AP Computer Science Name: _____
Unit 2 Practice Assignment

Instructions: Write Java programs (in Blue J) to accomplish the following four objectives. Make sure you read each question carefully and understand exactly what the question is asking! This in itself is a skill to master for the AP Exam (and academic life in general).

1. If we list all the natural numbers below 10 that are multiples of 3 or 5, we get 3, 5, 6 and 9. The sum of these multiples is 23. Find the sum of all the multiples of 3 or 5 below 1000.

   Hints: The modulus operator (%) will be extremely useful for this question. A number 'n' is a multiple of 'a' if n % a == 0.

   Answer: **233168**

2. Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

   1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

   By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

   Hints: First, figure out how to generate Fibonacci numbers. You will need to keep track of the previous two terms and the current term, and update these values at the end of the body of the loop. Second, modulus will again be useful for determining whether a number is even or odd.

   Answer: **4613732**

3. The sum of the squares of the first ten natural numbers is,

$$1^2 + 2^2 + ... + 10^2 = 385$$

The square of the sum of the first ten natural numbers is,

$$(1 + 2 + ... + 10)^2 = 55^2 = 3025$$

Hence the difference between the sum of the squares of the first ten natural numbers and the square of the sum is 3025 − 385 = 2640. Find the difference between the sum of the squares of the first one hundred natural numbers and the square of the sum.

Hints: Read the example carefully and make sure you're calculating what is asked. This is where most students go wrong in this question.

Answer: **25164150**

4. A Pythagorean triplet is a set of three natural numbers, $a < b < c$, for which,

$$a^2 + b^2 = c^2$$

For example, $3^2 + 4^2 = 9 + 16 = 25 = 5^2$.

There exists exactly one Pythagorean triplet for which $a + b + c = 1000$.
Find the product abc.

Hints: A brute force method for this program would go through all possible values of a, b, c that could result in the required answer. Think about what constraints the problem has. For example, it makes no sense to check values of a, b, or c greater than 1000 since a + b + c == 1000. This is not necessarily the tightest constraint, but it is an obvious one to serve as an example.

Answer: **31875000**