

**The Infinite Actuary Exam STAM Online Course**

**C.1.3. Practice Problems on Exponentials**

1. [4.F01.10] You observe the following five ground-up claims from a data set that is truncated from below at 100:

125      150      165      175      250

You fit a ground-up exponential distribution using maximum likelihood estimation. Determine the mean of the fitted distribution.

- A. 73                      B. 100                      C. 125                      D. 156                      E. 173

2. [4.F02.23] You are given:

- (i) Losses follow an exponential distribution with mean  $\theta$ .
- (ii) A random sample of 20 losses is distributed as follows:

| Loss Range       | Frequency |
|------------------|-----------|
| $[0, 1000]$      | 7         |
| $(1000, 2000]$   | 6         |
| $(2000, \infty)$ | 7         |

Calculate the maximum likelihood estimate of  $\theta$ .

- A. Less than 1950
- B. At least 1950, but less than 2100
- C. At least 2100, but less than 2250
- D. At least 2250, but less than 2400
- E. At least 2400

3. [4.F04.26] You are given:

- (i) A sample of losses is: 600 700 900
- (ii) No information is available about losses of 500 or less.
- (iii) Losses are assumed to follow an exponential distribution with mean  $\theta$ .

Determine the maximum likelihood estimate of  $\theta$ .

A. 233

B. 400

C. 500

D. 733

E. 1233

4. [4.S01.7] You are given a sample of losses from an exponential distribution. However, if a loss is 1000 or greater, it is reported as 1000. The summarized sample is:

| Reported Loss  | Number | Total Amount |
|----------------|--------|--------------|
| Less than 1000 | 62     | 28,140       |
| 1000           | 38     | 38,000       |
| Total          | 100    | 66,140       |

Determine the maximum likelihood estimate of  $\theta$ , the mean of the exponential distribution.

- A. Less than 650
- B. At least 650, but less than 850
- C. At least 850, but less than 1050
- D. At least 1050, but less than 1250
- E. At least 1250

5. Variant of [4.F04.36] You are given:

(i) The following is a sample of 15 losses:

11 22 22 22 36 51 69 69 69 92 92 120 161 161 230

(ii)  $\hat{H}(x)$  is the maximum likelihood estimate of the cumulative hazard rate function under the assumption that the sample is drawn from an exponential distribution.

Calculate  $\hat{H}(75)$  .

A. 0.40

B. 0.51

C. 0.60

D. 0.76

E. 0.92

6. Variant of [C.F05.5] For a portfolio of policies, you are given:

- (i) There is no deductible and the policy limit varies by policy.
- (ii) A sample of ten claims is:

350 350 500 500 500<sup>+</sup> 1000 1000<sup>+</sup> 1000<sup>+</sup> 1200 1500

where the symbol <sup>+</sup> indicates that the loss exceeds the policy limit.

- (iii)  $\hat{S}(1250)$  is the maximum likelihood estimate of  $S(1250)$  under the assumption that the losses follow an exponential distribution.

Determine  $\hat{S}(1250)$ .

- A. 0.21                      B. 0.33                      C. 0.50                      D. 0.67                      E. 0.79