Exercise 2 (6.2)

Empirical Data

```
Variance reduction for delta = 10.0
Mean with propor. allocation + CV       =    55.650
Variance with propor. allocation + CV   =   207.017

Variance reduction for delta = 1.0
Mean with propor. allocation + CV       =     6.270
Variance with propor. allocation + CV   =    15.704

Variance reduction for delta = 0.1
Mean with propor. allocation + CV       =     0.638
Variance with propor. allocation + CV   =     1.607
```

Conclusion

So I used the (a + c) synchronization for the CRNs, the same as for exercise 1.

If we check the results for exercise 1:

```
CRNs with the (a + c) synchronization
delta = 10.0 avg = 55.84410000000003 var = 2113.079303120312
delta = 1.0 avg = 6.254299999999966 var = 38.38847035703572
delta = 0.1 avg = 0.643300000000003 var = 2.013266436643664
```

We can see that the variance was reduced quite a bit compared to exercise 1:

$\delta = 10$: $2113.079 \rightarrow 207.017$

$\delta = 1$: $38.388 \rightarrow 15.704$

$\delta = 0.1$: $2.013 \rightarrow 1.607$

The ratio grows bigger as δ grows so the control variable helps a lot when the difference between the two systems gets bigger (although at some point, I expect it to make not much of a difference if δ gets too big, because the estimate would be pretty useless for both I guess).

If delta is small (0.1), the extra work might not make much sense, but for bigger values, it sure does.

This is a sad conclusion, since programming these things tend to give me headaches.