(1) A company insures a risk given by a Pareto variable with pdf $f(x)$ given by

$$f(x) = \frac{1}{2}\left(\frac{10}{x}\right)^6, \qquad x \geq 10.$$

The policy on the risk is stop-loss insurance with deductible d. If $d = 20$, and the security loading for the policy is 40%, find the premium the company charges the customer.

(2) An insurance company models annual medical insurance claims from a large corporation by a compound Poisson variable. The mean annual claim frequency is 1200. The size of a claim has mean 250 and standard deviation 1400. The insurance company wants to charge a premium that is large enough so that the probability annual claims exceed the premium is less than 5%. Using the normal approximation, estimate the security loading the insurance company requires on the policy. [Use $P(Z < 1.645) = 0.95$ for a standard normal variable Z.]

(3) An aggregate claims variable is compound Poisson. The claim frequency is 4.6 and the individual claims take only the values 1 or 2, with a claim of size 1 having probability 0.4. Find the pure premium on stop-loss insurance with deductible 3.7 for this risk.

(4) A frequency variable N for an aggregate claims variable is negative binomial with a mean of 4.5 and variance 11.25.
(a) Find the parameters (r, p) for the variable.
(b) Find the probability $P(N = 1)$.

(5) An insurance company assumes that the aggregate claims variable for a corporate policy is compound Poisson. It has a full credibility standard of 1000 claims for claim frequency. Suppose the severity variable is Gamma with parameters $r = 1.5$, $\lambda = 7$. Assuming the same full credibility standard for premium as for frequency, find the credibility of 1000 claims for premium.

(6) An auto insurance company divides its customers into 2 types, A and B. Type A customers have a probability $1/3$ of making a claim in a given year. Type B customers have a probability $1/8$ of making a claim in a given year. The probability of a random customer being Type A is 25%. Suppose a customer makes a claim in 2001. Find
(a) The probability the customer will make a claim in 2002,
(b) The probability the customer will make exactly one claim in the 2 year period $2002, 2003$.
Assume at most one claim is made in a given calendar year and independence from year to year. Use a Bayesian analysis.