Lesson Four
Math 6080 (for the Masters Teaching Program), Summer 2020

Part 1. While Loops. In contrast to the “if x:” Python command, which performs the Python task following the colon if x is true and then stops, the Python command “while x:” performs the Python task following the colon if x is true and then returns to the “while x:” to run it again (if x remains true). Thus:

\[
\begin{align*}
x &= 1 \\
\text{if } x &= 1: \\
\quad &\text{print(’one’)}
\end{align*}
\]

will print one and then stop. But:

\[
\begin{align*}
x &= 1 \\
\text{while } x &= 1: \\
\quad &\text{print(’one’)}
\end{align*}
\]

will print one over and over in an infinite loop (try it).

A “while x:” loop is useful when you change the conditions for x before returning. Thus:

\[
\begin{align*}
x &= 1 \\
\text{while } x &< 10: \\
\quad &\text{print(x)} \\
\quad &x = x + 1
\end{align*}
\]

will do print the numbers from 1 to 10 and then stop (try it!).

Remark. The command “x = x + 1” is interesting. It re-assigns the variable x to its old value plus one. Python has a shorthand for this: “x += 1” which I intend to never use.

First Exercise. Print lists of the first 20 powers of two, and the first 20 natural numbers followed by their square roots (with a comma in between).

First Big Exercise. Automate the process of finding the gcd of two numbers with a “while” loop. For example, given the numbers from Lesson One write Python code starting with:

\[
\begin{align*}
n &= 560014 \\
m &= 29652 \\
\text{while } m &!= 0: \\
\quad &\text{(you fill in the rest).}
\end{align*}
\]

Reference: w3schools.com/python (Python while loops)