### Problem 1 (20 points)
Write a program that, for input \(x_0, y_0, n\), generates sequences \(\{x_0, x_1, \ldots, x_n\}\) and \(\{y_0, y_1, \ldots, y_n\}\) by the iteration
\[
\begin{align*}
x_{k+1} &= 1 - y_k + |x_k| \\
y_{k+1} &= x_k
\end{align*}
\]
Use input \(x_0 = 1.5, y_0 = 2.13\) to generate and plot the set of points \(\{(x_j, y_j) \mid j = 0, 1, \ldots, n\}\). The graph is called Gingerbreadman map.

![Gingerbreadman Map](image)

### Problem 2 (20 points)
Write a program to calculate the following sum and use WYSIWYG method to verify your program for \(n = 5\)
\[
\sum_{k=1}^{n} \left(-1\right)^{k+1} \cdot \sum_{i=1}^{k} \left(2 \cdot i - 1 \right)^2 \prod_{j=1}^{k} \left(2 \cdot j\right)
\]

### Problem 3 (20 points)
For any input positive number \(M\), the sum
\[
\sum_{k=2}^{n} \frac{1}{\sqrt{k \cdot \ln(k)}}
\]
will be larger than \(M\) when \(n\) is large enough. Use while-do to calculate the sum and stop when the sum is larger than \(M\). Output \(n\).

### Problem 4. (20 points)
For input a vector \(x = [x_1, \ldots, x_n]\) and \(y = [y_1, \ldots, y_n]\), write a program to carry out the following
Problem 5 (20 points)

Write a program that, for input numbers $a$ and $b$ output the number $s$ according to the following formula/diagram:

\[
\begin{align*}
    a \geq 5 & \quad \Rightarrow s = a + 2b \\
    b \leq 0 & \quad \Rightarrow s = 2a + b \\
    b < 2 & \quad \Rightarrow s = 3a + b \\
    a < 5 & \quad \Rightarrow
\end{align*}
\]

Problem 6. (Extra 15 points)

For an input vector $x = [x_1, \ldots, x_n]$ and a real number $t$, we want to know the index $k$ at which $s = |x_k - t|$ is smallest among $|x_1 - t|, |x_2 - t|, \ldots, |x_n - t|$. Write a program to carry out the search and output $k$ and $s$. 

\[
\sqrt{\frac{1}{n} \sum_{k=1}^{n} (x_k^2 - y_k^2)}
\]

Use random vectors to test your program.