Homework 1

1. Do you have a smartphone? (If not, simply pick one and go on)Please
   search the internet and find out
         I have an iPhone 11.
   a. How many processors does it have? How many cores?
            1 processor (Apple A13 Bionic) with 6 cores.
   b. How much is the main memory?
            4 GB
   c. What kind of GPU does it have?
            Integrated GPU with the A13 chip.
   d. What are the FLOPS for the smartphone? And based on the
      information, would it have made it into the fastest machine in
      which year the latest?
            736 Gigaflops. The second question is confusing. The fastest
            phone processor currently is the Apple 15 Bionic which has
            a peak performance of 1224 Gigaflops. Which is significantly
            (almost twice) as fast as the A13. When the A13 came out, it
            was the fastest for the year 2019.
2. Suppose we have two computers A and B. Computer A has a clock cycle of 1
   ns and performs 2 instructions per cycle. Computer B, instead, has a
   clock cycle of 600 ps and performs 1.25 instructions per cycle. Assuming
   a program requires the execution of the same number of instructions in
   both computers.
   a. Which computer is faster for this program?
            Computer A performs $2 * 10^9$ instructions per second.
            Computer B performs $2.08333334 * 10^9$ instructions per second

            Therefore Computer B is faster.
   b. What if Computer B required 10% more instructions than Computer A?
            If Computer B required 10% more instructions than Computer
            A, than Computer B then it would perform 2.2 instructions
            per cycle. That is $3.666666674 * 10^9$ instructions per
            second.
3. Consider a computer that has a peak performance of 8 GFlops/s. An
   application running on this computer executes 15 TFlops, and takes 1
   hour to compute.
   a. How many GFlops/s did the application attain?
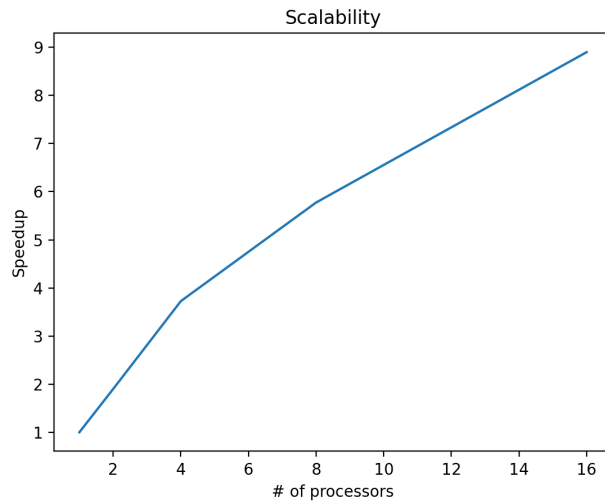   15e12/3600 = 4.1666e9 or 4.17 GFlops/s

> b. What efficiency did it achieve
>
>   4.17/8 = 52.125%

4. Given the following table, use your favorite plotting tool to plot

# Processors	1	2	4	8	16
# GFlops/s	4.0	7.6	14.9	23.1	35.6

> a. The scalability of the program (speedup vs number of processors)

Scalability

> b. The parallel efficiency attained (parallel efficiency vs number of
>   processors). Please see
>   http://www.netlib.org/scalapack/slug/node112.html for the
>   definition of the parallel efficiency.

Parallel Efficiency vs # of Cores