CMSC 11, Review exercises for algorithm design and basic C programming

The solutions to these graduated exercises will involve the use of input and output statements, assignment, conditions, branching and loops (including multiple branches, nested loops, etc). Most involve numbers (int or floats) and working on all of them can help you master the basics of algorithm design. Other advanced programming concepts that have not yet been discussed in the lectures (e.g., functions, arrays) are <u>not</u> necessary for solving these problems, but you may do some advanced reading and use these features if you wish. If you can honestly solve most of these problems on your own, then you are doing things right and you will be well on your way to learn more advanced stuff. Keep practicing, and sharpen your problem-solving skills!

1. Input 2 numbers, then compute and output their average.
2. Input 2 numbers and find which value is smaller.
3. Input 2 numbers and print the same two numbers in ascending order.

4. Input an integer n, followed by a list of n numbers, and compute and print their average.
5. Input an integer n, and print all divisors of n and their sum.
6. Input an integer n, followed by a list of n numbers, and count the number of zeros in the list.

7. Input a positive integer n, and compute and print n factorial ($n!$) the product of all the integers from 1 to n.
8. Input 2 positive integers A and B, and find the greatest common factor of A and B, i.e., the biggest integer that divides both A and B exactly.
9. Input 2 positive integers A and B, and find the least common multiple of A and B, i.e., the smallest integer that is both a multiple of A and B.

10. Input 3 positive integers A, B and C, and find the least common multiple of A, B and C.
11. Input a positive integer n, and determine whether n is prime (no divisors except 1 and itself) or composite (has divisors other than 1 and itself).
12. Input an integer n, and print the first n prime numbers.

13. Input an integer n, and print the number of primes between n and $2n$.
14. Twin primes are prime numbers that differ by two, (e.g., 3 and 5 is the smallest pair of twin primes). Find and print the first 30 pairs of twin primes.
15. Input a positive integer n, and neatly print an $n \times n$ multiplication table.

16. Input a positive integer n, and draw an isosceles triangle-shaped figure of chars, of height n.
17. Input positive integers L and W, and draw a box-shaped figure L chars long and W chars thick.
18. Input a positive integer n, and draw a Christmas tree-shaped figure of chars, consisting of n stacked trapezoids, neatly centered on the screen.

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          Merry Christmas!
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