MEMORIAL UNIVERSITY OF NEWFOUNDLAND

Department of Mathematics and Statistics

AMAT-2120 Fall 2004

Assignment 2. Due at 10:00am Wednesday October 13

1. Write a C program that displays the given number in the given numeric base. The program will interactively request the positive integer number x to be displayed and the positive integer base $b > 1$.

For example, for $x = 813$ and $b = 5$, we have

$$813 = 1 \times 5^4 + 1 \times 5^3 + 2 \times 5^2 + 2 \times 5^1 + 3 \times 5^0.$$

Therefore, the output of your program should be the sequence of digits

$$1, 1, 2, 2, 3.$$

Make necessary checks to ensure that the given numbers are admissible ($x > 0$ and $b > 1$). Make your program report an error if they are not. Think how your program will treat the case $b > 10$, where the "digits" can be greater than 9.

Make sure that your program is properly documented.

Test your program. The program and script must be submitted on paper and electronically.

2. The code below computes the iterates of the so called Collatz map

$$k \to \begin{cases} k/2, & \text{if } k \text{ is even,} \\ 3k+1, & \text{if } k \text{ is odd.} \end{cases}$$

Assume that all variables are declared as `int`. Assuming the value $k = 5$ is entered, trace execution by hand and determine the output from this fragment of code. (The line numbers begin from 10 indicating that the program header is omitted.)

```
10      printf("Enter the value of k=");
11      scanf("%d", &k);
12      i=0;   /* counter of iterations*/

13      while (k!=1)
14      {
15         printf("i=%d, k=%d\n",i, k);  /* printing current values of i and k */

16         /* Computing new value of k (Collatz map) */
17         if (k%2==0)
18            k=k/2;
19         else
20            k=3*k+1;

21         i++; /* Incrementing counter */
22      }

23      printf("Done: i=%d, k=%d\n",i, k); /* printing final values of i and k */
```

3. Exercise 2.2.6 (a,b,g,i,j), p.47: Evaluate the following expressions and list the data type of the result. In evaluating the expressions be aware of the data types of all intermediate calculations.

(a) $10.0 + 15/2 + 4.3$
(b) $10.0 + 15\%2 + 4.3$
(g) $20.0 - 2/6 + 3$
(i) $10 + 17\%3 + 4.$ (The dot belongs to the code.)
(j) $10 + 17/3. + 4$