

Hypotheses in Significance Tests

For problems 1-3, state H_0 and H_a in words and in symbols. You do not need to answer the question posed in each problem.

1. A company has developed a new deluxe AAA battery that is supposed to last longer than its regular AAA battery. Based on years of experience, the company knows that its regular AAA batteries last for 30 hours of continuous use on average with a standard deviation of 2 hours. The company selects an SRS of 50 new batteries and uses them continuously until they are completely drained. The batteries in this sample last an average of 30.7 hours. What conclusion would you make about the new batteries?
2. Quinton says he is an 80% free-throw shooter. Rico, who has seen most of Quinton's games, is skeptical that Quinton shoots that well. Rico starts keeping track and finds out that Quinton makes 32 of his next 50 free-throws. Is this evidence that Quinton is not as good as he claims to be?
3. One study chose 18 subjects at random from a company with over 200 workers who assembled electronic devices. Half of the workers were assigned at random to each of two groups. Both groups did similar assembly work, but one group was allowed to pace themselves while the other group used an assembly line that moved at a fixed pace. After two weeks, all the workers took a test of job satisfaction. Then they switched work setups and took the test again after two more weeks. (This experiment uses a matched pairs design.) The authors of the study want to investigate whether job satisfaction of assembly-line workers differs when their work is machine-paced rather than self-paced. They plan to find the mean difference in job satisfaction scores for each worker in the sample in order to answer this question.

4. A company has developed a new deluxe AAA battery that is supposed to last longer than its regular AAA battery. Based on years of experience, the company knows that its regular AAA batteries last for 30 hours of continuous use on average with a standard deviation of 2 hour. The company selects an SRS of 50 new batteries and uses them continuously until they are completely drained. The batteries in this sample last an average of 30.7 hours. What conclusion would you make about the new batteries?

Look back to the hypotheses you wrote down in problem #1.

- a. Sketch the Normal curve for the sampling distribution of \bar{x} when H_0 is true. Why is the sampling distribution approximately Normal?
- b. The mean from the sample was 30.7. Plot this value on the curve and shade the area that represents the probability of getting an \bar{x} value of at least 30.7. Then find this probability.