Computer Organization Name: _____
Spring 2026 *Quiz 1*

This quiz is closed book. No computers or phones are allowed. A calculator is allowed. Show all work for partial credit; writing the formula/equation first is a good idea. Write the **most appropriate** units as possible, and label all answers.
Please write and **sign** the Honor Code pledge at the bottom of the quiz:

I have abided by the Wheaton College Honor Code in this work.

Useful Formulas

$$P = \frac{1}{T} \qquad S = \frac{T_{slow}}{T_{fast}} \qquad T = \frac{CC}{CR}$$

$$CPI = \frac{CC}{IC} \qquad T = \frac{IC \times CPI}{CR} \qquad CC = \sum_{i=1}^{n}(CPI_i \times IC_i)$$

1. Assume an RGBY color display using 8 bits for each of the colors (red, green, blue, and yellow) per pixel and a frame size of 2560×1600.

   A) What is the minimum size in bytes of the frame buffer to store a frame? [4 points]

   B) How long would it take, at a minimum, for the frame to be sent over a 300 Mbit/s network? [4 points]

2. Assume for arithmetic, load/store, and branch instructions, a processor has CPIs of 2, 12, and 6, respectively. Also assume that on a single processor a program requires the execution of 2.8×10^9 arithmetic instructions, 1.1×10^9 load/store instructions, and 250 million branch instructions. Assume that each processor as a 2.5 GHz clock frequency.

   Assume that, as the program is parallelized to run over multiple cores, the number of arithmetic and load/store instructions per processor is divided by $0.7 \times p$ (where p is the number of processors) but the number of branch instructions per processor remains the same.

   A) Find the total execution time for this program on 1 and 2 processors. [9 points]

   B) Find the relative speedup of the 2 processor result relative to the single processor result. [3 points]

Wheaton Honor Code Pledge: