SRS – Chapter 7 Practice Test – Answers

1. Can visualization of positive results help shot putters throw farther? In an experiment, an athletics coach randomly assigned 9 of his athletes to watch a two-minute video of top Olympic shot puts and the remaining 8 athletes to a control group that watched a two-minute video about nutrition. The videos were shown at the same time but in different rooms. In the next practice session the coach recorded the average distance thrown for each athlete. The athletes were not told that their coach was testing the effect of visualization.

(a) If there is convincing evidence that the athletes in the Olympics video group had a greater *ABILITY* to throw the shot, should you conclude that watching the video was the cause of the increased *ABILITY*? Explain your reasoning.

Yes. The coach conducted an experiment with randomly assigned treatments. Experiments allow for cause-and-effect conclusions.

(b) State the appropriate null and alternative hypotheses.

H_0: Athletes like these who watch a two-minute video of top Olympic shot puts have the same ABILITY to throw the shot as athletes like these who watch a two-minute video about nutrition.

H_a: Athletes like these who watch a two-minute video of top Olympic shot puts have a greater ABILITY to throw the shot than athletes like these who watch a two-minute video about nutrition.

(c) Explain what it means if the null hypothesis is true.

If millions of athletes like these watched a two-minute video of top Olympic shot puts and millions of athletes like these watched a two-minute video about nutrition, the mean distance of shot puts for each group would be the same.

(d) The mean distance thrown for the Olympics video group was 7.62 meters and the mean for the control group was 7.36 meters. Calculate the difference (Olympics video – Control) in mean distance and explain how this difference is evidence for the alternative hypothesis.

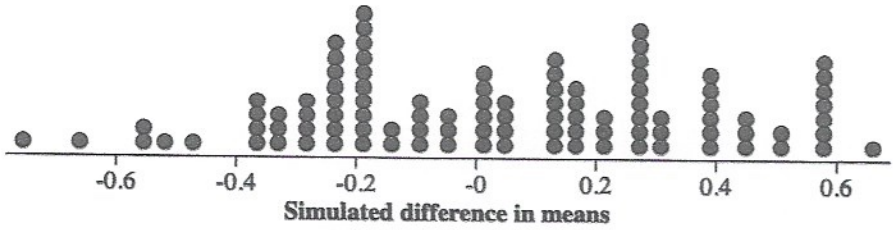
Because $\bar{x}_{video} - \bar{x}_{control} = 7.62 - 7.36 = 0.26 > 0$, there is evidence that athletes like these who watch a two-minute video of top Olympic shot puts have a greater ABILITY to throw the shot than athletes like these who watch a two-minute video about nutrition.

(e) What are two explanations for the evidence described in part (d)?

It is possible that athletes like these who watch a two-minute video of top Olympic shot puts have the same ABILITY to throw the shot as athletes like these who watch a two-minute video about nutrition and that the observed difference in means is due to RANDOM CHANCE.
It is also possible that athletes like these who watch a two-minute video of top Olympic shot puts have a greater ABILITY to throw the shot than athletes like these who watch a two- minute video about nutrition.

(f) The dotplot displays the results of 100 simulated experiments. Use the dotplot to estimate the *p*-value.

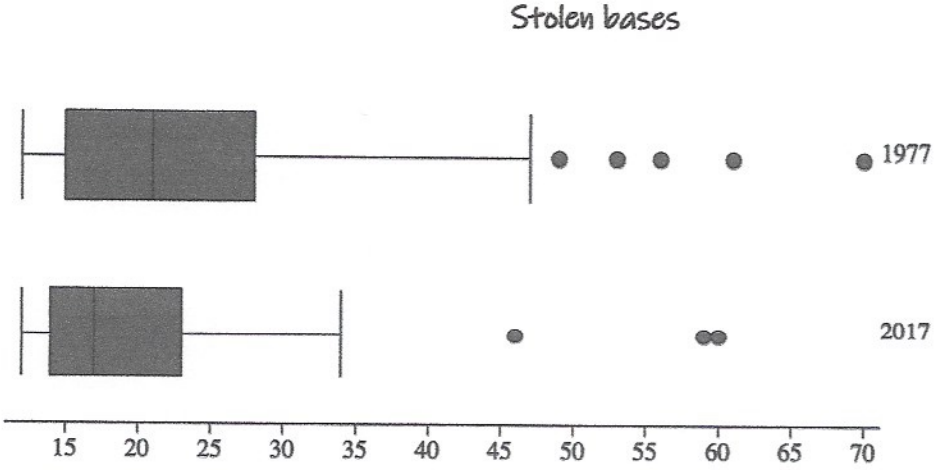
Because 22 of the 100 simulated differences are greater than or equal to the observed difference of 0.26, the p-value is approximately 22/100 = 0.22.



(g) What conclusion should you make based on the *p*-value?

Because it is fairly likely (p-value ≈ 0.22) to have a difference (Olympics video – Control) in means of 0.26 meters or more by RANDOM CHANCE alone if all athletes had the same ABILITY to throw the shot whether having watched the Olympics or nutrition video, there is not convincing evidence that athletes like these who watch a two-minute video of top Olympic shot puts have a greater ABILITY to throw the shot than athletes like these who watch a two-minute video about nutrition.

2. A student investigating whether MLB players in the past were faster than current players compared players from 1977 and 2017 with at least 12 stolen bases (there were 91 such players in 1977 and 70 such players in 2017). The boxplots display the distributions of the number of stolen bases in those two years:



(a) If there is convincing evidence that baseball players in 1977 had a greater *ABILITY* to steal bases than players in 2017, should you conclude that players were faster in 1977? Explain your reasoning.

No. These data come from an observational study so a cause-and-effect conclusion is hard to justify. Perhaps teams now believe that a stolen base is only marginally effective as a strategy and have decided not to attempt it as often.

(b) State the appropriate null and alternative hypotheses.

H_0: Baseball players in 1977 had the same ABILITY to steal bases as baseball players in 2017. H_a: Baseball players in 1977 had a greater ABILITY to steal bases than baseball players in 2017.

(c) Explain why it might be better to test for a difference in medians rather than a difference in means in this context.

Because both distributions are skewed to the right and both have high outliers, the mean may no longer be a good measure of what "typical" is. Because the median is more resistant to skewness and outliers, the median is a better measure of a "typical value" in these distributions.