Thien Tran

2^6	2^5	2^4	2^3	2^2	2^1	2^0
64	32	16	8	4	2	1

1. A. 0011 1101 1101 1010

3 D D A

$= \boxed{3DDA}$

B. 1100 1010 1010 0011

C A A 3

$= \boxed{CAA3}$

C. 1101 1110 0111 1001

D E 7 9

$= \boxed{DE79}$

D. 1100 0010 1101 0011

C 2 D 3

$= \boxed{D2D3}$

16^3	16^2	16^1	16^0
4096	256	16	1

2. A.

5	C	E	9
20480	3072	224	9

$= \boxed{23785}$

B.

B	1	4	3
45056	256	64	3

$= \boxed{45379}$

C.

8	C	F	2
32768	3072	240	2

$= \boxed{36082}$

D.

5	2	D	0
20480	512	208	0

$= \boxed{21200}$

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1

3. A. 10110011

   01001100

   +1

   01001101 $\Leftarrow (2^0 + 2^2 + 2^3 + 2^6) \cdot -1$

   $= \boxed{-77}$

   B. 00101010 $\Leftarrow 2^1 + 2^3 + 2^5$

   $= \boxed{42}$

   C. 11110001

   00001110

   +1

   00001111 $\Leftarrow (2^0 + 2^1 + 2^2 + 2^3) \cdot -1$

   $= \boxed{-15}$

   D. 11011100

   00100011

   +1

   00100100 $\Leftarrow (2^2 + 2^5) \cdot -1$

   $= \boxed{-36}$

4. 412.75

2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	2^{-1}	2^{-2}	2^{-3}
256	128	64	32	16	8	4	2	1	0.5	0.25	0.125

$\frac{412}{2} = 206$ 0

$\frac{206}{2} = 103$ 0

$\frac{103}{2} = 51 R_1$ 1

$\frac{51}{2} = 25 R_1$ 1

$\frac{25}{2} = 12 R_1$ 1

$\frac{12}{2} = 6$ 0

$\frac{6}{2} = 3$ 0

$\frac{3}{2} = 1 R_1$ 1

$\frac{1}{2} = 0 R_1$ 1

$412 = \boxed{110011100}$

$0.75 \cdot 2 = 1.5$ 1

$0.5 \cdot 2 = 1$ 1

$0.75 = \boxed{.11}$

$\boxed{412.75 = 110011100.11}$

5.

There are two huge advantages of a 2's complement number system:

1. Negative Numbers make more sense

- When machines can only see "1"s and "0"s, there is no minus or negative operators. For example, theres no actual way to represent -5 in a sign-magnitude system.

2. There is only one value for zero.

- In 1's complement when bits are inverted to represent negative numbers, the value of zero can be both "00000000" and its inverse "11111111". 2's complement addresses this.