PHYS-4007/5007: Computational Physics
Problem Set 1 (Due: 22 February 2023)

1. (20 pts) Write a program in Fortran 77 and in Python 3 (*i.e.*, two separate codes in two separate files) that does the following:

   - Asks the user to enter their name (first and last in that order) and year-of-birth (as a four-digit number).
   - Calculates the square of their age and the square-root of their age.
   - Prints their name, age, age squared, and the square-root of their age to the screen in the format:

     Last Name, First Name: nn n.nnnEee n.nnn

     where age is printed as a two-digit integer, age squared is printed in scientific notation, and the square-root of age as a real number in floating point notation. Note that there should be 4 spaces between the colon character (':') and the age, 3 spaces in between each of the printed numbers. Make sure that the ':' mark appears after the name and before the numbers. For example, for me the output would look like:

     Luttermoser, Donald: 58 3.364E+03 7.616

     Hint: In Appendix B, Subsection L.8 (pages B-46 through B-48), note the mantissa multiplier '1P' which will output an exponential number in proper scientific notation in Fortran.

2. (20 pts) Write a code in Fortran 77 that calculates the maximum height obtained ($y_{\max}$), down range distance ($x_{\max}$), and total time of flight (T) for a projectile launched with an initial velocity $v_\circ$ and projection angle $\theta_\circ$ in degrees. Your code should request the user to input both $v_\circ$ and $\theta_\circ$ and output $y_{\max}$, $x_{\max}$, and T with no more than 4 significant digits after the decimal point. Assume the projectile is launched from ground level and ignore air resistance and the Earth's spin. Single preceision is sufficient for these calculations. (*Hint*: Don't forget that trigonometric functions in Fortran 77 require the angle to be in radians.)

3. (20 pts) Write a code in Python 3 that calculates the maximum speed (in m/s) and the period of a 15.6 kg mass connected to a spring of spring constant 382 N/m, which oscillates on a frictionless horizontal table surface for the following maximum displacements: (a) 65.2 cm, (b) 127 cm, (c) 321 cm, and (d) 5.66 m. Make sure you pay attention to significant digits in your output.

For each problem, write a short description on how your code operates, and supply your answers for Problem #3. In addition, email your codes to me as attachments at **lutter@etsu.edu** by the due date listed above.