Solutions to Chapter 10 of *Cracking the Coding Interview*

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10.1

Let p be the probability of making a shot. The probability of making 2 out of 3 shots is $3p^2(1-p)+p^3 = -2p^3+3p^2$. We want to know when $-2p^3+3p^2 > p$, or equivalently, $-2p^2+3p > 1$. This simplifies to $(p-3/4)^2 < 1/16$, or equivalently, $|p-3/4| < 1/4$. So we have a unique reason to play the second game whenever $p \in (1/2, 1)$. When $p \in \{0, 1/2, 1\}$, the probability of winning is the same for both games.

10.2

We assume that the triangle is equilateral, and that the ants all walk at the same constant speed. Two ants will collide if and only if they start walking opposite directions around the triangle. So the probability we are looking for is $6/8 = 3/4$.

If the ants are walking on a regular n-gon, then there are 2^n possible configurations of "walking directions," only 2 of which (all ants walking counterclockwise and all ants walking clockwise) result in no collisions. So the probability of collision in this case is $(2^n-2)/2^n = 1-2^{n-1}$.

10.3

Let l_i be the line $a_i x + b_i y = c_i$, $i \in \{1, 2\}$. Since the l_i are lines, some coefficient is $\neq 0$. Divide the equations for both lines through by that nonzero coefficient. If the resulting equations are identical, clearly there is an intersection. Otherwise, they intersect if and only if they have distinct slopes.

10.5

The line through the centers of the squares.