MTH 4135 Homework 1

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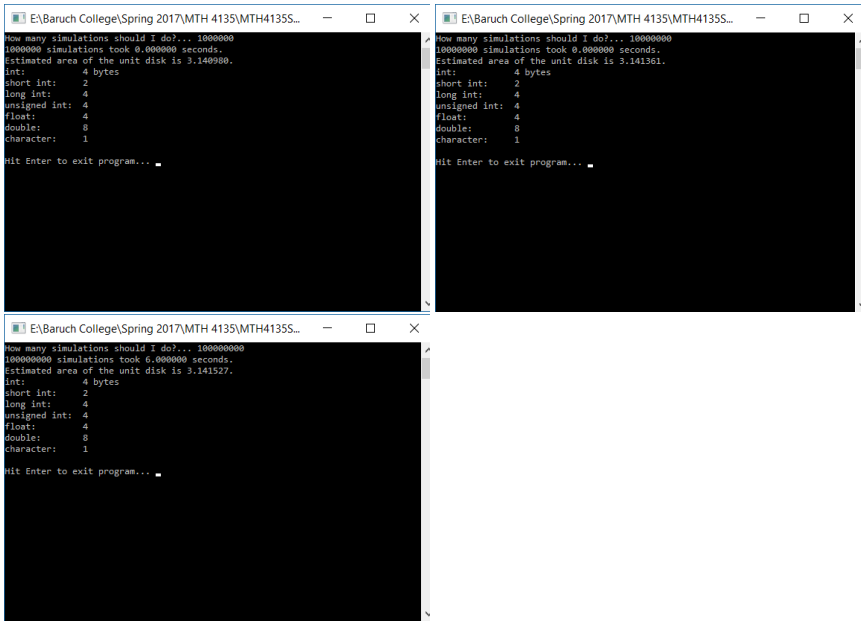
1. Download the program **TimedPi.cpp** and the header files **Declarations.h** and **Definitions.h** into the same folder. Compile **TimedPi.cpp** and run it performing 1 million, 10 million, and 100 million simulations. For each of these runs, attach a screen snapshot.



2. The five dimensional unit ball is the subset of $\mathbb{R}^5$ given by

$$B = \{(v, w, x, y, z) : v^2 + w^2 + x^2 + y^2 + z^2 \leq 1\}$$

Let C denote the five dimensional cube

$$C = \{(v, w, x, y, z) : |v| \leq 1, |w| \leq 1, |x| \leq 1, |y| \leq 1, |z| \leq 1\}$$

so $B \subset C$. Since each side of C is of length 2, the five-dimensional "volume" of C is $2^5 = 32$. Modify **TimedPi.cpp** to use Monte Carlo simulation to estimate what fraction of C's volume is also occupied by B. Use this to estimate the five dimensional volume of B. You should do at least 100 million simulations. Google the words "n-ball volume" and go to the Wikipedia page. From their formula, compute the numerical value of the volume of the 5 dimensional unit ball.

Executive Summary:

Methodology: