# CMPUT 229 - Computer Organization And Architecture I
## Quiz #2 — Winter 2014

**CMPUT 229 Honor Code** Solution

By turning in the quiz solution for grading, I certify that I have produced the solution in accordance to the academic integrity policies in Section 26.1 of the University of Alberta 2013/2014 Calendar.

**Question 1 (10 points):**

The table below shows the amount of time (in seconds) spent in different classes of instructions when a given program executes in a machine. A change to the compiler leads to a program that executes fewer integer (INT) instructions and does not affect the time of any of the other classes of instructions. This compiler improvement leads to a 12% improvement in the total execution time of this program.

What is the reduction, expressed as a percentage, in the time spent in INT instructions?

| FP Instructions | INT Instructions | Load/Store Instructions | Branch Instructions |
|---|---|---|---|
| 60s | 90s | 70s | 30s |

Original Total Time = 60s + 90s + 70s + 30s = 250s

Improved Total Time = (1 - 0.12) × 250s = 220s

Time Improvement = 250s - 220s = 30s

Improved INT time = 90s - 30s = 60s

$$\% \text{ Improvment} = \frac{90s - 60s}{90s} = \boxed{33\%}$$

By how much should the time spent in INT instruction be reduced to achieve a total time reduction of 40%?

250s × 40% = 100s

Since INT instructions only make up 90s, this is impossible.