Section 9.1 - Significance Tests: The Basics (Part 1) (pp 529-537)

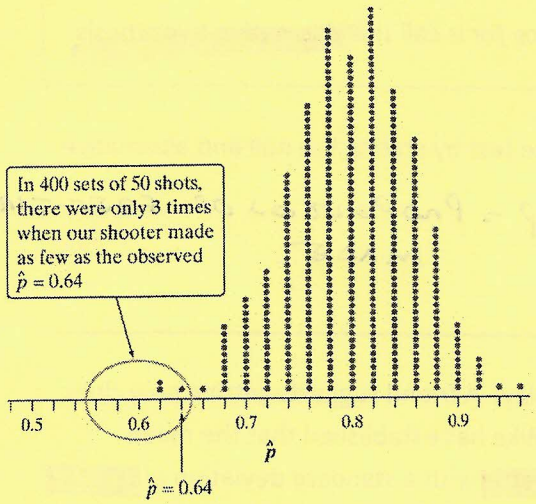
In the last chapter, we used data from random samples to *estimate population* parameters. In this chapter, we will use data from random samples and randomized experiments to *test a claim about a population* parameter. This type of inference is called a **significance test**. A significance test is a formal procedure for comparing observed data with a claim (called a **hypothesis**) whose truth we want to assess. The claim will be a statement about the population parameter.

The Reasoning of Significance Tests

Statistical tests deal with claims about a population. Tests ask if sample data give good evidence *against* a claim. Let's look at an example.

Suppose a basketball player is *claimed* to be an 80% free-throw shooter. Suppose he shoots 50 free-throw and makes 32 of them. What is the sample proportion $\hat{p}$? $\frac{32}{50} = 0.64$

What can we conclude about the player's claim based on the sample data? PROBABLY SHOULD MAKE MORE SHOTS



A simulation was run to simulate 400 sets of 50 shots assuming the player really is an 80% free-throw shooter. This dotplot shows the results.

Based upon the distribution of $\hat{p}$, what would you now say about the player's claim and the result of the sample proportion of 0.64? Justify.

THERE IS STRONG EVIDENCE THAT HE IS NOT AN 80% FREE-THROW SHOOTER SINCE ONLY 3 TIMES OUT OF 400 DID WE HAVE $\hat{p}$ AS LOW AS 0.64.

There are two possible explanations for that the fact that our player only made $\hat{p} = 32/50 = 0.64$ of his free-throws:

1. THE PLAYER'S CLAIM IS CORRECT & BY BAD LUCK, A VERY UNLIKELY OUTCOME OCCURRED.
2. THE POPULATION PROPORTION p IS ACTUALLY LESS THAN 0.80, SO THE SAMPLE RESULT IS NOT AN UNLIKELY OUTCOME.

We are going to learn very specific vocabulary in order to conduct significance testing but the basic idea is: *an outcome that would rarely happen if a claim is true is good evidence that the claim is not true.*