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03/26/2016
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Homework Assignment 1

1. **Chapter 1**

- **Exercise 7**

Solve for p:

$$S_2 = \frac{1}{1 - p + \frac{p}{2}}$$

$$S_2 = \frac{1}{1 - \frac{p}{2}}$$

$$S_2 = \frac{2}{2 - p}$$

$$p = 2 - \frac{2}{S_2}$$

Substitute p into Amdahl's Law:

$$S_n = \frac{1}{1 - \left(2 - \frac{2}{S_2}\right) + \frac{(2 - \frac{2}{S_2})}{n}}$$

$$S_n = \frac{1}{1 - \left(\frac{2S_2 - 2}{S_2}\right) + \left(\frac{2S_2 - 2}{nS_2}\right)}$$

$$S_n = \frac{1}{1 - \left(\frac{2n(S_2 - 1) + 2(S_2 - 1)}{nS_2}\right)}$$

$$S_n = \frac{1}{1 - \left(\frac{2(n + 1)(S_2 - 1)}{nS_2}\right)}$$

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2. **Chapter 3**

- **Exercise 27**

A: enq(16), B: enq(16), B: enq(17), C: deq() == B

- **Exercise 32**

Line 15 => A: enq(16), B: enq(16), B: enq(18), C: deq() == B

Line 16 => A: enq(16), B: enq(16), B: enq(18), A: enq(18), C: deq() == A

No, a linearization point actually happens as soon as `getAndSet()`, on line 22, returns a non-null value.

3. **Chapter 7**

- **Exercise 85**

A deadlock occurs because the next thread is never informed it can acquire the lock. Both threads look at the object and think the other thread has the lock because they see each others flags set to true.

4. **Appendix B**

- **Exercise 222**

column-first: 32

row-first: 1024

This is because each word in the array starts at the first column and goes all the way across the row. We know that a[0,0] maps to the first word of cache line 0, in the column-first traversal, we would be properly traversing along the rest of the word that is mapped to cache line 0. When we do a row-first traversal, with the same initial condition, the next increment goes to a whole other word and would result in a cache miss.