Hexadecimal:	0	1	2	3	4	5	6	7

Binary:	1000	1001	1010	1011	1100	1101	1110	1111
Hexadecimal:	8	9	A	B	C	D	E	F

Binary =	1110	0101	
Hexadecimal =	E	5	= E5 hex

## **OCTAL TO OTHER**

### **1. OCTAL TO BINARY**

Converting from octal to binary is as easy as converting from binary to octal. Simply look up each octal digit to obtain the equivalent group of three binary digits.

Octal:	0	1	2	3	4	5	6	7
Binary:	000	001	010	011	100	101	110	111

Octal =	3	4	5	
Binary =	011	100	101	= 011100101 binary

### **2. OCTAL TO HEXADECIMAL**

When converting from octal to hexadecimal, it is often easier to first convert the octal number into binary and then from binary into hexadecimal. For example, to convert 345 octal into hex:

*(from the previous example)*

Octal =	3	4	5	
Binary =	011	100	101	= 011100101 binary

Drop any leading zeros or pad with leading zeros to get groups of four binary digits (bits):

Binary 011100101 = 1110 0101

Then, look up the groups in a table to convert to hexadecimal digits.

Binary:	0000	0001	0010	0011	0100	0101	0110	0111
Hexadecimal:	0	1	2	3	4	5	6	7

Binary:	1000	1001	1010	1011	1100	1101	1110	1111
Hexadecimal:	8	9	A	B	C	D	E	F

Binary =	1110	0101	
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Hexadecimal =	E	5	= E5 hex

Therefore, through a two-step conversion process, octal 345 equals binary 011100101 equals hexadecimal E5.

### 3. OCTAL TO DECIMAL

The conversion can also be performed in the conventional mathematical way, by showing each digit place as an increasing power of 8.

$$345 \text{ octal} = (3 * 8^2) + (4 * 8^1) + (5 * 8^0) = (3 * 64) + (4 * 8) + (5 * 1) = 229 \text{ decimal}$$

OR

Converting octal to decimal can be done with repeated division.

1. Start the decimal result at 0.
2. Remove the most significant octal digit (leftmost) and add it to the result.
3. If all octal digits have been removed, you're done. Stop.
4. Otherwise, multiply the result by 8.
5. Go to step 2.

Octal Digits	Operation	Decimal Result	Operation	Decimal Result
345	+3	3	× 8	24
45	+4	28	× 8	224
5	+5	229		

## **HEXADECIMAL TO OTHER**

### 1. HEXADECIMAL TO BINARY

Converting from hexadecimal to binary is as easy as converting from binary to hexadecimal. Simply look up each hexadecimal digit to obtain the equivalent group of four binary digits.

Hexadecimal:	0	1	2	3	4	5	6	7
Binary:	0000	0001	0010	0011	0100	0101	0110	0111
Hexadecimal:	8	9	A	B	C	D	E	F
Binary:	1000	1001	1010	1011	1100	1101	1110	1111

Hexadecimal =	A	2	D	E	
Binary =	1010	0010	1101	1110	= 1010001011011110 binary

