1. Write a function \([p \ r] = \text{longdivision}(m, n)\) that performs the long division of two given integers \(m\) and \(n\). Use the following pseudocode:

   \[
   \begin{align*}
   \text{Input: } & m, n \\
   \text{Initialize } & p = 0 \text{ and } r = m \\
   \text{while } & r \geq n \text{ do} \\
   & p = p + 1 \\
   & r = m - pn \\
   \text{end} \\
   \text{Output: } & m = pn + r
   \end{align*}
   \]

2. Explain in your own words what the following code does:

   ```matlab
   while 1
     disp('What is 3+4?')
     answer=input('');
     if answer == 7
       disp('Correct')
       return
     else
       disp('Wrong, but you get another chance.')
     end
   end
   ```

3. Create a random vector \(x = \text{ceil}(20 \cdot \text{rand}(1,10)) - 10\) of 10 integers in the interval \([-10, 10]\).

   (a) Write a MATLAB script that replaces all negative numbers in \(x\) with zeros. Hint: the command \texttt{find} should come in handy.

   (b) Add another line to your code that allows you to efficiently delete all zeros from the vector produced in (a).

4. Start with \(A = \text{magic}(5)\). Next, compute a new matrix \(B\) with the following commands:

   \[
   p = \text{randperm}(5); q = \text{randperm}(5); B = A(p, q);
   \]

   Explain what the following MATLAB statements compute. When do you observe differences for \(A\) and \(B\) and why?

   \[
   \begin{align*}
   \text{sum}(A), \text{sum}(B) \\
   \text{sum}(A'), \text{sum}(B') \\
   \text{sum}(\text{diag}(A)), \text{sum}(\text{diag}(B)) \\
   \text{sum}(\text{diag}(	ext{flipud}(A))), \text{sum}(\text{diag}(	ext{flipud}(B))) \\
   \text{rank}(A), \text{rank}(B)
   \end{align*}
   \]