Programming test questions

1. Write a complete program that prints out all integers from one to 100 which are divisible by seven.

2. Write a complete program that prompts the user to type a line of input, and then prints the same line out with characters reversed.

3. Write a complete program that prompts the user to type a line of input, and then prints the same line out with alphabetic characters capitalised.

4. Write a complete program that prompts the user to print a single integer number followed by a space followed by a single operator followed by a space followed by another single integer number, and then prints out the result of evaluating the expression for the operators + (add) - (subtract) * (multiply) / (integer divide)

   So for instance, if the user type 123 + 456 then the program should print 579. No error checking is required.

5. You are given a file words.txt that contains a sequence of words, one per line.

   Write a complete program that reads the file and prints to System.out only those words that start with the letter A or the letter b (take care to respect the case sensitivity!)

6. You are given a file words.txt that contains a sequence of words, one per line.

   Write a complete program that reads the file and prints to System.out only those words that are longer than 10 characters.

7. You are given a file words.txt that contains a sequence of words, one per line.

   Write a complete program that reads the file into an array, and then prints to System.out the names in the reverse order from their order in the file.

8. Write a class LLNode which implements a linked list node whose payload is a single string. In the style of the example given in the notes, you should provide a constructor which takes an string and a reference to a list.

   Write a complete program that reads the lines of a file into a linked list using head insertion, and then prints them out in list order (which will be the reverse of their order in the file).

9. You are given a text file containing a series of integers, one per line, in ascending order.

   Write a complete program to (i) read the file and count the number of lines into a variable numberOfLines; (ii) declare and allocate an array of integers containing numberOfLines elements; (iii) read the file again,

loading the array with the numbers in the file; (iv) compute and print out the sum, the mean, the median, the lower quartile, the upper quartile and any number that appears more than once.

10. You are given a file lines.txt that contains lines of text.

    Write a complete program that reads the file and prints the lines of text to System.out in reverse order, with each line preceded by an integer showing the number of characters in the original input line with a colon (:) separating the integer from the original input.

    For instance, if given the file

    ```
    Adrian
    was here
    ```

    your program must print

    ```
    8:was here
    6:Adrian
    ```

11. Write out the first eight elements of the Fibonacci sequence.

    Write a recursive method `int fib(int n)` which takes an `int n` and returns the Fibonacci sequence element `n`.

    How many times is fib() called for fin(4)?

12. A function `f` takes an integer argument `n` and returns an integer. If $n < 2$ then the value of f is n, otherwise the value is the sum of the values of f with arguments n-1, n-2 and n-3.

    The sequence of values f(-1), f(0), f(1), f(2), f(3), f(4), f(5), f(6), f(7) is therefore -1, 0, 1, 0, 1, 2, 3, 6, 11

    Write down values for f(8) and f(9).

    Write a recursive Java function int f(n) which implements the above definition.

    When calculating f(4), how many times is f called?

13. Write a method void sieve(int k) which outputs all prime integers in the range 2 to k-1 using the Sieve of Eratosthenes algorithm

14. Write a complete program that prompts the user for two numbers, and then computes and prints out the Greatest Common Divisor using Euclid's algorithm.

15. Using the bubble sort algorithm (for an example see page 97 of Java Concisely), write a complete program that prompts the user to type in five integers, and then print them out in descending order.

16. Using the bubble sort algorithm (for an example see page 97 of Java Concisely), write a complete program that prompts the user to type in five words, one per line, and then print them out in alphabetical order.

17. Write a class Country that has: (a) three private instance variables: a String called name; a String called capital; an int called population;

    (b) a constructor that takes three parameters: two String parameters and an int, and then sets the values of the instance variables name, capital, and population using those parameters;

    (c) public getters for the three data fields;

    (d) a public toString() method which returns a String containing a textual representation of the data fields.

18. Given a class `Country` defined as above, write a class Countries which contains: (a) two private instance variables: an array of Country elements called countries and an integer variable nextFreeCountry;

    (b) a constructor which takes one integer parameter size and allocates the countries array with size elements;

    (c) a method addCountry(String name, String capital, int population) which fills in the element indexed by nextFreeCountry and increments the nextFreeCountry variable. You do not need to do any error checking or exception handling.

19. Write a class CD that has: (a) three private instance variables: a String called title; a String called artist; a double called price;

    (b) a constructor that takes three parameters: two String parameters and an int, and then sets the values of the instance variables using those parameters;

    (c) public getters for the three data fields;

    (d) public setters for the three data fields;

    (e) a public toString() method which returns a String containing a textual representation of the data felds.

20. Given a class `CD` defined as above, write a class Playlist which contains:

    (a) two private instance variables: an array of CD elements called items and an integer variable nextFreeItem;

    (b) a constructor which takes one integer parameter size and allocates the items array with size elements;

    (c) a method addCD(String title, String artist, int price) which fills in the element indexed by nextFreeItem and increments the nextFreeItem variable. You do not need to do any error checking or exception handling.

    (d) a public toString() method which returns a String containing a textual representation of the data fields for all elements of the items array that have been loaded with data.

    (e) a public totalPrice() method which returns the total price of the play list.