Tutorial 3

Week of January 28, 2019

Question 5.49, Page 237

There are 40 students in an elementary statistics class. On the basis of years of experience, the instructor knows that the time needed to grade a randomly chosen first examination paper is a random variable with an expected value of 6 min and a standard deviation of 6 min.

(a) If grading times are independent and the instructor begins grading at 6:50 p.m. and grades continuously, what is the (approximate) probability that he is through grading before the 11:00 p.m. TV news begins?

(b) If the sports report begins at 11:10 p.m, what is the probability that he misses part of the report if he waits until grading is done before turning on the TV?

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Suppose the sediment density (g/cm) of a randomly selected specimen from a certain region is normally distributed with mean 2.65 and standard deviation 0.85.

(a) If a random sample of 25 specimens is selected, what is the probability that the sample average sediment density is at most 3.00? Between 2.65 and 3.00?

(b) How large a sample size would be required to ensure that the first probability in part (a) is at least 0.99?

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Suppose that when the pH of a certain chemical compound is 5.00, the pH measured by a randomly selected beginning chemistry student is a random variable with mean 5.00 and standard deviation 0.2. A large batch of the compound is subdivided and a sample given to each student in a morning lab and each student in an afternoon lab. Let $\overline{X}$ be the average pH as determined by the morning students and $\overline{Y}$ be the average pH as determined by the afternoon students.

(a) If pH is a normal variable and there are 25 students in each lab, compute $P(-0.1 \leq \overline{X} - \overline{Y} \leq 0.1)$. [Hint: $\overline{X} - \overline{Y}$ is a linear combination of normal variables, so is normally distributed. Compute $\mu_{\overline{X}-\overline{Y}}$ and $\sigma_{\overline{X}-\overline{Y}}$.]

(b) If there are 36 students in each lab, but pH determinations are not assumed normal, calculate (approximately) $P(-0.1 \leq \overline{X} - \overline{Y} \leq 0.1)$.