ANOTHER SAMPLE TEST QUESTION

Recall the in-class demonstration of the dice-rolling simulation. It simulates $n$ rolls of a fair, 6-sided die. For this question, let $n = 25$ and let $\bar{x}$ denote the sample mean derived from a sample of size 25. One fact you’ll need which you may not know is that the population standard deviation for all dice rolls is $\sigma = 1.708$.

(a) Give the approximate sampling distribution of $\bar{x}$, and state the name of the theorem which is used to draw this conclusion.

(b) What is the probability that for a single roll of the die, the outcome will be less than 2.5? Now, what is the approximate probability that for 25 rolls of the die, the average will be less than 2.5?

(c) Imagine that someone hands you a mysterious 6-sided die which may not be a fair die. You roll it 25 times and observe a sample mean of $\bar{x} = 2.60$ and a sample standard deviation of $s = 1.7$. Give a 95% confidence interval for the true mean based on this information.

(d) Based only on your answer to (c), do you have reason to believe that the die is unfair? Explain.

(e) Of the four quantities $\mu = 3.5$, $\bar{x} = 2.6$, $\sigma = 1.71$, and $s = 1.7$, which are statistics and which are parameters? Answer the same question about the quantity

$$t = \frac{\bar{x} - 3.5}{s/\sqrt{n}}.$$