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Problem 1

Solution: Given problem can be reformulated in the following way:

Suppose we have a random variable X which have geometrical distribution with success probability A. Geometrical distribution model number of failures before the first success. So, it's our case.

The expected value of a geometrically distributed random variable X is $\frac{1}{A}$ and the variance is $\frac{1-A}{A^2}$

Problem 2

Solution: Each component of the solution vector looks as follows:

$$\arg\min_{x_k}\left\{\|x-a\|_2^2+\lambda\|x\|_1\right\}=\begin{cases}0, & |2a_k|<\lambda\\ a_k+\frac{\lambda}{2}, & a_k\leq-\frac{\lambda}{2}\\ a_k-\frac{\lambda}{2}, & a_k\geq\frac{\lambda}{2}\end{cases}$$