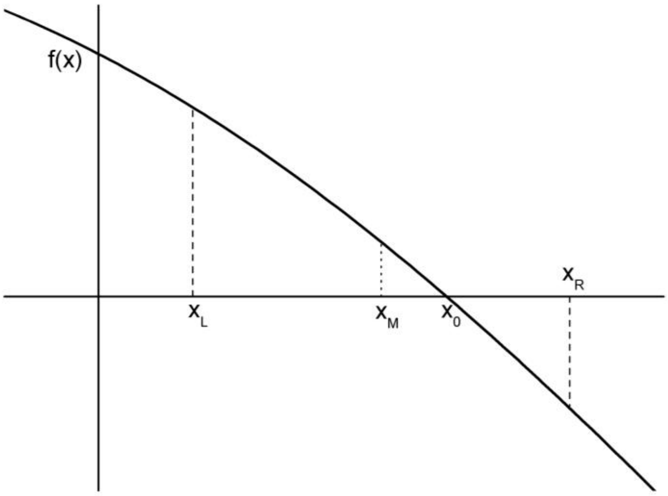
Bisection method:

The goal of the exercise is to apply the bisection method to find the root of a function $f(x)$, that is to say find the x_0 value for which $f(x_0) = 0$.
It is assumed that the function has a root (x_0) between the left boundary (x_L) and the right boundary (x_R).



The algorithm is as follows:

1. Specify the values for x_L, x_R and $Tolerance$.
2. Calculate the middle value (x_M): $x_M = \dfrac{x_R + x_L}{2}$
3. Find in which interval is the root (x_0): $x_L \le x_0 < x_M$ or $x_M \le x_0 \le x_R$?
4. Modify the initial interval:
   - If $x_L \le x_0 < x_M$ then x_R is replaced by x_M.
   - If $x_M \le x_0 \le x_R$ then x_L is replaced by x_M.
5. Iterate the steps 3, 4 and 5 until the $Error$ is below a given $Tolerance$:

$$Error \equiv \left| \frac{x_R - x_L}{x_M} \right| \le Tolerance$$

6. Print the root value (x_0).

Exercise:

- Find the root of the function $f(x) = \cos x - x$ starting with the initial interval $x_L = 0$, $x_R = 1$.

Calculate the root (x_0) with 8 digits of accuracy.
Give the number of necessary iterations.