Answer on Question #62106 – Math – Statistics and Probability

Question

In a study of plants, five characteristics are to be examined. If there are six recognizable differences in each of four characteristics and eight recognizable difference in the remaining characteristics. How many plants can be distinguished by these five characteristics?

Solution

The number of plants can be distinguished by these five characteristics is

$N = 6 \cdot 6 \cdot 6 \cdot 6 \cdot 8 = 10368.$

Answer: 10368.

Question

8 Let X have a uniform distribution on the interval [A,B]. Compute V(X).

Solution

Given X is uniformly distributed on [A,B]:

$f(x) = \frac{1}{B-A}, A \le x \le B$ and $f(x) = 0, x \notin [A, B]$.

Then

$$\mu = \int_{-\infty}^{+\infty} x f(x) dx = \int_{A}^{B} \frac{x dx}{B-A} = \frac{1}{B-A}\left(\frac{x^2}{2}\right)_A^B = \frac{1}{2}\frac{1}{B-A}(B^2 - A^2) = \frac{A+B}{2};$$

$V(X) = \int_{-\infty}^{+\infty} (x-\mu)^2 f(x) dx = \int_A^B \frac{(x-\mu)^2 dx}{B-A} = = \frac{1}{B-A}\int_A^B (x-\mu)^2 d(x-\mu) = \frac{1}{B-A}\left(\frac{(x-\mu)^3}{3}\right)_A^B =$
$\frac{1}{3}\frac{1}{B-A}\left[\left(B - \frac{A+B}{2}\right)^3 - \left(A - \frac{A+B}{2}\right)^3\right] = \frac{(B-A)^2}{12}.$

Answer: $\frac{(B-A)^2}{12}$.