CS 125 Section 4 – “My beliefs form a simple state diagram: Either my code works or is sufficiently tested. Pick one…”

>Challenge 1. Partner up! Solve the following in teams of two.
When you get stuck 'raid' another pair to ask for hints!

1.1 Make sure you **understand** every line in the following program, then work out the algorithm's intended purpose, and explain why a better name for the ‘flag’ variable might be ‘toggle’ or ‘output’.

```
ALGORITHM A
1 boolean flag = true;
2 int n = 0;
3 while(n != -1) {
4   n = TextIO.getlnInt();
5   if (n == 0) flag = ! flag;
6   if (flag) TextIO.put(n);
7 }
```

1.2 What exactly will the code print out if the user enters the following numbers (one per line)

i) 1 0 2 3 0 4 -1 ?

ii) 0 0 0 5 0 -1 ?

Check your answer with other students.

Lines 4 and 6 are now swapped to create a new algorithm (Algorithm B; see below) -

```
ALGORITHM B
1 boolean flag = true;
2 int n = 0;
3 while(n != -1) {
4   if(flag) TextIO.put(n);
5   if(n == 0) flag = ! flag;
6   n = TextIO.getlnInt();
7 }
```

1.3 What will algorithm B print for user input (one number per line)

i) 1 0 2 3 0 4 -1 ?

ii) 0 0 0 6 5 0 -1 ?

1.4 Write a briefly summary in plain English that explains what algorithm B will print. Your explanation should be precise enough that it does not fit algorithm A. Compare! Is your summary better than other students’ descriptions?

> Challenge 2. Reverse Data Game (15 mins)

Carefully read the code below and discuss it with a partner. Your roommate runs the program and secretly enters four numbers (each time entering an integer between 1 and 99).

```
int previous = 0;
int remain = 4;
int value = 0;
int a = 0;
int b = 0;
while (remain > 0) {
   previous = value;
   value = TextIO.getlnInt();
   if (value > previous)
      a= a+1;
   if (value < previous)
      b= b+1;
   remain--;
}
TextIO.put(a);
TextIO.put(',');
TextIO.put(b);
```

```
(Game 0) Example Output: "4,0"
Example input: 10,20,30,40

Game 1 Output: "3,0"
Input?

Game 2 Output: "2,2"
Input?

Game 3 Output: "1,2"
Input?
```

2.1 For each game the output is shown; what might your friend have entered to produce that output?

2.2 Next your friend tells you that the final value of 'a' is suppose to be the number of times the next number was larger than the previous value entered. But the above program is incorrect - the count is "off-by one". Your friend fixes the program. Now the output of Game 0 is "3,0". How many different ways might she/he have fixed the program so that the count is correct - (assume input values are always between 1 and 99). Find at least four alternate ways your friend might have changed the program to make the count correct.

>Challenge 3. Writing Algorithms (in pairs; 10 mins)

Imagine that you were in charge of a factory that produces Russian nesting dolls. Your job is to figure out for each design, how many dolls can nest, and how big each one should be.

Assume that each doll has to be 20% smaller than the one it fits in, and dolls smaller than 1" big cannot have dolls nested inside them. Given the size of the outermost doll, we want an algorithm that 1) prints the size of each doll (largest first); 2) Prints the total number of different sizes to be created.

3.1. Figure out what order the following lines of pseudo-code should be in to create that algorithm. Hint: You may need to use some lines more than once. Finished? Check another student pair's work and let your algorithm be reviewed and checked for correctness.

```
a)     count  =  count  +1

b)     }

c)     print  count

d)     count  =  0

e)     height  =  height  *  0.8

f)     height  = get initial height from user

g)     while  (height  >=  1.0)

h)     print  height

i)     {
```

>Challenge 4. Variables and Expressions (5 mins; check your answers using Eclipse + Compiler)

4.1 Describe the error if any, for each code fragment.

```
a)  double  x  =  .07 + 1;                OK (1 is promoted to a double)
b)  char  c  =  'foo';                    ___________________________
c)  int  y;
    y  =  -47;                            OK
d)  int  class  =  4;                     ___________________________
e)  char  key_press  =  'f';              ___________________________
f)  double  lnum;
    -107.0  = lnum;                       ___________________________
g)  int  1st_value  =  100;               ___________________________
h)  int  size  =  3.9;                    ___________________________
i)  char  my  character  = 's';           ___________________________
j)  diameter  =  5.7;
    double  diameter;                     ___________________________
k)  int  v1  =  7,  v2  =  8;             OK
l)  int  m  =  200;
    int  n  =  2*m;                       OK
m)  int  offset  =  123;
    char  c  =  'a'  +  offset;           ___________________________
n)  double  length  = 78493461238;        ___________________________
```

Lab today:

* Achievement points:

- ✓ MP1 code review. Be ready to present and discuss your MP1-DebugMe code and work in this challenge.
- ✓ Be prepared to show that you're up to date with Turings Craft

* Review your MP1 grading result in subversion. Revise and re-commit if necessary.

* Start on MP2 "Hollywood".