Homework 1: Midterm 1 preparation

Due: Monday, January 23, in class.

Problem 1. Identifiers

In the list below, circle all C identifiers (i.e., valid variable names). (note, some variable names are valid, but prohibited by our style guide. They should be circled.)

- a1
- ThisIsAnInt
- Myspace.com
- 12Months
- _X_
- Flash_Drive
- Num_Vars
- INWARDS
- HOW_MUCH?
- if20
- true
- if
- iff
- a1a2a3a4
- float
- me@gmail
- don’t_like_it
- not_my_fav_0_rit_e
- __Robots
- stone-cold

Problem 2. Constants

For each constant below, specify its type. If the constant is invalid, say "invalid".

(a) -357
(b) 929,567
(c) -2.001
(d) 'c'
(e) 800e-3
(f) 4.2.2
(g) 0
(h) 'Alex'
(i) true
(j) 23,01.14
(k) 5.2e12
(l) '\n'
Problem 3. Expressions

Rewrite each C expression using parentheses to show the order of operations.
(e.g. a+b-c is (a+b)-c.)

(a) \(4 + x + 3 / x\)  
(b) \(b + -23 - -14 \times 2\)  
(c) \(c \times f - 2 \% 3 + 2\)  
(d) \(3 \times -34 - -23 + 45 / 23\)  
(e) \(a + b \% -c / a \times b / c\)  

Problem 4. Assignment

Consider the following code fragment:

```c
int x, y, z;
...
x = x + z;
y = x + y;
z = z + y;
```

For each set of variable assignments below, specify the values of \(x\), \(y\) and \(z\) after the code fragment executes.

(a) Initial: \(x: 3\) \(y: 1\) \(z: 1\)  
Final: \(x: ___\) \(y: ___\) \(z: ___\)  

(b) Initial: \(x: 7\) \(y: 12\) \(z: 10\)  
Final: \(x: ___\) \(y: ___\) \(z: ___\)  

(c) Initial: \(x: -1\) \(y: 15\) \(z: 22\)  
Final: \(x: ___\) \(y: ___\) \(z: ___\)
Problem 5. Trickier assignment

Consider the following code fragment:

```c
int x, y, z;
...
x = x + z/y;
y = y * x % z;
z = z + 1;
```

For each set of variable assignments below, specify the values of \( x \), \( y \) and \( z \) after the code fragment executes.

(a) Initial: \( x: 5 \quad y: 5 \quad z: 5 \)
    Final: \( x: \_\_ \quad y: \_\_ \quad z: \_\_ \)

(b) Initial: \( x: 3 \quad y: 2 \quad z: 5 \)
    Final: \( x: \_\_ \quad y: \_\_ \quad z: \_\_ \)

(c) Initial: \( x: 10 \quad y: 10 \quad z: 20 \)
    Final: \( x: \_\_ \quad y: \_\_ \quad z: \_\_ \)

Write a function that takes as input two integer values, computes the square root of the sum of their squares and returns it.

Problem 8. More code writing.

Three towns, Sunny Hill, Greenville and Riverbend are represented as points on a map. Sunny Hill is located at the coordinates (20, 14), Greenville — at the the coordinates (32, −12) and Riverbend is at the origin of the coordinates, (0, 0). Write a C program that uses only the function you defined in Problem 7 to compute the distances between each pair of towns, and print them out. (Make certain your program is complete). You can assume that the function from Problem 7 is defined in a separate file.

```c
#include <stdio.h>

int main() {

    return 0;
}
```
Problem 9: Function composition.

Consider the following C functions:

```c
int p(int a, int b) {
    return (a+b)/a;
}

int r(int a) {
    return a-1;
}

int s(int a, int b) {
    return (a*a + b*b)/(a*b);
}
```

Compute the result of the following function calls:

(a) p(r(10), r(-2))
(b) r(s(2,3))
(c) s(p(1,r(3)), p(4, -4))
(d) s(r(s(1,1)), r(s(r(4),r(-1))))
(e) r(r(r(5)))
(f) p(p(1,1), p(2,2))
(g) s(s(1,1), s(2,2))
(h) s(p(1,1), p(2,2))
(i) s(r(s(-1,1)), r(s(-2,2)))
(j) p(s(r(4),p(1,2)), s(r(-1), p(3,4)))