Chapter 1 Problem 22 [†]

Solution

About how many floating-point operations can a supercomputer perform each year?

According to the textbook, a supercomputer can make one floating-point operation in 10^{-17} s. Treat this like a conversion factor where

$$1\ calculation = 10^{-17}\ s$$

In one year there are

$$1\ year\left(\frac{365.25\ day}{1\ year}\right)\left(\frac{24\ hr}{1\ day}\right)\left(\frac{60\ min}{1\ hr}\right)\left(\frac{60\ s}{1\ min}\right) = 3.16\times 10^{7}\ s$$

Now convert the time into calculations

$$3.16\times 10^{7}\ s\left(\frac{1\ calculation}{1\times 10^{-17}\ s}\right) = 3.16\times 10^{24}\ calculations$$

Since we are estimating, we really don't know it to three significant digits. Therefore, there are about 10^{24} calculations in a year.

[†]Problem from University Physics by Ling, Sanny and Moebs (OpenStax)