Name _____

Friday, April 1

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6.035 Spring 2016 Miniquiz #22 5 Minutes

Consider the following piece of x86-64 assembly code, where each instruction is assigned an ID:

```
1. mov -8(%rbp), %r10
2. add %r15, %r10
3. mov %r10, -16(%rbp)
4. mov -24(%rbp), %r11
5. add %r11, %r12
6. mul %r10, %r12
7. add %r11, %r12
```

Each memory instruction completes in 2 cycles, each arithmetic instruction completes in 1 cycle.

Consider the simple processor without the instruction pipeline. In how many cycles does the computation execute?

Consider now a superscalar processor with the instruction pipeline. Reorder the instructions below to minimize the execution time. In how many cycles does the computation execute?

Cycle →

1	2	3	4	5	6	7	8	9	10

(In each cell, fill in the id of the instruction that starts in the corresponding cycle)