MAP 4175 / 5177 Name:____________________________

Tests 6 Date: October 9, 2019

Show all work for full credit, and use correct notation. Simplify answers completely.

You are given the following data: (Dashes indicate missing values.)

i	y_i	s_i	b_i	r_i
1	3	3	-	50
2	5	4	4	40
3	7	8	2	-
4	11	-	-	-
5	16	6	-	17
6	20	-	3	-

1. Compute the Kaplan-Meier estimate $S_{50}(8)$.

Note that $r_3 = 40 - 4 - 4 = 32$. Then

$$S_{50}(8) = \left(1 - \frac{3}{50}\right) \cdot \left(1 - \frac{4}{40}\right) \cdot \left(1 - \frac{8}{32}\right) = 0.6345$$

2. Compute the Nelson-Aalen estimate $\widehat{H}(8)$.

$$\widehat{H}(8) = \frac{3}{50} + \frac{4}{40} + \frac{8}{32} = 0.41$$

3. Let A denote the approximate value of the standard deviation of the estimator for $S(8)$ using Greenwood's formula, and let B denote the approximate value of the standard deviation of the estimator for $S(8)$ using Klein's formula. Determine the value of $A - B$.

$$A = \sqrt{[0.6345]^2 \cdot \left(\frac{3}{50 \cdot 47} + \frac{4}{40 \cdot 36} + \frac{8}{32 \cdot 24}\right)} = 0.07632 \cdots$$

For B, note that $\hat{S}(8) = e^{-0.41}$, and so

$$B = \sqrt{[e^{-0.41}]^2 \cdot \left(\frac{3 \cdot 47}{50^3} + \frac{4 \cdot 36}{40^3} + \frac{8 \cdot 24}{32^3}\right)} = 0.06378 \cdots$$

$$\therefore A - B = 0.01254 \cdots$$

Numbers 4 and 5 use the following data:
In a mortality study on 12 dragons, you are given the following observed exit times:

3+ 4+ 5 5 5+ 6+ 7 7 7 8 9 9+

4. Determine the Kaplan-Meier estimate of the survival function $S(7)$.

The relevant y_j, s_j, and r_j values are:

y_j	s_j	r_j
5	2	10
7	3	6

$$\therefore S_{12}(7) = \left(1 - \frac{2}{10}\right) \cdot \left(1 - \frac{3}{6}\right) = 0.4$$

5. Determine Greenwood's approximation of the variance of the Kaplan-Meier estimator for estimating the survival function $S(7)$.

$$V_{12} = [0.4]^2 \cdot \left(\frac{2}{10 \cdot 8} + \frac{3}{6 \cdot 3}\right) = 0.030\bar{6}$$