1. For a warranty on iPhones, the probability of having a claim in any given calendar is 0.22 for each iPhone.

Wang Warranty Company sells warranties on iPhones. Wang has found that the cost of repair of an iPhone is distributed uniformly between 50 and 290.

Gao Actuarial Consultants buys an iPhone for each of its 500 employees and purchases an iPhone warranty for each phone from Wang Warranty. Wang charges Gao the expected value of the total losses plus one standard deviation.

Calculate the premium that Wang would charge to Gao.

Solution:

\[ E[S] = \sum_i q_i \cdot \mu_i = (500)(0.22)\left(\frac{290 + 50}{2}\right) = 18,700 \]

\[ Var[S] = \sum_i q_i \cdot \sigma_i^2 + q_i(1-q_i)\mu_i^2 = \]

\[ 500\left[ (0.22)\left(\frac{(290 - 50)^2}{12}\right) + (0.22)(1-0.22)\left(\frac{290 + 50}{2}\right)^2 \right] = 3,007,620 \]

Premium = \[ E[S] + \sqrt{Var[S]} = 18,700 + \sqrt{3,007,620} = 20,434.25 \]
2. You want to create a discrete distribution from the Pareto distribution with parameters of \( \alpha = 4 \) and \( \theta = 4500 \). You use a span of 300 and the Method of Moment Matching where you match the first moment.

Calculate the probability assigned to the 1500 in your discrete distribution. Please provide an answer to at least 5 decimal places.

**Solution:**

\[
 f(1500) = \frac{2 \cdot E[X \wedge 1500] - E[X \wedge 1200] - E[X \wedge 1800]}{300}
\]

\[
 E[X \wedge d] = \left[ \frac{\theta}{\alpha - 1} \right] \left[ 1 - \left( \frac{\theta}{\theta + d} \right)^{\alpha - 1} \right]
\]

\[
 f(1500) = \frac{2 \left[ \frac{4500}{3} \right] \left[ 1 - \left( \frac{4500}{6000} \right)^3 \right] - \left[ \frac{4500}{3} \right] \left[ 1 - \left( \frac{4500}{5700} \right)^3 \right] - \left[ \frac{4500}{3} \right] \left[ 1 - \left( \frac{4500}{6300} \right)^3 \right]}{300}
\]

\[= 0.063678611\]