Lab 6
Loops

PROGRAM SPECIFICATIONS

Pi can be approximated by the following series:

```
4 - 4/3 + 4/5 - 4/7 + 4/9 - ...
```

As you add more terms of the series together, you get the value of Pi with more precision. The drawback to this series is that it very slowly approximates Pi. However, since we have a computer, we can overcome this to some degree because of the speed at which computers perform arithmetic.

Your task:

- You must use a do while loop for the overall flow of the program

- Get an integer greater than 9 from the user that represents to which term to approximate Pi
  - You must ensure the integer they enter is greater than 9
  - As long as the user enters an invalid number, re-prompt for input
  - You must use a while loop for this range checking

- Once a valid integer is obtained, calculate the approximate value of Pi to that term
  - You must use a for loop for the calculations

- Print the values of the 10 terms leading up to and including the last term specified, formatted to 15 digits to the right of the decimal point, preceded by the term number

- After the results have been displayed, the user should be asked if s/he wants to perform another approximation of Pi.
  - If the answer is yes, get another term and perform the calculation as specified above.
  - The user should be asked if s/he wants to go again until the answer is no.
  - You must handle all cases of “yes” and “no”
  - You must check against “yes” or “no” and not just the first letter
  - You must use a loop to ensure “yes” or “no”
  - Note: “yes” and “no” are Strings you can’t use == to check a String. There are methods in the Strings class that checks for equality

- You must use my variables and you can declare variables as needed. I have provided comments on the loops in the Java file

TO TURN IN

A **zip** file that contains Lab 6 folder with

- The package and your Java source file
- An output run of your program named cscd210lab6out.txt with at least 3 runs of your program and ensure you test your go again. One run must be greater than 100 for the term
- Name your zip your last name first letter of your first name lab6.zip

EXAMPLE RUN:

```
Welcome to the Pi approximation program.
This program will approximate Pi based on the following series:
4 - 4/3 + 4/5 - 4/7 + 4/9 - ...

Enter the term number to which you would like to approximate Pi
(note that 4 is term 1, 4/3 is term 2): 9

Invalid input! Please enter a term greater than 9: -999
Invalid input! Please enter a term greater than 9: 0
Invalid input! Please enter a term greater than 9: 20

The values of Pi from term 11 to term 20 are
--------------------------------------------
Term 11: 3.232315809405594
Term 12: 3.058402765927333
Term 13: 3.218402765927333
Term 14: 3.070254617779185
Term 15: 3.208185652261944
Term 16: 3.079153394197428
Term 17: 3.200365515409549
Term 18: 3.086079801123835
Term 19: 3.194187909231942
Term 20: 3.091623806667840

Would you like to try again (yes/no)? yo!

Invalid input, please enter yes or no: yes

Enter the term number to which you would like to approximate Pi
(note that 4 is term 1, 4/3 is term 2): 10

The values of Pi from term 1 to term 10 are
--------------------------------------------
Term  1: 4.000000000000000
Term  2: 2.666666666666667
Term  3: 3.466666666666667
Term  4: 2.895238095238096
Term  5: 3.339682539682540
Term  6: 2.976046176046176
Term  7: 3.283738483738484
Term  8: 3.017071817071818
Term  9: 3.252365934718877
Term 10: 3.041839618929403

Would you like to try again (yes/no)? no
```