1. Write pseudocode to print all multiples of 5 between 1 and 100 (including both 1 and 100), unless the number is 55. If the number is 55, print “fav #”.

2. Use this algorithm for converging-pointers on the following data. Show your work for every iteration of the algorithm where the else statement executes (i.e., when the data changes). Lastly, state the purpose of this algorithm.

   | 0  | 15 | 24 | 0  | 0  | 42 | 9  | 0  | 33 | 10 |
---|----|----|----|----|----|----|----|----|----|----|

   1. Get values for n and the n data items
   2. Set the value of legit to n
   3. Set the value of left to 1
   4. Set the value of right to n
   5. While left is less than right do Steps 6 through 10
   6. If the item at position left is not 0 then increase left by 1
   7. Else (the item at position left is 0) do Steps 8 through 10
   8. Reduce legit by 1
   9. Copy the item at position right into position left
   10. Reduce right by 1
   11. If the item at position left is 0, then reduce legit by 1
   12. Stop

3. Suppose France has 65,086,098 citizens and that there is a database with everyone’s name and cell number, sorted by full name (first name, middle name, last name). In the worst case, how many comparisons are required to find:
   a. John Paul Bernard III?
   b. The cell phone number: 06 55 72 31 24?

4. Suppose an O(n²) algorithm with constant 5 (i.e., 5n²) and an O(n) algorithm with constant 100 (i.e., 100n) exist for the same task. Which algorithm is preferred? Briefly justify your answer.
5. Sort the following numbers using the selection sort. Show all steps, as done in class.

   67   34   684   23   78   9

6. Suppose you have been hired to develop a new system that will hold sensitive customer information. You present your boss with the amount of time it will take to create a fully secure system that protects its customers. Your boss requests that you develop the system more quickly, even if the system ends up being less secure.
   a. Define deontology and utilitarianism.
   b. From each point of view, should you develop the system your boss requests? Justify your response.

7. Data science is at the intersection of what fields?

8. A dataset should be divided into three subsets. What are the three subsets, and what is the purpose of each?