

ICS Homework Week 8

October 30, 2020

1 Arithmetic Operations

Assume x and y are both 4 bit signed integers. Fill the following table. Truncate all the results to 4 bits with 2's complement and write their value in decimal.

	$x + y$	$x - y$	$x * y$	$-y$
$x = 4, y = 7$				
$x = -6, y = -8$				
$x = 5, y = -1$				
$x = -3, y = 6$				

2 Function Naming

1) Here are two poorly named functions written by ICS TAs. Please give the proper function names according to their functionalities. What arithmetic operations do they do?

```
1 int f1 (int x, int y) {  
2     return ((x&y) + ((x^y)>>1));  
3 }
```

```
1 int f2 (int x, int y) {  
2     int z = x - y;  
3     int k = (z >> 31) & 1;  
4     int m = x - k * z;  
5     return m;  
6 }
```

Name of f1:

Name of f2:

2) Do the functions above provide their intended functionalities for all valid parameters? Why? Please explain with concrete examples.

3 Find the Mole

Given an array of integers, inside which every element appears twice except for one. Find that single element.

For example, given array `{1,3,4,1,2,4,3}`, you need to return `2`.

Can you do this by using only **ONE int variable** and with **ONE traversal**?

```
1  int single_element(int array[], int length) {  
2      // fill in your codes...  
3  
4  
5  
6  
7  
8  }
```