Autumn 2022, ISTM, FCU-Purdue 2+2 ECE Program
ISTM116 Programming Applications for Engineers, Quiz 1

Use file name "quiz1_dxxxxxxx_1.c" for Question 1 and file name "quiz1_dxxxxxxx_2.c" for Question 2 for your source, where "dxxxxxxx" is your student ID. When you finish a question, upload the source code file to the instructor's computer.

1. (50 points) You may start with program skeleton **quiz1_skeleton_1.c** and change the file name to **quiz1_dxxxxxxx_1.c**. Write a C program that reads in a positive integer side from 3 to 29, and draws an isosceles triangle with isosceles side of length n and bottom side of length 2*n-1 such that the triangle orientation is shown as in the execution example, i.e., the *bottom of the triangle is on the right-hand-side of the triangle*. Output 10 blanks on the left side of the figure, use '$' to mark the sides of the isosceles triangle, and '@' to mark the interior points of the isosceles triangle. Example of program execution for n=12:

```
Enter an integer between 3 and 29: 12
                    $
                   $$
                  $@$
                 $@@$
                $@@@$
               $@@@@$
              $@@@@@$
             $@@@@@@$
            $@@@@@@@$
           $@@@@@@@@$
          $@@@@@@@@@$
         $@@@@@@@@@@$
          $@@@@@@@@@$
           $@@@@@@@@$
            $@@@@@@@$
             $@@@@@@$
              $@@@@@$
               $@@@@$
                $@@@$
                 $@@$
                  $@$
                   $$
                    $
```

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2. (50 points) You may start with program skeleton **quiz1_skeleton_2.c** and change the file name to **quiz1_dxxxxxxx_2.c**. A **fraction number** a is represented as p/q, if a≥0, or c, if a<0, where p and q are two *relatively prime non-negative integers*, and q ≠ 0. Fraction number a is called **proper fraction** if p<q; a is called an **improper fraction**, if p≥q. For an improper fraction a, i.e., p/q or -p/q, if q=1, a is **integer** p or -p; otherwise, a is a **mixed number**, i.e., it can be written as an integer followed by a proper fraction, i r/q or -i r/q, where i□q+r=p and r<q. Write a C program to do the following steps:

   a. Read two integers p and q as the numerator and denominator of fraction number a, where q≠0,

   b. Simplify fraction number a to make p and q to be two relatively prime non-negative integers,

   c. Determine whether a is a proper fraction or an improper fraction; if a is an improper fraction, determine, further, whether it is an integer or a mixed number. Output a as a proper fraction, an integer, or a mixed number.

   Repeat the steps until q is 0. (Hint: use greater common divisor function, **int** GCD(**int**, **int**) given in the skeleton program.)

   Example of program execution:

```
Input two integers p and q (terminates if q is 0): 12 18
Proper fraction: 2/3

Input two integers p and q (terminates if q is 0): 12 -18
Proper fraction: -2/3

Input two integers p and q (terminates if q is 0): 18 -12
Mixed number: -1 1/2

Input two integers p and q (terminates if q is 0): -18 -12
Mixed number: 1 1/2

Input two integers p and q (terminates if q is 0): 20 -2
Integer: -10

Input two integers p and q (terminates if q is 0): -15 3
Integer: -5

Input two integers p and q (terminates if q is 0): -15 -3
Integer: 5

Input two integers p and q (terminates if q is 0): 5 0
```