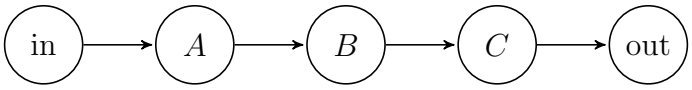

Figure 1: Sequential system

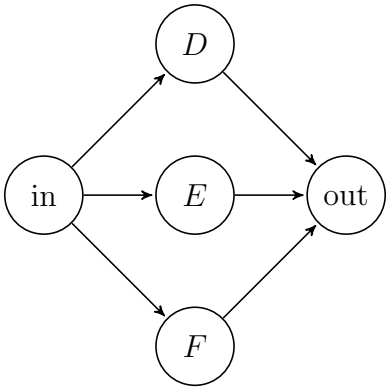

Figure 2: Parallel system

1. The three components of the sequential system, Figure 1, A, B, and C, will fail with probabilities $p_A = 0.1, p_B = 0.15$, and $p_C = 0.2$, independently of each other. What is the probability the sequential system will fail? $P(fails) = 1 - P(works) = 1 - P(A' \cap B' \cap C') = 1 - (1 - 0.1)(1 - 0.15)(1 - 0.2)$

2. The three components of the parallel system, Figure 2, D, E, and F, will function with probabilities $p_D = 0.9, p_E = 0.85$, and $p_F = 0.8$, independently of each other. What is the probability the parallel system will function? $P(works) = 1 - P(fails) = 1 - P(D' \cap E' \cap F') = 1 - (1 - 0.9)(1 - 0.85)(1 - 0.8)$

3. Semiconductor Garage is responding to an affirmative-action lawsuit by establishing hiring goals by race and sex for its business. The table below describes the 120 employees hired so far.

	Black	White
Female	50	30
Male	40	x

Need probabilities out of total number of employees, $120 + x$. $P(F \cap B) = 50/(120 + x), P(F) = 80/(120 + x)$, and $P(B) = 90/(120 + x)$. Independence is met when $P(F \cap B) = P(B)P(F)$. Hence, we solve for x:

$$\frac{50}{120 + x} = \frac{80}{120 + x}\frac{80}{120 + x}.$$

x = 24.

   (a) How many white males do they need to hire in order to be compliant, ie for the events F, an employee is female, and B, an employee is black, to be independent?

(b) The events W, an employee is white, and M, an employee is male also independent. Explain why and show it's true. This is true since independence of F, B implies independence of $F' = M$ and $B' = W$ (at least in this made up binary world, which I don't support aside from this problem.)

4. How many probability equations need to be verified to establish the mutual independence of four events? $\binom{4}{2} + \binom{4}{3} + \binom{4}{4} = 11$.