Professor: Dr. Fadi Malek **CSI 2172** **Date: 18 May 2004**

Assignment 1

Due Date: 31 May 2004

1. Your first program in C++ is to implement the following compaction algorithm according to the following specification:

a. The program will read user ids as strings of 8 characters.
b. The allowable characters are ['a' - 'z', 'A' - 'Z' and '0' - '9'].
c. Lower case letters are converted to upper case.
d. Characters 'A' - 'Z' are translated to the numbers 1 - 26.
('A' is translated to 1, 'B' to 2, ... 'Z' to 26)
e. Characters '0' - '9' are translated to the numbers 27 - 36.
('0' is translated to 27, '1' to 28, etc.)

Each number is stored in 1 byte (8 bits).
After the translation is done, we perform the following mapping:
From the first 3 numbers, we create a compacted integer value of size 16 bits by the following expression:

Compacted Value = number 0 + (number 1)*40 + (number 2)*40*40

From the second 3 numbers, we create another compacted value of size 16 bits by the following expression:

Compacted Value = number 3 + (number 4)*40 + (number 5)*40*40

From the last 2 numbers, we create a third compacted value of size 16 bits by the following expression:

Compacted Value = number 6 + (number 7)*40

Therefore, we have translated a user id from 64 bits (8 characters * 8 bits) to a string of 48 bits (3 compacted values * 16 bits)

Your program must then output to the screen the compacted user id (string of 48 bits) in hexadecimal format.

2. Implement the decompaction algorithm in C++ by reading the compacted string of bits in Hexadecimal format (see Exercise 1) and converting it back to the original user id in ASCII format.

3. Write a program in C++ which finds the greatest common divisor of 2 positive integers. The 2 integer numbers are read in by the program.

4. Implement 2 classes called Circle and Point in a 2-dimentional space.

- Given a point and a circle, check to see if a point is inside the circle, on the circle or outside the circle

- Given 2 circles, check to see if one circle is inside the other or tangent to it.