Solutions to Practice for Quiz 5

Math 125 (Introductory Statistics) *Kovitz* Spring 2025

Answer: (C) $P = 21\%$, fair

The null hypothesis is that the die is fair, with a box having five 0's and one 1.

The alternative hypothesis is that the die gets too many fives.

Model the number of fives for the die by the sum of the draws from the box.

The average of the box is 1/6, and the SD of the box is $(1 - 0)\sqrt{(1/6)(5/6)} = 0.37268$,

The EV for the sum of the draws is number of draws $\times$ average of the box.

The SE for the sum of the draws is $\sqrt{\text{number of draws}} \times$ SD of the box.

Here: EV $= 4500 \times (1/6) = 750$, and SE $= \sqrt{4500} \times 0.37268 = 25$.

Now, to approximate the chance of getting 770 or more fives, draw the block for 770 fives for the probability histogram. It runs from 769.5 to 770.5 fives. Then the endpoint for 770 or more fives (the tail) is 769.5. The chance for this result or any result more extreme is needed.

Using 770 in the standard units calculation is also OK. The continuity correction ($\pm 1/2$) is not absolutely needed here because the number of tosses is large. Read the first paragraph on pg. 317 of the text and look over example 1, which follows on pg. 317.

The normal curve may be used to approximate the chances for the sum of the draws because the number of draws is large enough. See the Central Limit Theorem in the box on page 325 of the text.

The standard units are: $\frac{769.5 - 750}{25} \approx 0.80$.

The central area for $z = \pm 0.80$ is 57.63%.
Two tails together are $100\% - 57.63\% = 42.37\%$.
The right tail—which is P—is half of that: 21.185%.

Since $P < 5\%$, conclude it was not chance error, but a real difference.

Answer: (C) $P = 21\%$, fair. (Note that using $\frac{770-750}{25} = 0.80$ would not have made any difference.)