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CMPT 360 Spring 2023

Assignment 1

Calculating Side Lengths And Angles Of A Triangle On A Complex Plane

Assignment	Due Date	group(s)	Language	Language	Platform
1	Monday, Jan 23	1 & 2	Java	Delphi	Windows
2					
3					
4					
5					
6					
7					

This assignment fulfills the following goals:

Group 1 language: Java

Group 2 language: Delphi

Implemented on windows platform

Problem:

The problem is the need to create a program that calculates side lengths and angles of a triangle on a complex plane with the input of a complex number in the format $a + bi$, aswell as make sure that incorrect inputs are caught then the user is prompted to fix the inputs.

Documentation:

Run the program.

Enter your points.

In format ' $A + Bi$ ' exactly,

the program will ask for points again if not input correctly.

One point per line, the program will output your results

Imports used:

Java:

`java.util.Scanner;`

Delphi:

`System.SysUtils,`

`System.Types,`

`System.StrUtils,`

`System.Math,`

`Variants`

Error Handling:

The errors are handled with thrown exceptions in both Delphi and in Java, which is within a try-except loop for Delphi and a try-catch loop for java, which is within a while loop that will not break until proper input is detected. It detected incorrect information such as negatives, single numbers, null variables, and float numbers.

Pseudo Code for both Delphi and Java:

Intake user input.

Clean user input.

Calculate if the input is good by using try and catch on the cleaning of the input.

Calculate Side lengths.

Using the Pythagorean theorem

$$A^2 + B^2 = C^2$$

Pythagorean theorem provides the hypotenuse length while the x and y from the two points provide the two sides.

Then take the side lengths and use cosine law.

$\text{CosineC} = (A^2 + B^2 - C^2) / (-2(A)(B))$ This calculates to find cosine C, in which then you use the inverse of cosine(arccos) to calculate the radians of the angle, which is then multiplied by $(180/\pi)$ to convert to degrees.

Clean the output, so it does not cover the whole screen.

Then output the information for the user to see.

Variables used in Java program

SideAB : Double;

SideBC : Double;

SideAC : Double;

A : Double;

B: Double;

C: Double;

Point1: String;

Point2: String;

Point3: String;

Point1Plot : String array;

Point2Plot : String array;

Point3Plot : String array;

xCoord : int;

```
yCoord : int;  
pointAa : int;  
pointAb : int;  
pointBa : int;  
pointBb : int;  
C2 : int;  
Distance : Double;  
SquareA : Double;  
SquareB : Double;  
SquareC : Double;  
RightEQ : double;  
ResultA : Double;  
ResultB : Double;  
ResultC : Double;
```

Java Program Start

```
import java.util.Scanner;  
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//SN: 613362  
//CMPT 360 Spring 2023  
//Assignment 1  
//Title: Calculating Side Lengths And Angles Of A Triangle On A Complex Plane  
class Main {  
  
    public void input(){  
  
    }  
    public static void main(String[] args) {  
        //intaking user input  
        Scanner userInput = new Scanner(System.in);  
        System.out.println("place three points in form A + Bi, one per line");  
        Boolean entryValid = false;  
        //instantiating side variables  
        Double sideAB = 0.00;  
        Double sideAC = 0.00;  
        Double sideBC = 0.00;  
        while(entryValid == false){  
            String Point1 = userInput.nextLine();  
            String Point2 = userInput.nextLine();  
            String Point3 = userInput.nextLine();  
  
            //cleaning the strings before use  
            String[] Point1Plot = cleaner(Point1);  
            String[] Point2Plot = cleaner(Point2);
```

```

String[] Point3Plot = cleaner(Point3);

//try and catch loops to allow for safer input
try{sideAB = distancefinder(Point1Plot,Point2Plot);
    sideAC = distancefinder(Point1Plot,Point3Plot);
    sideBC = distancefinder(Point2Plot,Point3Plot);
    entryValid = true;
}
catch(NumberFormatException x){
    System.out.println("please re-enter points A, B and C in form A + Bi where A and B are
integers, one per line");

}
}

```

End of required code(Entire program not listed)

Variables in Delphi Code:

```

Point1 : string;
Point2 : string;
Point3 : string;
validInput : boolean;
point1List : TStringDynArray;
point2List : TStringDynArray;
point3List : TStringDynArray;
point1A : Double;
point1B : Double;
point2A : Double;
point2B : Double;
point3A : Double;
point3B : Double;
SideAB : Double;
SideBC : Double;
SideAC : Double;
A : Double;
B : Double;
C : Double;
ResultA : Double;
ResultB : Double;
ResultC : Double;
enter : String;

```

Delphi Program Start:

```

program Project2;
{$APPTYPE CONSOLE}

{$R *.res}

begin
  try
  {
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    CMPT 360 Spring 2023
    Assignment 1
    Title: Calculating Side Lengths And Angles Of A Triangle On A Complex Plane
  }
  validInput := false;

  while (validInput = false) do
  begin
    WriteLn(Output, 'Place three points in form A + Bi, one per line. ');
    ReadLn(Input, point1);
    ReadLn(Input, point2);
    ReadLn(Input, point3);

    point1 := StringReplace(point1, 'i', '', []);
    point2 := StringReplace(point2, 'i', '', []);
    point3 := StringReplace(point3, 'i', '', []);
    point1List := SplitString(point1, ' ');
    point2List := SplitString(point2, ' ');
    point3List := SplitString(point3, ' ');

    try
      {error detection, detecting if there is an error in the input,
      it will check the length of the input then cancel if it does not fit
      along with this if any issue arise during formatting due to the format it
      will raise an exception and ask for new points}
      if ((Length(point1List) < 3) or (Length(point2List) < 3) or (Length(point3List) < 3))
      then raise Exception.Create('values formatted incorrectly');
      point1A := StrToFloat(point1List[0]);
      point1B := StrToFloat(point1List[2]);
      point2A := StrToFloat(point2List[0]);
      point2B := StrToFloat(point2List[2]);
      point3A := StrToFloat(point3List[0]);
      point3B := StrToFloat(point3List[2]);
    end;
  end;
end;

```

```

        validInput := true;
    except
        on E:Exception do
            Writeln('Please re-enter points, previous points faulty.');
```

end;

End;

End of required code(Entire program not listed)

Java:

Issue input example:

place three points in form $A + Bi$, one per line

4 + 5i

hfgd + 6i

fhdg+ndsbd

please re-enter points A and B in form $A + Bi$ where A and B are integers, one per line

4 + 5i

5 + 3i

please re-enter points A and B in form $A + Bi$ where A and B are integers, one per line

4 + 5i

8 + 4i

Output:

angle of point A : 49.40016229193084

angle of point C : 32.4721499774729

angle of point B : 98.13299654681866

side length between points A and B : 2.23606797749979

side length between points A and C : 4.123105625617661

side length between points B and C : 3.1622776601683795

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Delphi input:

Place three points in form $A + Bi$, one per line.

e

2 + 8i

d

Please re-enter points, previous points faulty.

Place three points in form $A + Bi$, one per line.

2 + 4i

4 + 2i

$7 + 2i$

Output:

Side length for points A and B: 2.8

Side length for points B and C: 3

Side length for points A and C: 5.4

Angle for point A: 23.2

Angle for point B: 135

Angle for point C: 21.8

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press Enter to exit

The screenshot displays a Java IDE with two main windows. The left window shows the source code for a Java program named 'Main.java'. The code imports the Scanner class and contains a 'Main' class with an 'input()' method and a 'main()' method. The 'main()' method prompts the user to enter three points in the form 'A + Bi', one per line. It then calculates the side lengths and angles for a triangle formed by these points. The right window shows the output of the program, which displays the calculated side lengths and angles for the points entered by the user. The output is as follows:

```
Place three points in form A + Bi, one per line.
e
2
1
Please re-enter points, previous points faulty.
Place three points in form A + Bi, one per line.
2+3i
ds+ds
void
Please re-enter points, previous points faulty.
Place three points in form A + Bi, one per line.
3 + 4i
2 + 1i
200 + 100i
Side length for points A and B: 2.8
Side length for points B and C: 3.0
Side length for points A and C: 5.4
Angle for point A: 23.2
Angle for point B: 135.0
Angle for point C: 21.8
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press Enter to exit
```


Conclusions:

The syntax is slightly different but very similar in a lot of ways. Indexing is done the same way in Delphi as it is done in Java. One of the difficulties was that Delphi is predominantly done in application making but can be done in console development if you find the right program to develop. I also noticed the Delphi program's exception handling is much more fine-tuned. You can specify the error to throw and a response based on each error it throws, whereas in Java, if it throws an exception, you need separate lines of error throwing to get the different effects, unlike Delphi, which can do it from one line. I also learned that Delphi has more need for importing libraries for particular uses. For example, I used dynamic string arrays in the Delphi program because it allowed for indexing. Still, Java has the indexing function built in. Delphi is more barebones with the basics, but it has the basics, such as reading and writing for user input, already in the system. But then the rest needs to be imported. I also note that the math classes and libraries need to be called and referenced when using some math functions. In Java, you don't need to use an operator when multiplying if you have the brackets in between the numbers, whereas in Delphi, you need to use the * operator. I also appreciate that Delphi requires you to declare your variables at the program's top. And this allows you to see the variables and keep cleaner code easily. The development environment I used for Delphi also uses the Delphi code to create special brackets beside the line numbers and shows how far the loops reach, which is extremely useful for bug fixing. Finally, even with my knowledge of significantly more Java, having very little experience, and only having completed a basic non-calculation program in Delphi before, I prefer Delphi as it allows for cleaner code and more control over the functions.