

## Homework2

- 1 . Suppose all the numbers are 8-bit long. Give the result of the following expressions of C language in full 8-bit 2's complement form and signed decimal form.

Expression	2's-complement	Signed 8-bit Decimal
3+2	0000 0101	5
99/2		
(-23)/2		
-127-1		
125+3		
125>>3		

2. The following C code pieces are executed on a typical 32-bit machine with 2's complement encoding. Please give the output and show how you can get the result in detail.

```
int main()
{
    int x = 257;
    char y = -10;
    int z = 128;
    char a = (char)x;
    short b =(short)y;
    unsigned short d = (unsigned short)b;
    char c = (char)z;
    unsigned int e = (c > 0) ? 0 : 1;
    int f = ((unsigned) z<<24)>>24;
    Int g =(z<<24)>>24;
    printf("a=%d,b=%d,d=%x,c=%d,e=%d,f=%d,g=%d\n",a,b,d,c,e,f,g);
}
```

3.

Consider a **16-bit** floating-point representation based on the IEEE floating-point format, which is illustrated below.

S	E	E	E	E	E	E	F	F	F	F	F	F	F	F	F
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1. Filling the blanks with proper values.

- 1) The denormalized values can be represented in a form  
 $V = (-1)^{\text{sign}} * (0.\text{fraction}) * 2^E$ , where **E** = \_\_\_\_**[1]**\_\_\_\_;
- 2) The normalized values can be represented in a form  
 $V = (-1)^{\text{sign}} * (1.\text{fraction}) * 2^{(e - \text{bias})}$ , where **bias** = \_\_\_\_**[2]**\_\_\_\_,  
 and the value of e ranges from \_\_\_\_**[3]**\_\_\_\_ to \_\_\_\_**[4]**\_\_\_\_.

2. Give the equivalent value of the following numeric numbers or FP representation.

Numeric value	FP representation (in hex)
$(12.625)_{10}$	$(0x \text{ [1] } )_{16}$
$(-0.09375)_{10}$	$(0x \text{ [2] } )_{16}$
<b>[3]</b>	$(0x4C18)_{16}$
<b>[4]</b>	$(0x7EB0)_{16}$

3. Calculate both the **sum** and **multiplication** of  $(12.625)_{10}$  and  $(0x4C18)_{16}$ , and then round the results to **5** bits to the right of the binary point with **Round-to-Even** rounding modes. Give your steps detailed.