Outline of lecture 2 - 24 - 10.

1. Find a z so that $P(Z > z) = 0.04$. Use closest table entry and resolve ties in favor of the larger z.

2. Find a z so that $P(Z < z) = 0.03$. Use closest table entry and resolve ties in favor of the smaller z.

3. A sample of $n = 400$ surgeries finds 32 that required a repeat surgery. Determine the P-value of a test the null hypothesis that the probability p that a surgery needs to be repeated is 0.06 versus the alternative hypothesis that p exceeds 0.6.

4. A journal requires P-value < 0.0001 in order to publish. What fraction of submissions having no merit nonetheless meet this criterion?

5. A sample of 900 x-ray orders finds 80 for which additional images are ordered. Determine the P-value of a test of the hypothesis that 12% of x-ray orders require such additional orders versus the alternative that fewer than 12% require additional orders.

6. Design a test to "call an election" with:
  p = fraction of the population voting Republican
  X = number in sample voting Republican
  null hypothesis: Democrat wins $(p \leqslant 0.5)$
  alternative hypothesis: Republican wins $(p > 0.5)$
  David-Goliath setup specifications:

  $p_0 = 0.48$ $P(\text{reject } H_0 \text{ if } p = 0.48) \sim 0.01$
  $p_1 = 0.52$ $P(\text{fail to reject } H_0 \text{ if } p = 0.52) \sim 0.01$

  find z_0 with $P(Z > z_0) \sim 0.01$

  z_1 z_1

$$n = \left(\frac{\sqrt{p_0 \, q_0} \, \left| z_0 \right| + \sqrt{p_1 \, q_1} \, \left| z_1 \right|}{p_0 - p_1} \right)^2$$

$$c = z_0 \sqrt{n \, p_0 \, q_0} + 0.5 + n \, p_0$$

find z_1 with $P(Z < z_1) \sim 0.01$

Determine n and c of the test that "calls the election for the Republican if $X \geq c$ and otherwise calls it for the Democrat."

$$n = \left(\frac{\sqrt{p_0\, q_0}\, \left| z_0 \right| + \sqrt{p_1\, q_1}\, \left| z_1 \right|}{p_0 - p_1} \right)^2$$

$$c = z_0 \sqrt{n\, p_0\, q_0} + 0.5 + n\, p_0$$

The test should be made to treat both Democrats and Republicans exactly equally. Whatever c turns out to be just double it and subtract one to get a new n treating both parties equally.

7. Historically, 20% of orders are returned. A test of the hypothesis that 20% of orders are returned versus the two-sided alternative that other than 20% are returned finds 33 from a sample of 100 are returned. Determine the P-value.