- CPSC 275: Introduction to Computer Systems

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Fall 2025

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Homework 10

NOTE: You are not required to hand in the following exercises, but you are strongly encouraged to complete them to strengthen your understanding of the concepts covered in class.

1. Assuming a 5-bit unsigned arithmetic, add each pair of the following numbers:
   A. `10100 + 10001`
   B. `11000 + 11000`
   C. `10111 + 01000`
   D. `00010 + 00101`
   E. `01100 + 00100`

   Indicate whether an overflow occurred.

2. Repeat Exercise 2 assuming a two's complement integer arithmetic.

3. Assuming a 6-bit two's-complement arithmetic, subtract each pair of the following numbers:
   A. `010011 - 011001`
   B. `100000 - 000001`
   C. `011111 - 111111`
   D. `101010 - 010101`

4. Assuming an 8-bit two's-complement arithmetic, for each negation, give the 8-bit result and indicate if overflow occurs.
   A. `-(0x01)`
   B. `-(0x80)`
   C. `-(0x7F)`

5. Write a function with the following prototype:

   ```
   int uadd_ok(unsigned x, unsigned y);
   ```

   which returns `1` if arguments `x` and `y` can be added without causing overflow; `0` otherwise.

6. Write a function with the following prototype:

```
int tadd_ok(int x, int y);
```

which returns `1` if arguments `x` and `y` can be added without causing overflow; `0` otherwise.

7. You are assigned the task of writing code for a function `tsub_ok`, with arguments `x` and `y`, that will return 1 if computing `x-y` does not cause overflow. Based on the code Exercise 6, you write the following:

```
/* Determine whether arguments can be subtracted without overflow */
int tsub_ok(int x, int y) {
   return tadd_ok(x, -y);
}
```

   A. For what values of x and y will this function give incorrect results?
   B. Write a correct version of this function.

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