

Department of Computer Science and Information Technology La Trobe University

CSE400F Semester 1, 2019 Assignment Part A

5%

This is an individual Assignment. You are not permitted to work as a Pair Programming partnership or any other group when writing this assignment.

Due Date

Due: Wednesday 3th April at 10.00 a.m.

Delays caused by computer downtime cannot be accepted as a valid reason for a late submission without penalty. Students must plan their work to allow for both scheduled and unscheduled downtime. **There are no days late or extensions on this assignment as execution test marking will begin in your normal lab (Week 4).** After the submit server has closed, NO assignments can be accepted. Non-attendance at the week 4 lab you have signed up for on the LMS page will also result in your assignment being awarded 0, except as detailed below.

Copying, Plagiarism

Plagiarism is the submission of somebody else's work in a manner that gives the impression that the work is your own. The Department of Computer Science and Information Technology treats academic misconduct seriously. When it is detected, penalties are strictly imposed. Refer to the subject guide for further information and strategies you can use to avoid a charge of academic misconduct.

Assessment Objectives

- To practise using the **String** class. (Lecture/Workshop 2)
- To practise using if, if-else statements (Lecture 5 and 6, Lecture/Workshop 3)
- To practise reading from a text file. (Lecture 4, Lab 3)

Submission Details and marking

Full instructions on how to submit electronic copies of your source code files from your latcs8 account are given on **page 2**. All assignments in OOF are marked, face to face, in the lab, in an execution test. This means that we mark running code. Your code must compile and display a result to the screen. Regrettably, we don't have the time or resources to look at code. The smallest amount of code that produces and displays a correct result will gain more marks than lots of code that doesn't compile, run or display something to the screen. If you cannot attend the lab you have signed up for on the LMS page, please email me (m.ahmadi2@latrobe.edu.au) to arrange another time.

Marking summary

This assignment is worth **5%** of your final mark in this subject.

Implementation (Execution of code) 80%, explanation of code 20%

Instant zeros or heavily reduced marks	Not submitting code Not attending marking session Not able to explain code that has not been taught yet Does not run on latcs8 Uses System.exit()
RadiansDegrees.java	30%
Angle.java	30%
AngleFile.java	40%

Using code not taught in OOF

Please also note carefully that whilst we encourage innovation and exploring java beyond what has been presented in the subject to date, **above all, we encourage understanding.**

All of the Tasks that follow can be solved using techniques that have been presented in lectures, lecture / workshops and labs so far.

These are the techniques and knowledge that we will later be examining in the Real Time Test (20 marks) and the exam (50 marks).

Code and techniques that are outside the material presented will not be examined, of course.

You are free to solve the Tasks below in any way, with one exception and one condition.

Any assignment that uses code that is outside what has been presented to this point **must be fully explained at the marking execution test.** Not being able to fully explain code outside what has been presented in the subject so far will **result in the assignment being awarded a mark of 0**, regardless of the correctness of the program.

Submitting an assignment with code outside what has been presented so far and not attending the marking execution test will result in an automatic mark of 0, regardless of the correctness of the submission.

An example would be the `split()` method in the `String` class. The reason being that this method returns an array and we haven't studied arrays yet. So using the `split()` method would require you to be prepared to explain to the marker how arrays worked in Java.

Electronic Submission of the Source Code

- Submit all the Java files that you have developed in the tasks above.
- The code has to run under Unix on the latcs8 machine.
- You submit your files from your latcs8 account. Make sure you are in the same directory as the files you are submitting. Submit each file separately using the **submit** command.

```
submit SOF RadiansDegrees.java
submit SOF Angle.java
submit SOF AngleFile.java
```

After submitting the files, you can run the following command that lists the files submitted from your account:

```
verify
```

You can submit the same filename as many times as you like before the assignment deadline; the previously submitted copy will be replaced by the latest one.

Please make sure that you have read page 1 about the submission close off date and time and the compulsory requirement to attend the execution test in Week 4

Failure to do both of these things will result in your assignment be awarded a mark of 0, regardless of the correctness of the program.

Execution test marks are provisional and subject to final plagiarism checks and checks on the compliance of your code to this assignment document.

As such, final assignment marks may be lower or withdrawn completely.

Background - Task

You are tasked with writing **three** Java programs related to trigonometry and angles. In the first task you will calculate convert between radians and degrees. In the second task you will calculate an unknown angle of a right triangle based on the users' input. And in the third task you will calculate an unknown angle of a right triangle based on information from a file.

Background – Radians to Degrees

Degrees are a measurement of an angle such that a full rotation of a circle is 360 degrees. Whereas a radian is defined as the angle of an arc with a length equal to the radius of a circle, a full rotation in radians is 2π . To convert from radians to degrees we use:

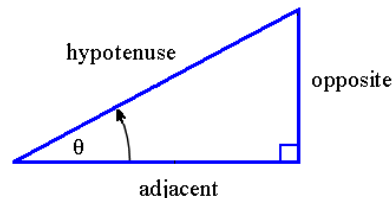
$$degrees = radians \cdot \frac{180^\circ}{\pi}$$

And to convert from degrees to radians we use:

$$radians = degrees \cdot \frac{\pi}{180^\circ}$$
$$\pi \approx 3.141593$$

Background – sine, cosine, and tangent of an angle

In right triangle, we have the opposite side which is opposite to the angle we are looking for, adjacent side which is next to the angle and hypotenuse which is the longest side. This is shown below



To calculate the angle we can use the following formulas:

$$\theta = \sin^{-1}\left(\frac{O}{H}\right)$$

$$\theta = \cos^{-1}\left(\frac{A}{H}\right)$$

$$\theta = \tan^{-1}\left(\frac{O}{A}\right)$$

Background - Limitations and Notes

Decimal places:

We have not yet learnt how to control the number of decimal places that are displayed so this will not be an issue.

Error checking:

In this program you can assume that the data in the input files are without errors and are in the specified format. Unless otherwise specified.

Converting integers from Strings

We have not yet learnt a high level method for converting integers from Strings, and hence the method used in lecture/workshop 2 is to be applied.

File name

The input must accept any file name, i.e. do not hard code the file name.

Background – Math class

You will need to use the Math class as you have done in the labs for some calculations.

You can find information on the suitable methods here:

<https://docs.oracle.com/javase/9/docs/api/java/lang/Math.html>

(Note: \sin^{-1} is equivalent to asin)

Background –Converting integers from Strings

We have not yet learnt a high level method for converting integers from Strings, and hence the method used in lecture/workshop 2 is to be applied.

If we have the String as follows:

```
String number = "354";
```

To convert one of the digits to an int, we can use the charAt method and subtract '0'

```
int tens = number.charAt(1) - '0';
```

You will need to think about how you would convert "354" as a String to 354 as an integer using the above techniques.

You must use this technique for full marks

Task 1 – RadiansDegrees.java

Follow the steps to complete the task using the steps and information above. (Note indentation indicates that the indented parts are contained within the previous step. Eg. All steps within an if statement are indented)

In this task we will **not** use the Math class

1. The program prints to the screen the student number, student name and the assignment number. This is enclosed by double asterisks. Ensure you follow the below format.

```
*** John Smith 11117777 ***
```

(Replace with your details)

2. 3 double variables are created:
 - a. pi initialized to 3.14159265
 - b. radians initialized to 0
 - c. degrees initialized to 0(These are not the only variables needed in the program, you will need to work out the rest)
3. The program then asks the user if they want to 1. Convert from radians to degrees, or 2. Degrees to radians.
4. If the user enters a 1 as an integer then
 - a. The program asks the user to enter the angle in radians as a double
 - b. The degree value is calculated and stored based on the users input
 - c. The value in degrees is printed to the screen
5. Else if the user enters a 2 as an integer then
 - a. The program asks the user to enter the angle in degrees as a double
 - b. The radian value is calculated and stored based on the users input
 - c. The value in radians is printed to the screen
6. Else
 - a. The program prints a message indicating the user has entered an invalid choice
7. The program ends appropriately

Solution length

The code should be around 40-70 lines of code (without comments). If your code is significantly larger, you may want to reconsider your approach.

Example output

```
*** John Smith 11117777 ***
Do you want to convert from 1. Radians to degrees or 2. Degrees to radians: 1
Enter the angle in radians: 1.571
90.01166971790565 degrees
```

```
*** John Smith 11117777 ***
Do you want to convert from 1. Radians to degrees or 2. Degrees to radians: 2
Enter the angle in degrees: 90
1.5707963249999999 radians
```

```
*** John Smith 11117777 ***
Do you want to convert from 1. Radians to degrees or 2. Degrees to radians: 3
Invalid choice
```

Task 2 – Angle.java

Follow the steps to complete the task using the steps and information above. (Note indentation indicates that the indented parts are contained within the previous step. Eg. All steps within an if statement are indented)

1. The program prints to the screen the student number and student name. This is enclosed by triple asterisks. Ensure you follow the below format.

```
*** John Smith 11117777 ***
```

(Replace with your details)

2. 3 integer variables are created and are initialized to 0:
 - a. opposite
 - b. adjacent
 - c. hypotenuse(These are not the only variables needed in the program, you will need to work out the rest)
3. The program then asks the user if they know the length of the opposite side
4. If the user enters “yes” (**ignore case**) then
 - a. The program then asks the user for the opposite side
 - b. Store in a variable that the opposite side is known
5. Repeat steps 3 to 4 for adjacent and hypotenuse
6. Using the sine, cosine, and tangent of an angle formulas in the background information find the angle based on the known values. You will need static methods from the Math class.
7. If there are not enough known values (1 or 0) then a message should be printed to the screen that indicates that the angle cannot be calculated
8. Else the angle is printed to the screen
9. The program ends appropriately

(Note the hypotenuse needs to always be greater in length than both the adjacent and the opposite. As an extension to test your knowledge you can add a condition to prevent an invalid hypotenuse being entered)

Solution length

The code should be around 40-70 lines of code (without comments). If your code is significantly larger, you may want to reconsider your approach.

Example output

```
*** John Smith 11117777 ***
Do you know the length of the opposite side: No
Do you know the length of the adjacent side: Yes
Enter the length of the adjacent side: 144
Do you know the length of the hypotenuse: Yes
Enter the length of the hypotenuse: 200
The angle is 0.7669940078618667 radians or 43.945519562308846 degrees
```

```
*** John Smith 11117777 ***
Do you know the length of the opposite side: Yes
Enter the length of the opposite side: 45
Do you know the length of the adjacent side: Yes
Enter the length of the adjacent side: 45
Do you know the length of the hypotenuse: No
The angle is 0.7853981633974483 radians or 45.0 degrees
```

```
*** John Smith 11117777 ***
Do you know the length of the opposite side: No
Do you know the length of the adjacent side: No
Do you know the length of the hypotenuse: No
The angle can not be calculated from the given information
```

Task 3 – AngleFile.java

Follow the steps to complete the task using the steps and information above. (Note indentation indicates that the indented parts are contained or related to the previous step. Eg. All steps within an if statement are indented)

1. The program prints to the screen the student number, student name and the assignment number. This is enclosed by double asterisks. Ensure you follow the below format.

```
*** John Smith 11117777 ***
```

(Replace with your details)

2. The program then asks the user to enter a file name
3. The program opens the file
4. The program then reads two lines from the file and stores each in two separate String objects.

Each line contains, the voltage, the current and the appliance name
The format of a line in the file is:

OoooAaaa

Where o is the opposite, always 3 characters

Where a is the adjacent, always 3 characters

Example:

O025A300

The length of the opposite side is 25, and the adjacent is 300

5. The program stores the opposite side from both lines into suitable variables. The technique of converting the string to an int for the opposite must be implemented as explained in the background information.
6. The program stores the adjacent side from both lines into suitable variables. The technique of converting the string to an int for the adjacent must be as implemented explained in the background information.
7. The angle is calculated for each using the sine, cosine, and tangent of an angle formulas in the background information.
8. Print the angles of both appliances, such that the angle that is larger is printed first
9. The program ends appropriately

Solution length

The code should be around 40-70 lines of code (without comments). If your code is significantly larger, you may want to reconsider your approach.

Example output

Given the file named "a.txt"

```
1 O034A100
2 O145A145
```

The following output is given

```
*** John Smith 11117777 ***
Enter file name: a.txt
Angle 2 is 45.0 degrees.
Angle 1 is 18.778033222445544 degrees.
```

Given the file named "b.txt"

```
1 O099A099
2 O099A098
```

The following output is given

```
*** John Smith 11117777 ***
Enter file name: b.txt
Angle 2 is 45.29083902235055 degrees.
Angle 1 is 45.0 degrees.
```

Example input files

Three example input files attached with the assignment can be used:

a.txt
b.txt
c.txt

Be aware these do not cover all cases; hence you are likely to want to make your own test input files.

Transferring files between Windows and Unix

Be very careful transferring files from Windows to Unix. If you do transfer a file from Windows to Unix open the file, in Unix, using vi.

For example, if you transferred a file named `b.txt` from Windows to Unix

open the file in Unix with the command

```
vi -b b.txt
```

you will (might) see a lot of `^M`'s at the end of each line.

These MUST be removed using the command shown below or else your input file will have too many newline characters and will not translate properly. That is, your code will not correctly read the input file for Tasks 1 and 2.

Your code will work on Windows but NOT on Unix.

Still in vi, in command mode (press the Esc key first) do the following

```
:%s/ctrl-v ctrl-m//g
```

`ctrl-v ctrl-m` means hold down the control key and with the control key down press v then press m.

Final notes

There will be consultation sessions for the assignment, the times will be posted on LMS, if you have problems come to consultation.

Do a little bit every night; before you know it you will be finished. The assignment is marked with running code, so you are better to have 1 or 2 Tasks completed that actually compile and run, rather than a whole lot of code that doesn't compile.

The execution test is done on `latcs8` so please make sure that your code runs on `latcs8` before you submit.