



4. As a batch of parts comes off an assembly line, a random part is selected for quality control inspection. After that, every tenth part is selected until the desired total of 50 parts is achieved. What type of sampling is this? (No explanation needed.)
5. A card trick is performed using a special deck with cards numbered 1 through 50. One card is drawn at random, and laid aside. A volunteer from the audience then draws a second card. Is the number on the second card independent of the number on the first card? Explain in **one sentence**.
6. A large online role playing game is played by millions of players worldwide. The game developers are interested in the choice of players to play on the “good” or “evil” side. They plan to gather 15,000 players from the US (where there are almost 200,000 total players) at random and record which side they chose. They want to see if the proportion of all US players of this game that would choose the good side is different from 0.5. Answer only the following questions about this setting.
- (a) Construct the hypotheses step of the appropriate test for this setting.
- (b) What would the conditions step look like in this problem?
- (c) Suppose that the  $P$ -value in this setting was 0.0638 based on a negative test statistic. What conclusion would you make at the 0.05 level? (You do not need to verify this  $P$ -value.)

7. A study in the April 2016 issue of the Journal of Developmental and Behavioral Pediatrics considered the effect on children of being raised in a household in which the parents were the same sex. One variable measured was the emotional difficulties of the children (all 6-17 years old). Among 95 children included in the study (all with same sex parents), the average score on the emotional difficulty inventory was 1.97 pts. on a 5 point scale with a standard deviation of 0.73 pts. On the scale used in the paper, higher scores indicate more emotional difficulties. In the same paper, they found that for 95 children with different sex parents, the average score was 1.93 pts out of 5 with a standard deviation of 0.69. Does this data provide enough evidence, at the 0.01 level, to conclude that the average emotional difficulty rating for all children of same sex parents is not the same as the average rating for children of different sex parents?

(Link: [http://journals.lww.com/jrnldb/Fulltext/2016/04000/Same\\_Sex\\_and\\_Different\\_Sex\\_Parent\\_Households\\_and.1.aspx](http://journals.lww.com/jrnldb/Fulltext/2016/04000/Same_Sex_and_Different_Sex_Parent_Households_and.1.aspx))

8. Administrators of a large school district are attempting to study the effect that a new magnet school is having on students. To get a baseline for comparison, 12 students who applied for the magnet school and were not selected in the random lottery are tested to see the increase in their test scores over the course of the year in their original school. For these 12 students, the mean increase in standardized science test score was 3.000 points with a standard deviation of 3.977 points. Construct a 95% confidence interval for the mean increase in points on the test for all students not selected in the magnet school lottery.

9. Would you feel confident saying that the mean improvement was positive, based on your interval? (No explanation needed.)

10. Suppose we wanted to conduct a test to see if we have sufficient evidence to conclude that there is a difference between the mean fat content of sandwiches at Burger King and the mean fat content of sandwiches at McDonalds.

(a) What would a Type I error be? (No more than one sentence.)

(b) What would a Type II error be? (No more than one sentence.)

11. Suppose that the grades at a particular large public high school are normally distributed with an average of 86.4% and a standard deviation of 8.2%.

(a) What is the probability that a random student would have a grade less than 90%?

(b) If the bottom 20% of students are recommended for summer school, what would the cutoff be for the recommendation?

(c) What is the probability that a random group of 20 students would have an average grade of less than 85%?