

The Infinite Actuary Exam STAM Online Course

A.1.2. Practice Problems on Moments

1. A nonnegative random variable X has a hazard rate function of $h(x) = \frac{3}{x}$ for $x > 2$ and 0 otherwise. Find $E[X]$.

- A. 1 B. 2 C. 3 D. 6 E. 9

2. The survival function of X is $2 - x$ for $1 < x < 2$. Find $E[X]$.

- A. 1/2 B. 5/4 C. 4/3 D. 3/2 E. 2

3. The survival function of X is $\frac{4 - x^2}{3}$ for $1 < x < 2$. Find $\text{Var}[X]$.

- A. 0.080 B. 0.081 C. 0.082 D. 0.083 E. 0.084

4. [4.S01.3] You are given the following times of first claim for five randomly selected auto insurance policies observed from time $t = 0$:

1 2 3 4 5

Calculate the kurtosis of this sample.

- A. 0.0 B. 0.5 C. 1.7 D. 3.4 E. 6.8

5. [3-CAS.F04.28] A large retailer of computers issues a warranty with each computer it sells. The warranty covers any cost to repair or replace a defective computer within 30 days of purchase. 40% of all claims are easily resolved and do not involve any cost to replace or repair. If a claim involves a cost to replace or repair, the claim size is distributed as a Weibull with parameters $\tau = \frac{1}{2}$ and $\theta = 30$.

Which of the following statements are true?

- (i) The expected cost of a claim is \$60.
- (ii) The survival function at \$60 is 0.243.
- (iii) The hazard rate at \$60 is 0.012.

- A. (i) only.
B. (ii) only.
C. (iii) only.
D. (i) and (ii) only.
E. (ii) and (iii) only.

6. [C.F06.3] You are given a random sample of 10 claims consisting of two claims of 400, seven claims of 800, and one claim of 1600. Determine the empirical skewness coefficient.

- A. Less than 1.0
- B. At least 1.0, but less than 1.5
- C. At least 1.5, but less than 2.0
- D. At least 2.0, but less than 2.5
- E. At least 2.5

7. [4B.S95.28] You are given the following:

- For any random variable X with finite first three moments, the skewness of the distribution of X is denoted $\text{Sk}(X)$.
- X and Y are independent, identically distributed random variables with mean 0 and finite second and third moments.

Which of the following statements must be true?

- (i) $2\text{Sk}(X) = \text{Sk}(2X)$
- (ii) $-\text{Sk}(Y) = \text{Sk}(-Y)$
- (iii) $|\text{Sk}(X)| \geq |\text{Sk}(X + Y)|$

- A. (ii) only B. (iii) only C. (i) and (ii) only D. (ii) and (iii) only E. None of A, B, C, or D

8. You observe the following losses:

Loss amount	0	100	200	300	400	500	600
Number of losses	12	38	26	12	9	1	2

Calculate the empirical coefficient of variation for the loss data.

- A. 0.01 B. 0.73 C. 1.37 D. 10.58 E. 50.79

9. [3-CAS.S04.28] A pizza delivery company has purchased an automobile liability policy for its delivery drivers from the same insurance company for the past five years. The number of claims filed by the pizza delivery company as the result of at-fault accidents caused by its drivers is shown below:

Year	Claims
2002	4
2001	1
2000	3
1999	2
1998	15

Calculate the skewness of the empirical distribution of the number of claims per year.

- A. Less than 0.50
- B. At least 0.50, but less than 0.75
- C. At least 0.75, but less than 1.00
- D. At least 1.00, but less than 1.25
- E. At least 1.25

10. [4B.S93.34] Claim severity has the following distribution:

Claim Size	100	200	300	400	500
Probability	0.05	0.20	0.50	0.20	0.05

Determine the distribution's skewness coefficient.

- A. -0.25
- B. 0
- C. 0.15
- D. 0.35
- E. Cannot be determined

11. The following claims are observed:

Claim Size	Number of Claims
2,000	2
4,000	6
6,000	12
8,000	10

What is the empirical skewness coefficient?

- A. -1.00
- B. -0.56
- C. 1.49
- D. 2.50
- E. 2.67

12. Suppose that X is exponential with mean 10, and Y is an independent exponential with mean 20. Find $\text{Var}[XY]$.

- A. 20,000
- B. 60,000
- C. 80,000
- D. 120,000
- E. 160,000