3. (1) $25 = 16+8+1 = 2^4+2^3+2^0$.

$0.8125 = 0.5+0.25+0.0625 = 2^{-1}+2^{-2}+2^{-4}$

$(25.8125)_{10} = (11001.1101)_2 = (31.64)_8 = (19.D)_{16}$.

(2) $2^5+2^3+2^2+2^0 = 32+8+4+1 = 45$.

$2^{-2}+2^{-3} = 0.25+0.125 = 0.375$.

$(101101.011)_2 = (45.375)_{10} = (55.3)_8 = (2D.6)_{16} =$

$(0100\ 0101.\ 0011\ 0111\ 0101)_{8421}$.

(3) $(0101\ 1001\ 0110.0011)_{8421} = (596.3)_{10}$

$596 = 2^9+2^6+2^4+2^2$. $0.3 = 2^{-2}+2^{-5}+2^{-6}+\cdots$, 则

原式 $= (1001010100.010011\cdots)_2 = (254.4\cdots)_{16}$.

(4) $(4E.C)_{16} = (1001110.11)_2 = (78.75)_{10}$

$4\times16+14=78$. $12\times16^{-1} = 0.75$, 则 √

2. (1) $32768 = 16^3\times8$. $(32768)_{10} = (8000)_{16}$. 取负数补码, 则

int $x = -32768$ 对应的机器数为 FFFF8000H.

(2) $522 = 16^2\times2+10$. $(522)_{10} = (20A)_{16}$.

short $y = 522$ 对应的机器数为 020AH.

(3) $65530 = 16^3\times15+16^2\times15+16\times15+10$. $(65530)_{10} = (FFFA)_{16}$.

unsigned $z = 65530$ 对应的机器数为 0000FFFAH.

(4) '@' 的 ASCII 码查表可得为 64. $(64)_{10} = (40)_{16}$.

char $c = $ '@' 时对应的机器数为 40H.

(5) $(1.1)_{10} = (1.0011\cdots)_2$, 负数, 符号位为1, 单精度浮点数.

阶码为$127+0 = 127$. $(127)_{10} = (0111\ 1111)_2$, 尾数为23位, 则

机器数 $(1011\ 1111\ 1000\ 1100\ 1100\ 1100\ 1100\ 1100)_2 = $ BF8CCCCC H.

(6) $(10.5)_{10} = (1010.1)_2 = (1.0101)_2 \times 2^3$, 正数, 符号位为0.

双精度浮点数, 阶码为$1023+3 = 1026$, $(1026)_{10} = (100\ 0000\ 0010)_2$

尾数为52位, 则机器数为 4025 0000 0000 0000 H.

10. (1) FFFB000BH = 1...10000...010B, 为负数, 真值为

   $\text{int } X = -(1111\ 1111\ 1111\ 1010)_2 = -(2^{16}-4-1-1)_{10} = -65530.$

(2) DFFCH = 1101 1111 1111 1100 B, 为负数, 真值为

   $\text{short } y = -(10\ 0000\ 0000\ 0100)_2 = -(2^{13}+4)_{10} = -8196.$

(3) unsigned $z = (FFFFFFFA)_{16} = 16^8 - 1 - 5 = 4294967290.$

(4) 2AH = 42, 查表可知对应ASCII码表示为 *, char c = '*'.

(5) C4480000H = 1100 0100_0100 1000 0000 0000 0000 0000 B.

   符号位为1, 为负数, 阶码为 $(10001000)_2 = (2^7+2^3)_{10} = 136.$

   阶码 136-127 = 9, 尾数为 1001 0---, 则

   $\text{float } A = -(1.1001)_2 \times 2^9 = -(1+2^{-1}+2^{-4}) \times 2^9 = -800.$

(6) C0248000 0000 0000 H = 1100 0000 0010 0100 1000 000--- B

   符号位为1, 为负数, 阶码为 $(10000000010)_2 = (2^{10}+2^1) = 1026.$

   阶码为 1026-1023 = 3, 尾数为 010010---, 则

   $\text{double } b = -(1.01001)_2 \times 2^3 = -(1+2^{-2}+2^{-5}) \times 2^3 = -10.25$

15.

X	Y	X^Y	X&Y	X|Y	~X|~Y	X&!Y	X&&Y	X||Y	!X||!Y	X&&!Y
0x5F	0xA0	0xFF	0x00	0xFF	0xFF	0x00	0x01	0x01	0x00	0x01
0xC7	0xFD	0x37	0xC0	0xF7	0x3F	0x00	0x01	0x01	0x00	0x01
0x80	0x7F	0xFF	0x00	0xFF	0xFF	0x00	0x01	0x01	0x00	0x01
0x01	0x55	0x52	0x05	0x57	0xFA	0x00	0x01	0x01	0x00	0x01

① X = 0101 1111, y = 1010 0000, X^y = 1111 1111, X&y = 0000 0000,

   X|y = 1111 1111, ~X|~y = 1111 1111, X&!y = 0000 0000.

   X&&y = 1, X||y = 1, !X||!y = 0, X&&~y = 1.

② X = 1100 0111, y = 1111 1000, X^y = 0011 0111, X&y = 1100 0000,

   X|y = 1111 0111, ~X|~y = 0011 1111, X&!y = 0000 0000,

   X&&y = 1, X||y = 1, !X||!y = 0, X&&~y = 1.

③ X = 1000 0000, y = 0111 1111, X^y = 1111 1111, X&y = 0000 0000,

$x|y = 11111111$, $\sim x | \sim y = 11111111$, $x\&|y = 00000000$,

$x\&\&y = 1$, $x||y = 1$, $!x||!y = 0$, $x\&\&\sim y = 1$.

④ $x = 00000111$, $y = 01010101$, $x\wedge y = 01010010$, $x\&y = 00000101$,

$x|y = 01010111$, $\sim x|\sim y = 11111010$, $x\&|y = 00000000$,

$x\&\&y = 1$, $x||y = 1$, $!x||!y = 0$, $x\&\&\sim y = 1$.

21. 对比 $x*M$ 与 ... $b=x$, $x<<=4$, $x-=b$ 可得 $M = 2^4-1 = 15$.

对比 y/N 与 if $(y<0)$ $y+=3$, $y>>2$ 可得 $N = 2^2 = 4$.

其中 if $(y<0)$ $y+=3$ 为带符号整数除法中加上偏移量校正的步骤,

从而避免商为负数时朝 $-\infty$ 而非零舍入, 保证移位与直接相除结果一致.

29.

表示	X	x	Y	y	X+Y	x+y	OF	SF	CF	X-Y	x-y	OF	SF	CF
无符号	0x80	176	0x8C	140	0x3C	60	1	0	1	0x24	36	0	0	0
带符号	0x80	-80	0x8C	-116	0x3C	60	1	0	1	0x24	36	0	0	0
无符号	0x7E	126	0x5D	93	0xDB	219	1	1	0	0x21	33	0	0	0
带符号	0x7E	126	0x5D	93	0xDB	-37	1	1	0	0x21	33	0	0	0

38. $x/32$ 可以通过右移5位得到, 其中当 x 为负数时需加上偏移量校正.

即 $2^5-1 = 31$. 判断 int型变量的正负可右移31位得到符号位. 则

```
int div32 (int x) {
    int b = (x>>31) & 0x1F;
    return (x+b)>>5;
}
```

40. 浮点数能表示的最小N值为 $2^{(-126-23)} = 2^{-149}$ (绝对值最小).

最大值为 2^{127}, 规格化与非规格化间分界为 2^{-126}, 则:

```
if (x<-149) { exp=0; frac=0; }
else if (x<-126) { exp=0; frac= 0x400000 >> (-x-127); }
else if (x<128) { exp= x+127; frac=0; }
else { exp= 255; frac=0; }
```