AP Computer Science - Coding Set 3

1. Warm-up. Write a program that will ask for a user's name. Print out the letters of the name one letter at a time, skipping all a's (both lower case and capital). Print the message "Name with no a's." Use a `continue` statement in your program.

2. Design and implement a Hi-Lo guessing game where the program picks a random number between 1-100 inclusive, and then keeps asking the user to guess the number. On each guess, report to the user that he or she is correct or that the guess is too high or too low. Keep accepting guesses until the user guesses correctly or quits. Use a *sentinel value* to determine whether the user wants to quit.   (A sentinel value is an arbitrary value outside of the range of expected input that is "watched-for" by the program, and used only to exit a loop early.) Count the number of guesses and report that value when the user wins or quits. At the end of each game, ask whether the user wants to play again. Keep playing games until the user chooses to stop.

3. A perfect number is a positive integer equal to the sum of all its divisors (including 1 but excluding the number itself). For example:

 $28 = 1 + 2 + 4 + 7 + 14$.   Therefore, 28 is a perfect number.

Write a program to compute the first four perfect numbers.
Store the numbers in an array. Then output the array, appropriately labeled, on the screen.

(Euclid, 300 B.C.)

Hint:
- Euclid showed that if $2^n{-}1$ is a prime, then $2^{n-1}(2^n{-}1)$ is a perfect number. For example:

    $2^3{-}1 = 7$ is a prime =>
    $2^2(2^3{-}1) = 28$ is a perfect number

4. Write a program that will read in a Roman Numeral (accepted from the user as a String, in the ramge of zero to one hundred) and change it into the standard Arabic number, and output it. A chart of the Roman Numerals can be found at http://literacy.kent.edu/Minigrants/Cinci/romanchart.htm

5. This one is a very common interview question for people applying for jobs writing code. It tests multiple skills and data type conversion! (Typically, there's a "coding interview" for such jobs!)
Write a program that stores the numbers from 1 to 100 inclusive in an array of Strings. Then have it replace the multiples of 3 with the word "Buzz", the multiples of 5 with the word "Fizz", and the multiples of both 3 and 5 with the word "BuzzFizz" in the array. Finally, output the array.

6. Write a program to guide the Finch robot through an obstacle field. The Finch should proceed with a green beak until it detects an obstacle on its left or right side, and then should buzz and turn to avoid it. For purposes of indication, when the obstacle is detected on the right, have the Finch beak turn red, and do the same for the left side using blue. The turning motion will be accomplished by backing up a little bit, turning a little to the opposite side, and then proceeding. The program should end when the operator picks up the Finch and points its beak down.