

Disclaimer:

You will submit your file to an assignment that is given through MS teams. **Your file-name should be "Ex05_yourStudentNumber.java". So if you student number is 202051056016, this means the file you need to submit will have the name Ex05_202051056016.java. If your file does not include your student number in its name, I cannot grade it. This doesn't necessarily means that your file will include the .java in the name, but its file extension will be java.** Submissions made after the deadline will **not be accepted**, be sure to submit your work

before the due date and **make sure to click turn in button.** Your code will be automatically controlled, so be sure to have only one public class in your file that has the same name with your file. Failure to do so may result in you receiving 0 from this exercise. You will turn in a single java file.

Exercises:

1. (Compute pi): You can approximate pi by using the following series:

$$\pi = 4 \left(1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \cdots + \frac{(-1)^{i+1}}{2i-1} \right)$$

Write a method named **computePI** that takes an integer as a parameter and calculates pi and returns it. If the given parameter is 0, return 3.

2. (Factorial) Write a method named **factorial** that takes an integer as a parameter and calculates that number's factorial and returns it.

3. (Prime numbers)

A. Write a method named **isPrime** that takes an integer as a parameter and returns if the number is prime or not.

B. Write a method named **nPrimes** that takes an integer as parameter and **displays** first n prime numbers. Doesn't return anything.

4. (Perfect number) A positive integer is called a perfect number if it is equal to the sum of all its positive divisors, excluding itself. For example, 6 is the first perfect number $6 = 3 + 2 + 1$. The next is $28 = 14 + 7 + 4 + 2 + 1$.

Write a method named **nPerfectNumbers** that displays the first **n** perfect numbers, **n** will be a parameter to your method. Returns nothing. **1 is not a perfect number.**

5. (Statistics: compute mean and standard deviation) In business applications, you are often asked to compute the mean and standard deviation of data. The mean is simply the average of the numbers. The standard deviation is a statistic that tells you how tightly all the various data are clustered around the mean in a set of data. For example, what is the average age of the students in a class? How close are the ages? If all the students are the same age, the deviation is 0

Write a method named **displayStatistics** that takes the number of data, **n** as a parameter and prompts user to enter **n** data points as double numbers, finally displays the mean and standard deviation of these numbers using the following formula. Mean should be displayed up to 2 decimal places, standard deviation should be displayed up to 5 decimal places.

$$\text{mean} = \frac{\sum_{i=1}^n x_i}{n} = \frac{x_1 + x_2 + \cdots + x_n}{n} \quad \text{deviation} = \sqrt{\frac{\sum_{i=1}^n x_i^2 - \frac{\left(\sum_{i=1}^n x_i\right)^2}{n}}{n - 1}}$$