

# Quiz 11 Solutions

written by Alvin Wan . [alvinwan.com/cs70](http://alvinwan.com/cs70)

Monday, October 10, 2016

**This quiz does not count towards your grade.** It exists to simply gauge your understanding. Treat this as though it were a portion of your midterm or final exam.

## 1 Counting

1. How many ways can we store 10 indistinguishable shirts into 3 drawers?

**Solution:**  $\binom{12}{2}$

This is a stars and bars problem. Thus, we have

$$\binom{10 + 3 - 1}{3 - 1} = \binom{12}{2}$$

Note that this is the same as  $\binom{12}{10}$ .

**Confused about stars and bars?** We can think of placing shirts into drawers, as dividing the shirts into 3 groups. This means "cutting" the set of all shirts in two places. (i.e., to cut a string into three pieces, we need to cut in two places). Since there are 2 cuts and 10 shirts, we have 12 total "slots". Choosing to fill 10 of these slots with shirts is the same as choosing 2 of these slots to cut at. Either way, we arrive at a correct answer.

$$\binom{12}{10} = \binom{12}{2}$$

2. Given a standard 52-card deck with an additional two Joker cards, each with different colors, how many ways can we get 3 cards, with distinct values, that total to 5? Assume the Joker has a value of 0.

**Solution:**  $\binom{2}{1} \binom{4}{1}^3$

Anytime we have cards, we can consider suits and values separately. In this case, we will first consider the number of possible values. It turns out that there are only three sets of values that total to 5,  $\{(0, 2, 3), (0, 1, 4)\}$ . In either case, each of the values has four possible suits, and the Joker has two possible colors. Thus, we have 2 possible sets of values with 4 possible suits for each value and 2 possible colors for each Joker in a set.

$$\binom{2}{1} \binom{4}{1}^2 \binom{2}{1}$$