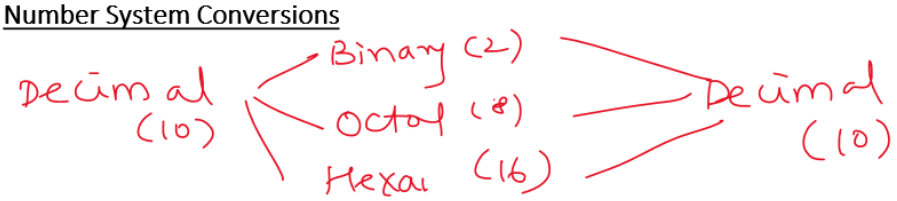
Number System Conversions



Octal (8) → Binary (2)

$(001\ 010\ 101 \cdot 110\ 010)_2$

Hexadecimal → Binary

$[0001\ 0010\ 0101 \cdot 0110\ 0010]_2$

Hexadecimal → Binary → Octal

Convert $(BC66.AF)_{16} = (\quad)_8$

Binary

$(B\ C\ 6\ 6 \cdot A\ F)_{16}$

$(001\ 011\ 1100\ 0110\ 0110 \cdot 1010\ 1111\ 0)_2$

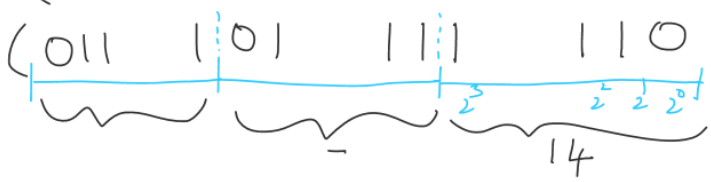
$(1\ 3\ 6\ 1\ 4\ 6 \cdot 5\ 3\ 6)_8$

Convert $(3576)_8 = (7\ 7E)_{16}$

$(3\ 5\ 7\ 6)_8$

$(011\ 101\ 111\ 110)$

$(011\ \ 101\ \ 111\ \ 110)_2$



$(7\ \ 7\ \ E)_{16}$

Determine the base of 'x' if

(i) $(225)_x = (341)_8$

$2x^2 + 2x + 5 = (3\times8^2 + 4\times8 + 1\times8^0)_{10}$

$2x^2 + 2x + 5 = (225)_{10}$

$\boxed{x = 10}$

(ii) $(211)_x = (152)_8$

$2x^2 + x + 1 = 106$

$2x^2 + x - 105 = 0$

$x = \dfrac{-1 \pm \sqrt{1 - 4(2)(-105)}}{4}$

= 7 , -7.5 (X)

x = 7

7 binary → -7

Binary { 3, 4, 5, 6, ... 8, 16, }

-7 → Binary

1's Compliment

Binary No. 1 0 1 0 . 1 0 1 1 1

1's complement 0 1 0 1 . 0 1 0 0 0

1's Complement 1 1 0 1 1 0 1 1 1 . 1 1 0 1 1 0 1

↳ 0 0 1 0 0 1 0 0 0 . 0 0 1 0 0 1 0

2's complement ⇒ 1's complement + 1

2's complement ⇒ 1's complement

Find 2's complement of $(11000100)_2$

	(MSD)							(LSD)
	1	1	0	0	0	1	0	0
1's comp	0	0	1	1	1	0	1	1
+								1
2's comp →	0	0	1	1	1	1	0	0

8, 16, 32, 64, 128.

Binary arithmetic:

$0 + 0 = 0$

$1 + 0 = 1$

$0 + 1 = 1$

$1 + 1 = 2 \rightarrow 10$ (Binary)

Find 2's complement of $(01110.1011)_2$

	(	0	1	1	1	0 .	1	0	1	1	)$_2$
1's comp:		1	0	0	0	1 .	0	1	0	0	
+ 1						1 .					
2's comp:		1	0	0	1	0 .	0	1	0	0	

Perform addition of: $(11001100)_2$ and $(11011010)_2$

$$\begin{array}{r} {\scriptstyle 1\quad\ 1\ \ 1} \\ 1\ 1\ 0\ 0\ 1\ 1\ 0\ 0 \\ (+)\quad 1\ 1\ 0\ 1\ 1\ 0\ 1\ 0 \\ \hline 1\ 1\ 0\ 1\ 0\ 0\ 1\ 1\ 0 \\ \hline \end{array}$$

$$\begin{array}{r} 10 \\ 1 \\ \hline 11 \\ \hline \end{array}$$

2) Add $(28)_{10}$ and $(15)_{10}$ using binary arthmetic

$28+15 = 43$

2	28
2	14 — 0
2	7 — 0
2	3 — 1
	1 — 1

$$(28)_{10} = \begin{array}{r} {\scriptstyle 1\ \ 1} \\ 1\ 1\ 1\ 0\ 0 \\ \hline \end{array}$$

$$(15)_{10} = \begin{array}{r} 1\ 1\ 1\ 1 \\ \hline 0\ 0\ 1\ 0\ 1\ 0\ 1\ 1 \\ \hline \end{array}$$

$2^7\ 2^6\ 2^5\ 2^4\ 2^3\ 2^2\ 2^1\ 2^0$

Verification:- $32 + 8 + 2 + 1 = (43)_{10}$

2	15
2	7 — 1
2	3 — 1
	1 — 1

3) Perform $(28)_{10} - (19)_{10}$ using 1's complement

→ $(28)_{10} - (19)_{10}$

Complement

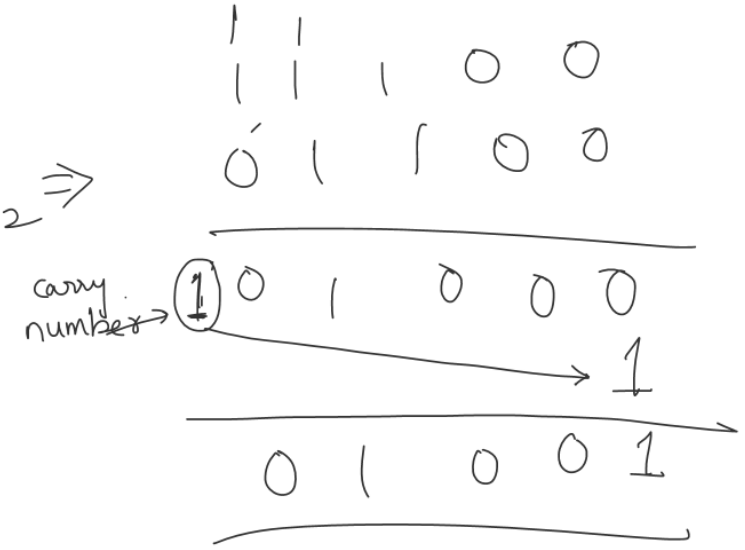
$\Rightarrow (28-19) = (9)_{10}$

$(28)_{10} = (1\ 1\ 1\ 0\ 0)_2$

$(19)_{10} = (1\ 0\ 0\ 1\ 1)_2$

$(28)+(-19)$

$(11100)+(01100)_2 \Rightarrow$



(4) perform $(15)_{10} - (28)_{10}$ using 1's complement

$\Rightarrow (-13)_{10}$

$(15)_{10} = (1\ 1\ 1\ 1)_2$

$(28)_{10} = (1\ 1\ 1\ 0\ 0)_2$

$(15) + (-28)_{10} =$ 1 → +15

-28

$(15)_{10} + (-28)_{10} =$

1

□ 0 0 0 1 1 → -28

□ 1 0 0 1 0 ⇒ -13

2^4 2^3 2^2 2^1 2^0

$(13)_{10} \rightarrow (01101)_2$ ↑ is complement