

STAT 479
Spring 2013

Test 1

February 12, 2013

1. (10 points) The random variable X is the loss under a medical insurance policy and is distributed as a 2 point mixture distribution. The 2 point mixture distribution is a combination of a gamma distribution with a weight of 0.4 and a Pareto distribution with a weight of 0.6.

The parameters for the gamma distribution are $\alpha = 2$ and $\theta = 100$.

The parameters for the Pareto distribution are $\alpha = 5$ and $\theta = 5000$.

Calculate the standard deviation of X .

2. (10 points) Yang Insurance Company writes automobile liability insurance. Losses under this coverage are distributed as a gamma distribution with parameters of θ^{Gamma} and $\alpha = 3$. θ^{Gamma} is distributed as a Pareto distribution with $\theta^{Pareto} = 10,000$ and $\alpha = 8$.

Yang has sold 500 policies to 500 independent insureds. The premium for each policy is 110% of the expected loss.

Using the normal approximation, determine the probability that the premiums will exceed the losses.

3. (15 points) The Wang Warranty Insurance Company has experienced the following number of claims per day during the last 3 days:

1 2 9

Wang's chief actuary Yifei decides to treat this as an empirical distribution and calculates the mean and variance.

His boss Cici then suggests that Yifei model the number of claims per day as a zero modified geometric distribution with the parameters (β and p_0^M) determined so the mean and variance match the mean and variance of the empirical distribution.

Determine p_0^M under this approach.

4. (10 points) You are given that $S(x) = 1 - 0.5\left(\frac{x}{10}\right) - 0.5\left(\frac{x^2}{100}\right)$ for $0 \leq x \leq 10$ and $S(x) = 0$ for $x > 10$.

Calculate p such that $\pi_p = E[X] + \sqrt{\text{Var}[X]}$.

5. (15 points) During 2011, Zhang Dental Company sells a policy with no deductibles and no upper limit. Dental losses follow an exponential distribution with a mean of 75.

During 2012, dental losses experience uniform inflation of 25%. Zhang decided to implement an upper limit on its policy so that the expected amount paid in 2012 will be the same as in 2011.

During 2013, dental losses are expected to experience uniform inflation of 40%. Zhang decides to keep the same upper limit on its policy as in 2012. Additionally, Zhang decides to implement an ordinary deductible of d so that the expected amount paid per loss is the same as in 2012 and 2013.

Determine d .

6. (10 points) Losses for an insurance policy covering tornado damage are distributed uniformly between 0 and 10,000.

Chen Casualty Insurance Company sells a policy to cover these losses. The policy has an franchise deductible of 1000.

Calculate $E[Y^P]$ for this policy.

7. (10 points) You are given:

a. X is distributed uniformly between 0 and B where B is a random variable.

b. $F_B(b) = \frac{b^3}{1000}$ for $0 \leq b \leq 10$ and $F_B(b) = 1$ for $b > 10$.

Find the unconditional probability that $X \leq 2$.

8. (10 points) Ang is a claims processor at Cao Car Insurance Company. The number of claims that Ang can process in an hour is distributed as a Poisson distribution with a mean of 1.5.

Claims that are received are categorized as liability claims (30% of all claims), collision claims (50% of all claims) and comprehensive claims (20% of all claims).

Ang gets paid based on the number and type of claims that she processes. She gets paid 500 for each liability claim processed, 400 for each collision claim, and 200 for each comprehensive claim.

All claims are worked in the order that they are received and Ang has 10 claims to work.

Calculate the probability that Ang makes less than 600 while working four hours.

9. (10 points) The random variable N represents the number of automobile accidents during any 24 hour period in West Lafayette. N is distributed as a Poisson distribution with a mean of 4.

Calculate the probability that the number of accidents in a 24 hour period will be less than the mode of this distribution. (If there are multiple modes, then you should calculate the probability that N will be less than the smallest mode.)