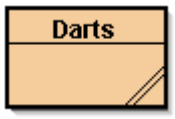
Assessment Instructions

Instructions: Write a program to calculate the value of ***pi*** by simulating throwing darts at a dart board.



1. You should already have a new project called Challenge Program in the Unit07 Assessments folder.
2. If you have not created a class called Darts in the project folder, please do so now.
3. Read the Virtual Lecture Notes (Part 2) to learn how to simulate the value of ***pi*** with darts.
4. You may want to review or re-use code from the PointsOnACircle class in this assessment.
5. Use top-down design and procedural abstraction in this program. In other words, put functional units into methods.
6. Prompt the user for how many times darts should be thrown in a trial. (If you enter a very large number, you may have to investigate the use of the **long** primitive data type.) The example below indicates darts were thrown 1500 times in each trial.
7. Prompt the user for the number of trials. The example below indicates there were 10 trials.
8. Estimate ***pi*** for each trial.
9. The imaginary circle representing your dartboard should have a radius measuring 1 unit.
10. Choose random values of x and y. You know two different ways to do that.
11. Count any (x, y) coordinate that satisfies $x^2 + y^2 \leq 1$ as a hit within the circle as a hit, any coordinates outside the circle as a miss.
12. Review the Virtual Lecture Notes for details about how to calculate ***pi***.
13. Calculate the average of the estimates for all trials and print the results.
14. Evaluate how many darts/trial it takes for the estimate of pi to begin to approach 3.141592 both for individual trials and the average.

Expected Output: When your program runs correctly, the output should resemble the following screen shot.

```
How many darts/trial? 1500
Trial [ 0]: pi = 3.136000
Trial [ 1]: pi = 3.258667
Trial [ 2]: pi = 3.114667
Trial [ 3]: pi = 3.208000
Trial [ 4]: pi = 3.162667
Trial [ 5]: pi = 3.165333
Trial [ 6]: pi = 3.058667
Trial [ 7]: pi = 3.090667
Trial [ 8]: pi = 3.152000
Trial [ 9]: pi = 3.160000
Estimate of pi = 3.150667
```

Assessment: Your assessment will be graded according to the following rubric.

Grading Rubric	**Pts**
Comments include name, date, and purpose of program.	1
User prompted for the number of darts/trial.	3
User prompted for the number of trials.	3
Array correctly initialized.	2
Random numbers correctly generated.	3
Program written in top-down format.	5
Separate methods used for functional units.	5
Arithmetic statements written correctly.	3
Iteration used appropriately.	2
Decision statement(s) correctly select hits and misses.	3
Output formatted to display with **`printf()`**	1
No compiler errors.	1
No runtime errors.	1
Output is correct and user-friendly.	1
Thoughtful PMR included.	1

Submission: Submit Darts.java for a grade.