Answer on Question #69532 – Math – Statistics and Probability

Question

If 50 (fifty) classes of 20 (twenty) students are randomly selected, what is the probability that 10 (ten) classes have no left-handed students if 8% of students in the class are left-handed students.

Solution

Let's recall the *formula for binomial probability* (probability for Bernoulli experiments):

$$\mathrm{P(k)} = \frac{\mathrm{n!}}{\mathrm{k!\,(n-k)!}}\mathrm{p^k}(1-\mathrm{p})^{\mathrm{n-k}},$$

where

$\mathrm{P(k)}$ is the probability of k successes out of n experiments,
n is the number of experiments,
p is the probability of success,
and $(1-p)$ is the probability of failure.

1. Let $k = 20,\ n = 20,\ p = 1 - 0.08$. Then the probability that a class has all 20 (twenty) no left-handed students is

$$\mathrm{P_1} = \frac{20!}{20!\,0!}(0.92)^{20}(0.08)^{0} \approx 0.19.$$

2. Let $k = 10,\ n = 50,\ p = \mathrm{P_1} = 0.19$. Then the probability that 10 (ten) selected classes have no left-handed students is

$$\mathrm{P_2} = \frac{50!}{10!\,40!}(0.19)^{10}(0.81)^{40} \approx 0.14.$$

Answer:

The probability is 0.14.