ID _____ Name _____

Assume all operations are based on 64-bit instruction operated on the Intel CPU and represent a number in a hexadecimal form unless specified

1. For each of the following sentences, you are to indicate whether or not the expression always yields "**true**" or "**false**". If you write no answer you will get **-1** points. If you write the right answer, you will get **+2** points. You write the wrong answer, you will get **-2** points. Justify your answer if you choose false.

   a) If you want to send data from your desktop with the x86 CPU to a server also with the x86 CPU in Internet you do not have to mind the endian because the two machine works on the same little endian.

   b) Every unsigned value u has an additive inverse and its inverse is always $-u$.

   c) Every Two's complement value x has an additive inverse and its inverse is always $-x$.

   d) Truncating numbers always generates an overflow.

```
1. short int sx = 0x28349410;
2. int fx = 0xFFFF9410;
3. unsigned ux = fx;
4. unsigned short usx = sx;
5. unsigned ux1 = sx;
6. int fx2 = fx >> 8;
7. unsigned ux2 = fx >> 8;
8. unsigned ux3 = (unsigned)fx >> 8;
```

   e) **sx** and **fx** are the same value.

   f) **ux** and **fx** are the same value.

   g) **ux1** and **fx** are the same value.

   h) **usx** and **sx** are the same binary representation.

   i) **fx** and **ux** are the same binary representation.

   j) **fx2** and **ux2** are the same binary representation.

   k) **fx2** and **ux3** are the same binary representation.

2. You have four-byte data of **0x9D43B76** to represent in a hexadecimal form.

a) Represent this data, assuming that they are a type of integer in a memory of little endian machines.

b) Represent this data, assuming that they are a type of instruction in a memory of little endian machines.

c) Represent this data, assuming that they are a type of short integer in a memory of little endian machines.

d) Represent this data, assuming that they are a type of string in a memory of little endian machines.

e) Compute the result of && operations with this data and **0xF348AA1B**.

3. Compute 0x1 ≪ 2 + 0x13 ≪ 4.

4. Assume we are running code on a 6-bit machine using two's complement arithmetic for signed integers. A "short" integer is encoded using 3 bits. Fill in the empty boxes in the table below. The following definitions are used in the table:

```
9.  short sy = -3;
10. int y = sy;
11. int x = -17;
12. unsigned ux = x;
```

Note: You need not fill in entries marked with "–".

Expression	Decimal Representation	Binary Representation
Zero	0	
–	–6	
–		01 0010
ux		
y		
x ≫ 1		
ux ≫ 2		
sy ≫ 1		
T_{Max}		
$-T_{Min}$		
$T_{Min} + T_{Min}$		