These practice problems are based on the material covered in the lecture in first week (1/23-1/25) and assigned reading.

1. This is our first Python program, intToBinary1.py. Solve parts (a)-(d) first by hand, without executing the program.

   ```python
   n = int(raw_input("Type a nonnegative integer. "))
   while n > 0:
       print n%2
       n = n/2
   ```

   (a) What output does the program produce for input 86?
   (b) What output does the program produce for input 141?
   (c) What output does the program produce for input 0?
   (d) What output does the program produce for input -50? Explain in a sentence why your program behaves in this manner.
   (e) Execute intToBinary1.py and when you are prompted "Enter a number", type hello. What happens? Explain in a sentence why your program behaves in this manner.

2. Consider the following program. Without executing on a computer, answer the following questions.

   ```python
   number = int(raw_input("Enter a number: "))
   while number > 0:
       print number % 10
       number = number / 10
   ```

   (a) What output does it produce, given input 3179?
   (b) Describe in one sentence, what the program does, in general.

3. Consider the following program. Without executing on a computer, answer the following questions.

   ```python
   number = int(raw_input("Enter a number: "))
   count = 0
   while count < number:
       print count*count
       count = count + 2
   ```
(a) What output does it produce, given input 10?
(b) Modify the program by swapping the two statements inside the body of the while loop. What output does it produce now, given input 10?

4. Consider the following program. The “!=” in the third line stands for “not equal to.” Without executing on a computer, answer the following questions.

```python
number = int(input("Enter a number: "))
count = 0
while count != number:
    print count
    count = count + 2
```

(a) What output does it produce, given input 10?
(b) What happens if the input is 9? Explain in 1-2 sentences. Use the back of the sheet, if necessary.

5. For each program below, make a table that shows that values of all the variables in the program at the beginning of each iteration of the while-loop (i.e., at the time the boolean expression in the while-statement is executed).

(a) n = 20
    while n > 0:
        n = n/3

(b) n = 10
    while n <= 15:
        n = n + 2

(c) n = 10
    m = 20
    while n <= m:
        n = n + 1
        m = m - 2

(d) n = 10
    while n%3 != 0:
        n = n + 1
6. I want to write a program that takes as input a positive integer \( n \) and prints for each integer 1 through \( n \), the square of that integer. For example, if \( n \) is 3, I would like the output to be:

The square of 1 is 1
The square of 2 is 4
The square of 3 is 9

Here are a few different attempts at writing this program. None of these attempts work – they all contain one or more errors. For each attempt, (i) identify the errors in that attempt and (ii) state the type of each error, syntax, run-time, or semantic. Your reading for the week contains an explanation of these three types of errors; this problem provides an opportunity to test your understanding of these ideas.

Finally, write down a completely correct program for the problem.

(a) \[
\begin{align*}
\texttt{n} & = \texttt{int(raw_input("Enter a number: "))} \\
\texttt{while count} & \leq \texttt{n}: \\
\texttt{print "The square of", count, "is", count*count} \\
\texttt{count} & = \texttt{count + 1}
\end{align*}
\]

(b) \[
\begin{align*}
\texttt{n} & = \texttt{int(raw_input("Enter a number: "))} \\
\texttt{count} & = 1 \\
\texttt{while count} & \leq \texttt{n} \\
\texttt{print "The square of", count, "is", count*count} \\
\texttt{count} & = \texttt{count + 1}
\end{align*}
\]

(c) \[
\begin{align*}
\texttt{n} & = \texttt{int(raw_input("Enter a number: "))} \\
\texttt{count} & = 1 \\
\texttt{while count} & \leq \texttt{n}: \\
\texttt{print "The square of", count, "is", count*count} \\
\texttt{count} & = \texttt{count + 1}
\end{align*}
\]

(d) \[
\begin{align*}
\texttt{n} & = \texttt{int(raw_input("Enter a number: "))} \\
\texttt{count} & = 1 \\
\texttt{while count} & \leq \texttt{n}: \\
\texttt{count} & = \texttt{count + 1} \\
\texttt{print "The square of", count, "is", count*count}
\end{align*}
\]

(e) \[
\begin{align*}
\texttt{n} & = \texttt{int(raw_input("Enter a number: "))} \\
\texttt{count} & = 1 \\
\texttt{while count} & \leq \texttt{n}: \\
\texttt{print "The square of count is", count*count} \\
\texttt{count} & = \texttt{count + 1}
\end{align*}
\]