Computer Science 220L
Laboratory 2 – Arithmetic, Loops

Learning Objectives:
- Develop simple Python programs that do input, produce output and do arithmetic.
- Develop simple Python programs that use for loops.

Directed Activities:
   Clear a space on your desk and write on this page the values of the variables as the code executes, and the outputs that will be generated from the following code segments.

   a. for i in range(8):
      print (i)

   b. for i in [1, 3, 9]:
      print (i, end = " ")

   c. for i in range(-1):
      print (i)

   d. sum = 0
      for i in range(5):
          sum = sum + i
      print (sum)

   e. power = 2
      for i in [2, 4, 6]:
          print (i ** power)

   f. difference = 0
      for i in [1, 8, -2, 15, 0]:
          difference = difference - i
      print (difference)

   g. product = 1
      for i in range(4):
          product = product * i
      print (product)

   h. product = 1
      for i in [1, 3, 5]:
          product = product * i
      print (product)

Now type the above code into loopCompare.py to compare your results.
2 – 6. Demonstrate your code to an instructor.

2. Coffee shop. (Adapted from the text)
   Write a program, `coffee.py`, to compute the cost of coffee orders for customers. First ask how many coffee orders are to be processed. Each order costs $10.50 per pound. Each order ships for $0.86 per pound, and there is a fixed cost of $1.50 per order for overhead. Ask the user for the number of pounds in each order. Calculate and display the cost of each order in turn.

3. Computing the area of a triangle. (Taken from the text)
   Write a program, "triangleArea.py", to calculate the area of a triangle given the length of its three sides, a, b, and c, using these formulas:
   \[ s = \frac{a + b + c}{2} \text{ and } A = \sqrt{s(s-a)(s-b)(s-c)} \]

4. Computing the features of a sphere. (Taken from the text)
   Write a program, "sphere.py", to calculate the volume and surface area of a sphere from its radius, given as input. Use the following formulas:
   \[ V = \frac{4}{3} \pi r^3 \text{ and } A = 4\pi r^2 \]

5. Compute a square root. (Adapted from the text, p. 74, Exercise 15)
   Write a program, `newton.py`, that approximates the square root of a number using Sir Isaac Newton’s method. Ask the user what the number, x, is and how many times to improve the approximation. \( x / 2 \) is a good first approximation. Given an approximation,
   \[ \text{approx} + \frac{x}{\text{approx}} \]
   \[ 2 \]
   is a better approximation. Display the number and the final value of the approximation.

   Write a program "pi.py" that approximates the value of \( \pi \) using the Wallis formula:
   \[ \frac{\pi}{2} = \frac{2*2*4*4*6*6*8*8}{1*3*5*7*9*...} \]
   The program should prompt the user for n, the number of terms in the series, compute the product of the n terms, and output the resulting approximation of pi.

   Demonstrate for instructor.

7. Upload the files to your OAKS account.
   `coffee.py` _______ `triangleArea.py` _______
   `sphere.py` _______ `newton.py` _______
   `pi.py` _______

8. If you left any file on the desktop, remove them. Log off of your computer.