King Fahd University of Petroleum and Minerals
Information and Computer Science Department

ICS 103: Programming in C, Term 171

Homework 3 for Sections 11 and 12 only

Write a program that displays a menu of choices, like this:

```
a) Draw a rectangle
b) Draw a triangle
c) Greatest Common Divisor
d) Reverse Digits
e) Exit program
Enter your choice:
```

If the user inputs **a** then ask the user to input the **height** and **width** of a rectangle as follows:

```
Enter rectangle height and width [1 to 30]: 4 7
```

The program should display a rectangle filled with * as shown below:

```
*******
*******
*******
*******
```

If the user inputs **b** then ask the user to input the **height** of a triangle as follows:

```
Enter triangle height [1 to 30]: 3
```

The program should display an isosceles triangle filled with * as shown below:

```
  *
 ***
*****
```

If the user inputs **c** then ask the user to input two integer numbers:

```
Enter two integer numbers: 18 12
```

The program should compute and print the greatest common divisor as follows:

```
The greatest common divisor of 18 and 12 is 6
```

If the user inputs **d** then ask the user to input an integer number:

```
Enter an integer number: 7253
```

The program should compute and print the number with reverse digits as follows:

```
The reverse of the integer number 7253 is 3527
```

The program should display repeatedly the same menu and ask the user to re-enter a new choice. If the user enters a character other than **a** to **e** then print an error message and redisplay the menu again. If the user enters **e** then terminate the execution of the program.

In addition, all user input should be checked. This includes the height and width of a rectangle, and the height of a triangle. Display an error message if the user input is outside the range **[1 to 30]**. You may also detect an input that is not an integer (such as a letter), and display an error message accordingly.

The greatest common division **gcd** of two integers **x** and **y** is defined as follows:

```
if y == 0 then gcd(x, 0) = x;
else gcd(x, y) = gcd(y, x%y);
```

The **gcd** can be calculated repeatedly in a loop until **x%y** becomes **0**. For example,

gcd(18, 12) ➔ gcd(12, 18%12) ➔ gcd(12, 6) ➔ gcd(6, 12%6) ➔ gcd(6, 0) ➔ 6

To reverse the digits of an integer, you should extract the digits and then reverse them in a loop. For example, **7253%10** extracts the digit **3**. However, **7253/10** (equal to **725**) removes the digit **3**.

Your program should define five functions, in addition to the **main** function. These are:

```
char menu();                          // display menu and return choice
void draw_rectangle(int h, int w);    // draw rectangle
void draw_triangle(int h);            // draw triangle
int gcd(int x, int y);                // calculate and return gcd of x and y
int reverse_digits(int x);            // calculate and return the reverse of x
```

Submission Guidelines

Submit your source file on Blackboard. The name of the source file should be:

HW3_XXXXXXXXX_YY.c, where XXXXXXXXX is your KFUPM ID number and YY is your section number

DO NOT INCLUDE .EXE FILE IN YOUR SUBMISSION

Submission should be on Blackboard: ICS 103 section 11 and 12 course page, under the **HW3 Assignment** submission link.

Important Notes

- **EACH STUDENT IS REQUIRED TO DO THE HOMEWORK ALONE**. COPYING FROM ANY SOURCE IS REGARDED AS CHEATING.
- **Cheating is taken seriously**. Any cheating attempt will result in 0 in this homework and a warning is sent to the student. Repeated cheating cases will result in zeros in all homeworks.
- **Submissions via email is not accepted and will be simply ignored**.
- **You must use proper indentation, meaningful identifiers, and proper documentation (comments) in your program to get a full mark.**