STAT 475
Quiz 3
Spring 2020
April 9, 2020

1. (14 points) Arnold Ant Farm is studying the life expectancy of ants. The farm's actuary, Kylie, isolates 100 ants and records the following data:

Number of Days till Death	Number of Ants Dying	r_j
1	6	100
2	10	94
3	12	84
4	20	72
5	35	
6	10	
7	3	
8	2	
9	1	
10	1	

Determine the 90% linear confidence interval for $\hat{S}(4)$ using the Nelson-Åalen estimator.

$$H(4) = \frac{6}{100} + \frac{10}{94} + \frac{12}{84} + \frac{20}{72} = 0.587017899$$

$$S(4) = e^{-H(4)} = e^{-0.587017899} = 0.556$$

$$Var\left[S(4)\right] = \left[S(4)\right]^2 \sum_{i=1}^{4} \frac{s_i(r_i - s_i)}{s_i^3}$$

$$= (0.556)^2 \left[\frac{6(100-6)}{100^3} + \frac{10(94-10)}{94^3} + \frac{12(84-12)}{84^3} + \frac{20(72-20)}{72^3}\right] = 0.00179899$$

Linear Confidence Interval $= 0.556 \pm 1.645\sqrt{0.00179899} = (0.486; 0.626)$

2. (6 points) Uppal Trucking Company suffered 100 accidents last year. The following table summarizes the amount of losses on those 100 accidents:

Amount of Loss	Number of Accidents
0 to 10,000	15
10,000 to 25,000	25
25,000 to 100,000	35
100,000 to 250,000	20
Over 250,000	5

Calculate $F_{100}(x)$ for losses between 25,000 and 100,000 using the Ogive.

Solution:

$$F(25,000) = \frac{40}{100} = 0.4$$

$$F(100,000) = \frac{75}{100} = 0.75$$

Ogive is the straight line between those two points or linear interpolation.

$$\frac{100,000-x}{100,000-25,000}(0.4) + \frac{x-25,000}{100,000-25,000}(0.75) = \frac{40,000-0.4x+0.75x-18,750}{75,000}$$

$$= \frac{21,250+0.35x}{75,000}$$