

Understanding Random Sampling and Random Assignment

Proposed Solutions to Lesson1

SHOW ME THE MONEY! (RANDOM SAMPLING)

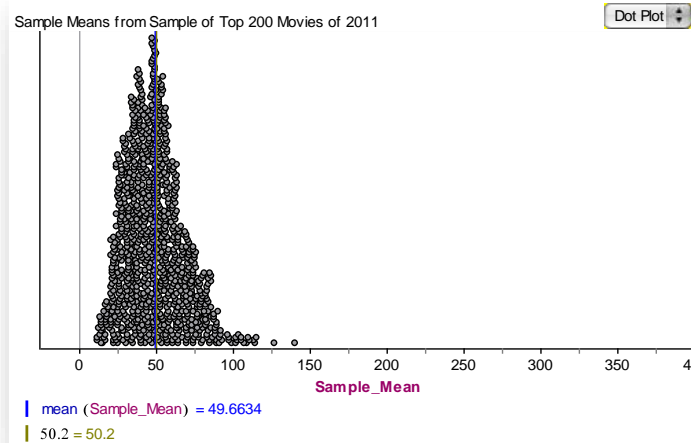
INTRODUCTION

1. Answers will vary by student.
2. Answers will vary by student.
3. Harry Potter and the Deathly Hallows Part 2.
4. Domestic Total Gross Earnings: \$381,011,219.

SAMPLING METHODS

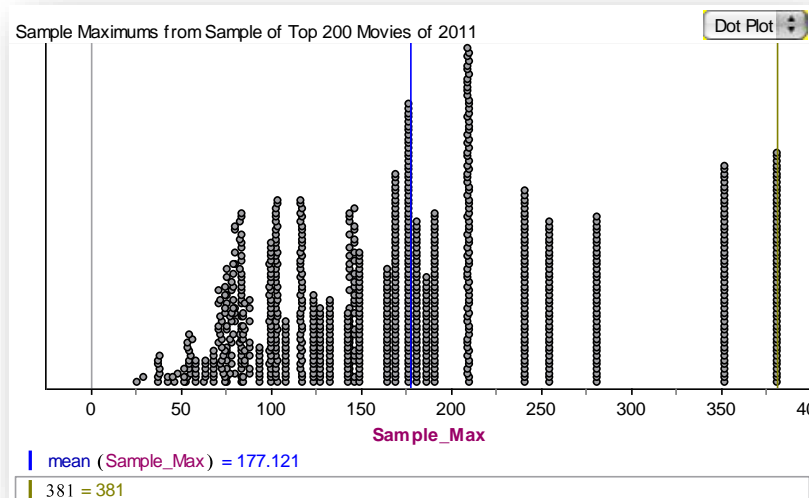
5. Answers will vary by student.
6. Answers will vary by student. *(Students will most likely obtain a sample mean higher than the true population mean, although they will not realize it.)*
7. No, the sample mean I computed is not the same as all the other sample means computed by the other students in my class.
8. Dotplots will vary by class.
9. Answers will vary by student. *(Students will most likely pick a value somewhere in the “middle” of the dots on the dotplot – which will be reasonably far from the true population mean.)*
10. Answers will vary by student.
11. No, the sample mean I computed is not the same as all the other sample means computed by the other students in my class. *(Students will most likely obtain a sample mean close to the true population mean, although they will not realize it.)*
12. Dotplots will vary by class. *(This dotplot should look very different from the dotplot in #8.)*
13. Answers will vary by student. *(Students will most likely pick a value somewhere in the “middle” of the dots on the dotplot – which should be reasonably close to the true population mean.)*
14. Yes, my guess in #13 is somewhat different than my guess in #9.
15. The sample means obtained by choosing our own samples tended to overestimate the population mean. The sample means obtained by choosing random samples tended to do a much better job of estimating the population mean. Random chance did a better job of choosing representative samples than when we chose samples on our own.

16. One possible dotplot is shown below.



BIASED AND UNBIASED ESTIMATES

17. Answers will vary by student. (For most students, the answer will be “no.” However, some students may have – by chance – gotten a sample maximum of \$381.0 million.)
18. No, my sample maximum is not the same as all the other sample maximums computed by the other students in my class.
19. Dotplots will vary by class.
20. One possible dotplot is shown below.



21. The two vertical lines in #16 are almost identical. The two vertical lines in #20 are very, very far apart. The mean (center) of sample means is very close to the population mean, so the sample mean is an unbiased estimator of the population mean. The mean (center) of the sample maximums is very far from the population maximum, so the sample maximum is a biased estimator of the population maximum.

DOES SPONGEBOB MAKE US DUMBER? (RANDOM ASSIGNMENT)

INTRODUCTION

1. (No solution needed.)
2. (No solution needed.)
3. Mean IQ *drawing pictures*: 117.3. Mean IQ *SpongeBob cartoon*: 107.4.
4. **Explanation 1:** The *drawing pictures* group did much better on the test of mental functions because they have a higher average IQ (the treatments really made no difference in mental function).
Explanation 2: The *drawing pictures* group did much better on the test of mental functions because the treatments have an impact on mental function.
5. Answers will vary by student.
6. Answers will vary by student.
7. Answers will vary by student.
8. A difference of zero indicates that the two treatment groups have the same proportion of females. A positive difference indicates that the *SpongeBob cartoon* treatment group has a higher proportion of females than the *drawing pictures* treatment group. A negative difference indicates that the *drawing pictures* treatment group has a higher proportion of females than the *SpongeBob cartoon* treatment group.
9. A difference of zero indicates that the two treatment groups have the same mean IQ. A positive difference indicates that the *SpongeBob cartoon* treatment group has a higher mean IQ than the *drawing pictures* treatment group. A negative difference indicates that the *drawing pictures* treatment group has a higher mean IQ than the *SpongeBob cartoon* treatment group.
10. Dotplots will vary by class.

11. One possible pair of dotplots is shown below.

