Answer on Question #84591 – Math – Statistics and Probability

Question

A population consists of three numbers $2, 5, 8$. Enumerate all possible samples of size 2 which can be drawn without replacement from this population. Verify that the sample mean is an unbiased estimate of the population mean. Calculate the standard error of the sample mean.

Solution

There are $C(3,2) = 3$ such samples.

Sample No.	Sample Values	Sample Mean
1	2,5	$(2+5)/2 = 3.5$
2	2,8	$(2+8)/2 = 5$
3	5,8	$(5+8)/2 = 6.5$

The mean of the sample means is $(3.5 + 5 + 6.5)/3 = 5$, the population mean is $(2 + 5 + 8)/3 = 5$.

The standard error of the sample mean is $\sqrt{((3.5-5)^2 + (5-5)^2 + (6.5-5)^2)/3} = \sqrt{1.5}$.

Answer:

The samples are $\{2,5\}, \{5,8\}, \{5,8\}$.
It is an unbiased estimate because it equals the parameter being estimate, i.e. the population mean.
The standard error of the means is $\sqrt{1.5}$.