Exercise 1

Let's say you are given a number, a, and you want to find its square root. One way to do that is to start with a rough guess about the answer, x_0, and then improve the guess by using this formula:

$$x_1 = (x_0 + a/x_0) / 2$$

For example, if we want to find the square root of 9, and we start with $x_0 = 6$, then $x_1 = (6 + 9/6) / 2 = 3.75$, which is closer. We can repeat the procedure, using x_1 to calculate x_2, and so on. In this case, $x_2 = 3.075$ and $x_3 = 3.00091$. So the repetition converges quickly on the correct answer.

Write a method called `squareRoot` that takes a `double` and returns an approximation of the square root of the parameter, using this technique. You should not use `Math.sqrt`.

As your initial guess, you should use $a/2$. Your method should iterate until it gets two consecutive estimates that differ by less than 0.0001. You can use `Math.abs` to calculate the absolute value of the difference.

Exercise 2

One way to evaluate $\exp(-x^2)$ is to use the infinite series expansion:

$$\exp(-x^2) = 1 - x^2 + x^4/2 - x^6/6 + \ldots$$

The ith term in this series is $(-1)^i x^{2i} / i!$. Write a method named `gauss` that takes `x` and `n` as arguments and returns the sum of the first `n` terms of the series. You should not use `factorial` or `pow`.