

Answer on Question #66001 – Math – Statistics and Probability

Question

The genetic features of a group of adult mice are such that the probability of an offspring being albino is 0.2. If 50 offsprings are born to a group of such mice, find the probability that 15 or more of them are albinos.

Solution

We have a binomial distribution (see https://en.wikipedia.org/wiki/Bernoulli_trial) with the following parameters:

$$n = 50, p = 0.2, q = 1 - p = 0.8.$$

Since

$$np = 10 > 5 \text{ and } nq = 40 > 5,$$

we shall use the normal approximation (see <https://onlinecourses.science.psu.edu/stat414/node/179>), namely De Moivre-Laplace integral theorem (see <http://www.statisticshowto.com/using-the-normal-approximation-to-solve-a-binomial-problem/>).

Let X be a random variable meaning the number of albino mice out of 50.

Then required probability (with the continuity correction) is

$$P(X \geq 15) = P(X > 14.5) = P\left(Z > \frac{14.5 - 10}{\sqrt{50 \cdot 0.2 \cdot 0.8}}\right) = P(Z > 1.59) = 0.5 - \Phi(1.59) \approx \\ \approx 0.5 - 0.4441 = 0.0559 = 5.59\%,$$

where

$$\Phi(x) = \frac{1}{\sqrt{2\pi}} \int_0^x e^{-\frac{t^2}{2}} dt$$

is the Laplace function, and we take its values from the z-table (see <http://www.statisticshowto.com/tables/z-table/>).

Answer: 0.0559.

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