# Exercises for Monday, first hour

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**Colorblindness**   Colorblindness is caused by a genetic defect which is present on approximately 8% of all X chromosomes. Since men only have one X chromosome, about 8% of the male population is colorblind.

1. Women have two X chromosomes. What percentage of the female population is colorblind? (You can check your answer against the actual figures.)

2. Suppose that the genetic defect occurred more frequently than 8% of the time. How common would it have to be in order for 50% of the female population to be colorblind?

**Forwards and backwards prediction**   Consider the following two tasks:

- Guessing the next letter of a text given the preceding ones:

    `...  re particularly impr_`

- Guessing the previous letter of a text given the following ones:
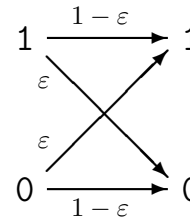
    `_onth following the c ...`

In general, which task is the more difficult — from statistical perspective, and from a cognitive? Why?

**Chinese whisper**   The binary symmetric channel is a communication channel which transmits 0s and 1s, but occasionally outputs the wrong symbol.

Suppose we have a binary symmetric channel with error probability 0.05, and that we send the string $X = 0000$ through this channel. We then send the output $Y$ back through the channel again, ending up with a third string $Z$.

What's the probability that $X = Z$?



**Coin flipping**   You generate two sequences by flipping a coin three times. What's the probability that the two sequences are identical? What's the probability that the have the same number of heads?