CSCI 1100 – 2017
Computer Science I

Assignment 3
Due: June 14, 2017 at 11:59pm
Submit on Brightspace

Remember that assignments are intended to be your <u>own</u> work!
It is okay to ask for help, to talk with TAs about a problem, or talk with your classmates about a problem.
It is <u>not</u> okay to submit a solution that is substantially the same as somebody else's solution.

Remember the golden rule of programming plagiarism: talk it out, but take no notes. Walk away for 30 minutes. Then, whatever you can remember after that break is yours; use it.

If you are in doubt, ask before submitting!

Question 1.
Include all of the following work in a single class named `Question1`. Use appropriate comments for all custom methods. It is your responsibility to ensure your code compiles before you submit!

This question expands on the calculator program you wrote for Question 2 in Assignment 2. You may either re-write the entire problem from A2 Q2, or else you may copy your working code (and cite this with a comment!) from the previous assignment and make modifications or changes from there.

You will write a calculator program that can handle basic arithmetic and basic trigonometric calculations on input values given by the user. There will be two menus of options given to the user: the first is a choice between performing arithmetic and trigonometry, and the second is choosing the specific arithmetic/trigonometric function they want to perform.

a) Write a method called `arrayContains` that takes a character array and a character value as parameters, and returns a boolean. Your method should determine whether the parameter character value exists within the parameter array, returning true if the character value exists, and false otherwise.

b) Write a method called `doPrompt` that takes a character array and a String as parameters, and returns a character. The parameter character array represents a set of valid character values, and the parameter String represents a prompt. Your method should print to output the prompt for the user, then use the Scanner class to take input from the user. Consider only the first character of the user's input, and convert it to lower case. If the entered character is <u>not</u> within the array of valid character values, then continue prompting; otherwise, return the (valid, converted to lowercase) character entered by the user.

c) Write a method called `arithCalculator` that takes a single character parameter and has no return value. The character parameter represents the arithmetic operation that will be performed. Your method will perform <u>floating point</u> (`double`) arithmetic on a set of values given by the user, either addition, subtraction, multiplication, or division depending on whether the parameter character is 'a', 's', 'm', or 'd', respectively.

All other character values will be ignored, and the resulting value will 0.0.. Your method should print out a prompt indicating that the user should enter two double values, then use the `Scanner` class to collect both values, and finally perform the appropriate arithmetic operation.

Your method should not return any value, but should print out the result of performing the indicated arithmetic operation on the two values given by the user, with an appropriate message.

d) Write a method called `trigCalculator` that takes a single character parameter and has no return value. The character parameter represents the trigonometric operation that will be performed. Your method will use the `Math` class to calculate one of the basic trig functions based on a single double value given by the user, either sin, cos, or tan depending on whether the parameter character is 's', 'c', or 't', respectively. All other character values will be ignored, and the resulting value will 0.0.. Your method should print out a prompt indicating that the user should enter one double value, then use the `Scanner` class to collect the value, and finally perform the appropriate trigonometric operation.

   Your method should not return any value, but should print out the result of performing the indicated trigonometric operation on the single value given by the user, with an appropriate message.

Write a `main` method that uses the methods from parts (b), (c), and (d) together to perform as many operations as the user desires, until they enter 'q' to quit. The user should first be prompted by a "main menu" to choose between (a)rithmetic, (t)rigonometry, or (q)uitting the program. If the user enters something that does not begin with one of these three valid characters, then they are continually prompted until they give valid input.

If they choose arithmetic, then the user should be prompted to choose between addition, subtraction, multiplication, or division. If the user's inputted choice is not valid, then continue prompting until it is. Two double values are then read from the user's input using the `Scanner` class, the indicated operation is performed, and the result printed to output. The user is then returned to the main menu selection.

If instead the user chooses trigonometry, then they should be prompted to choose between performing the sin, cos, or tan operation. If the user's inputted choice is not valid, then continue prompting until it is. One double value is then read from the user's input, the operation is performed, and the result printed to output. The user is then returned to the main menu selection.

For example, a single run of the program should result in something similar to the following set of output prompts and input values from the user:

```
Do you want to perform (a)rithmetic, (t)rigonometry, or (q)uit?
arith
Do want to (a)dd, (s)ubtract, (m)ultiply, or (d)ivide?
a
Enter two double values to add:
2
5.0
Your result is: 7.0
Do you want to perform (a)rithmetic, (t)rigonometry, or (q)uit?
a
Do want to (a)dd, (s)ubtract, (m)ultiply, or (d)ivide?
diiivide please
Enter two double values to divide:
13.0 2.0
Your result is: 6.5
Do you want to perform (a)rithmetic, (t)rigonometry, or (q)uit?
t
Do you want to compute (s)in, (c)os, or (t)an?
c
Enter one double value for your trig function:
0.785
Your result is: 0.7073882691671998
Do you want to perform (a)rithmetic, (t)rigonometry, or (q)uit?
t
Do you want to compute (s)in, (c)os, or (t)an?
t
Enter one double value for your trig function:
0
Your result is: 0.0
Do you want to perform (a)rithmetic, (t)rigonometry, or (q)uit?
t
Do you want to compute (s)in, (c)os, or (t)an?
www
Do you want to compute (s)in, (c)os, or (t)an?
vos
Do you want to compute (s)in, (c)os, or (t)an?
cos
Enter one double value for your trig function:
0
Your result is: 1.0
Do you want to perform (a)rithmetic, (t)rigonometry, or (q)uit?
q
```

Note that your own prompts do *not* have to be exactly the same, but *should* provide similar levels of information.

Bonus Question.
Include all of the following work in a single class named `BonusQuestion`. Use appropriate comments for all custom methods. It is your responsibility to ensure your code compiles before you submit!

a) Write a method called `grabFirstToken` that takes a single String parameter and returns a String value. This method should return a String that is equivalent to a substring of the String parameter up to the first whitespace character (either space, tab, or newline). Your method should look for the first whitespace character in the parameter String, and return the substring up to (but not including) this first whitespace character. For example, if called with a parameter of

```
"Three blind mice"
```

your method should return:

```
"Three"
```

b) Write a method called `shuffleNames` that takes an array of Strings as a parameter and returns a String value. This method should treat the Strings given by the parameter array as names, and re-combine them so that they will print out with each name in a different *column* instead of on a different line. The names should appear in the same order, left-to-right, as the order they are given in the parameter array. Your method should return a String that will contain each name in a different vertical column when printed, with spaces included to accommodate names of different lengths

For example, if the names given in the parameter array were (in order) Athena, Apollo, Hera, Hermes, and Winston, then your method would return a String value that looked like this when printed:

```
AAHHZW
tpeeei
horrun
elamss
nl e t
ao s o
     n
```

c) Write a `main` method that prompts the user for six names and collects these in an array of Strings. If the user gives multiple names, or any String containing multiple words separated by whitespace, then you should only store the first word. That is, you should consider the user's input, and only store their first word (up to the first occurrence of whitespace) as the inputted name.

For example, if the user were to give "Harold Winston" after being prompted for a name, then you should only store "Harold".

Use the method from part (b) to print out the result of shuffling these names into vertical columns.