

STEP III, 1998, Q14

- 14 A hostile naval power possesses a large, unknown number N of submarines. Interception of radio signals yields a small number n of their identification numbers X_i ($i = 1, 2, \dots, n$), which are taken to be independent and uniformly distributed over the continuous range from 0 to N . Show that Z_1 and Z_2 , defined by

$$Z_1 = \frac{n+1}{n} \text{Max}\{X_1, X_2, \dots, X_n\} \quad \text{and} \quad Z_2 = \frac{2}{n} \sum_{i=1}^n X_i,$$

both have means equal to N .

Calculate the variance of Z_1 and of Z_2 . Which estimator do you prefer, and why?



NextStepMaths.com

To view mark schemes, fully worked solutions and examiner's comments, and for more details about tutoring and other services offered, go to NextStepMaths.com