CS1073 - Assignment #4 - Winter 2024

Submission Deadline: Thursday, February 29th before 12:00 NOON (Atlantic) in the Assignment 4 submission folder in Desire2Learn. (Read the submission instructions at the end of this document carefully).

The purpose of this assignment is to review/gain practice with:

- decision statements,
- the `while` loop,
- the `Math` class,
- and arithmetic in Java.

This assignment is to be done individually. What you hand in must be your own work. Incidents of plagiarism <u>will</u> be reported.

If you have questions about the assignment, you should first go to a scheduled help session. (Locations and times for all help sessions can be found on D2L). If you have attended a help session and the issue is unresolved, you may contact your course instructor. You are NOT to discuss this assignment with anyone else (including your classmates).

As always, begin by creating a new folder to hold your work for this assignment.

Water Cooler Cups:

Suppose you are writing software for a company that designs water cooler cups. The cups they produce are either cylindrical or conical. They're interested in knowing how much material is required to make each cup and how much water the cup can hold.

a) Begin by writing two classes: CylinderCup (to represent a cylindrical cup), and ConeCup (to represent a conical cup).

For each CylinderCup, we must record the radius and height in centimetres. Include 2 instance variables and an appropriate constructor method. You should also have an accessor method for each instance variable (2 in total), as well as 2 additional methods: one to calculate and return the amount of

material required for the cup (surface area), and another to calculate and return the amount of water the cup can hold (volume).

For each ConeCup, we must record the radius and height in centimetres (passed into the constructor), and we must also calculate the slant height in centimetres. Include 3 instance variables and an appropriate constructor method. You should also have an accessor method for the instance variables (3 in total), as well as 2 additional methods: one to calculate and return the amount of material required for the cup (surface area), and another to calculate and return the amount of water the cup can hold (volume).

NOTES:
- Use the value of π that is defined in the Math class.
- Remember that the cup is not an enclosed shape, it must have an open end for filling and drinking from.

Write Javadoc comments for your CylinderCup and ConeCup classes. Include a comment for each class, for each instance variable and each method. Use @author, @param & @return tags where appropriate. Run the Javadoc utility on your files and view the resulting CylinderCup.html and ConeCup.html files in a browser to make sure that your Javadoc comments were inserted/formatted correctly. (Be sure to include author and private information when generating the documentation with Javadoc.)

b) Next, write a driver program that reads in the dimensions in centimetres, and displays the surface area and volume. After reading in the information for all the cups, the program should indicate whether the cup with the largest surface area is a cylinder or a cone, followed by its surface area. NOTE: each surface area and volume should be displayed with exactly 3 digits to the right of the decimal.

Begin by presenting the user with a list of options, and keep looping until the user indicates that they would like to quit. If the user enters an invalid option, display a message to let them know the option is not available and allow them to enter an option again. On the next page is sample output to show you how your program should work (note: user input is shown here in bold and italics):

```
Select one of the following options:
1 - Enter the information for a conical cup
2 - Enter the information for a cylindrical cup
3 - Quit
Enter your choice: 1
Length of radius (cm): 3
Length of height (cm): 5
Surface area: 54.955cm^2
Volume: 47.124cm^3

Select one of the following options:
1 - Enter the information for a conical cup
2 - Enter the information for a cylindrical cup
3 - Quit
Enter your choice: 2
Length of radius (cm): 6
Length of height (cm): 3
Surface area: 226.195cm^2
Volume: 339.292cm^3

Select one of the following options:
1 - Enter the information for a conical cup
2 - Enter the information for a cylindrical cup
3 - Quit
Enter your choice: 5
Not an available option.

Select one of the following options:
1 - Enter the information for a conical cup
2 - Enter the information for a cylindrical cup
3 - Quit
Enter your choice: 1
Length of radius (cm): 8
Length of height (cm): 7.5
Surface area: 275.602cm^2
Volume: 502.655cm^3

Select one of the following options:
1 - Enter the information for a conical cup
2 - Enter the information for a cylindrical cup
3 - Quit
Enter your choice: 2
Length of radius (cm): 2.5
Length of height (cm): 4
Surface area: 82.467cm^2
Volume: 78.540cm^3
```

```
Select one of the following options:
1 - Enter the information for a conical cup
2 - Enter the information for a cylindrical cup
3 - Quit
Enter your choice: 3

The cup with the largest surface area is a Cone
The surface area is: 275.602cm^2
```

After you have tested your application (with several different input values) and you're sure that it works properly, save sample output for submission. Include at least 3 cups and at least 1 of each of the different cup shapes (cone and cylinder) in the sample output you submit.

For this question, take a snapshot of the terminal window to include in your .zip file. That way, the marker will be able to see the input values as well. Since the output may be rather long, you may need multiple screen captures to get it all. For your assignment report, you may copy and paste the output from the terminal window into your report (again, this will ensure that the input values are also included.)

Remember that you should include a Javadoc comment at the top of your driver class. This comment should include a one-line description of the class and @author information

Submission instructions are on the next 2 pages…

i.   a written report. This should begin with a title page; your title page should include: the course (CS 1073), your section (FR01A, FR02A, FR03A, FR04A, FR05A or FR06A), the assignment number (Assignment #4 in this case), your full name, and your UNB student number. That should be followed by the sections below, with each part clearly identified with a section heading. Include:

   a.   the source code for all classes,

   b.   the sample output.

   (Aside: Your source code should contain all of the javadoc comments mentioned above. However, you do not need to include the .html files in your report.)

   This written report should be prepared using a word processor. (Options were outlined in Lab #1. If you choose to use the online version of MS Word, please see the note from Lab #1 about the issue when copying and pasting tabs into a document.)

   Copy & paste the items listed above into the report document. (These should appear in the document in the order that they are listed above). Add appropriate headings for each part. Fix up the formatting where necessary, adjusting line breaks & page breaks to ensure that your document is easy to read. Use a monospaced font for your code and question II output to maintain proper indentation. (Examples of monospaced fonts were mentioned in Lab #1.)

   Once the report is complete and you've checked it all over, save the final document file for your own records. Then **save a second copy in PDF format for submission**. (Note: Be sure to open the second file in a PDF viewer to verify that the PDF was generated correctly.) The **single .pdf file** containing your report will be submitted to the appropriate submission folder in Desire2Learn. (It is important that you submit a PDF file and NOT the original Word or LibreOffice document. This PDF will allow the marker to write comments directly on your work to give you better feedback.)

   Note: Please name this report as follows: **YourName_As4_Report.pdf**

i.   an archive file (.zip) that contains your Java source code and output for this assignment. Make sure that your archive includes **all the .java files** (in case the marker wishes to compile & run your code to test it), the output from testing your code. You should not include the report document or the .class files in your archive. This archive should be submitted as a single .zip file to the appropriate submission folder on Desire2Learn.

Side note: While we encourage you to run the javadoc tool on your .java files (to check to make sure that you wrote the Javadoc comments correctly), you do not need to add to your archive all of the files & folders that the javadoc utility creates.

This archive should be submitted as a **single .zip file** to the appropriate submission folder in Desire2Learn.

Note: Please name this archive file as follows: **YourName_As4_Archive.zip**

Reminder: Your submission in Desire2Learn should consist of TWO files (a .pdf and a .zip). Do NOT put your report inside your archive.

End of Assignment 4