

Due: - Written Exercises due Wednesday, April 20th, 4 pm in homework box in 2131 Kemper;
 - Programs due electronically Wednesday, April 20th, at 11:50 pm.

Written Exercises (20 pts): The written exercises should be typed and each page should have at the top your name and ID#, section #, and hw#. Handwritten answers will not be graded.

J&K, 5.1.2, 5.1.4, 5.1.6, 5.1.8, 5.1.16, 5.1.18, 5.2.2, 5.3.4, 5.5.2, 5.8.4.

Programs (60 pts): Handin a makefile called **Makefile**, and have it produce the executables specified (use **all** at the top). Together with the makefile, handin a source code file for each program, with the name specified. The third line of each source code file must contain your name, ID, and section #. For this homework use the *handin* utility as such:

```
handin cs30 hw3 Makefile ex5_5.c ex5_2.c ex5_10.c
```

The date and time your files are created in the **cs30** directory will be counted as your submit times. If those times are later than 11:50 pm on the due date your submissions will be considered late.

(1) J&K, p. 224, Ex. 5.5.

The expression $C(n,r)$ denotes the number of r -element subsets of an n -element set. E.g., $C(4,2) = 6$ because there are six 2-element subsets of a 4-element set. Write a program that computes $C(n,r)$ using the following component functions:

- (a) **main**: prompts the user for two numbers, storing them in variables **n** and **r**, respectively.
- (b) **check**: compares **n** and **r**. If $r > n$, check invokes the function **err_msg**, which prints **Error!**
- (c) **comb**: computes $C(n,r)$.
- (d) **fact**: computes factorial.

Name the source **ex5_5.c** and the executable file **ex5_5**. An example executable file **ex5_5** is at **/home/cs30/public/hw3/** on the csif machines.

(2) J&K, p. 224, Ex. 5.2.

Write a program that prompts the user for two integers and one of the letter codes **a** (for add), **s** (for subtract), **m** (for multiply), or **d** (for divide). The function **main** issues the prompt and stores the user's input in the variables **num1**, **num2**, and **operator**. Then **main** checks the letter code, and if it is **a**, it invokes function **add** with arguments **num1** and **num2**, and similarly for **s**, **m**, and **d**. Each of the functions **add**, **subtract**, **multiply**, and **divide** invokes the function **print_result** which prints the result of the arithmetic operation.

Name the source file **ex5_2.c** and the executable **ex5_2**. An example executable file **ex5_2** is at **/home/cs30/public/hw3/** on the csif machines.

(3) J&K, p. 225, Ex. 5.10.

Write a program that uses a recursive function to compute the greatest common divisor, gcd, of two integers greater than zero. gcd can be computed as follows, where $mod(M, N)$ is the remainder when M is divided by N :

$$\text{gcd}(M, N) = \begin{cases} N, & \text{if } \text{mod}(M, N) = 0 \\ \text{gcd}(N, R), & \text{if } \text{mod}(M, N) = R, R \neq 0 \end{cases}$$

Name the source file **ex5_10.c** and the executable **ex5_10**. An example executable file **ex5_10** is at **/home/cs30/public/hw3/** on the csif machines.