

9.07 Introduction to Statistics for Brain and Cognitive Sciences
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Homework Assignment 1
September 7, 2016
Due September 14, 2016 at 5:00 PM

1. As we discussed in class, the recent composite poll found that 45% of registered voters preferred Hilary Clinton compared with 41% who preferred Donald Trump. Suppose that the margin of error of the poll was 1%. Approximately how many registered voters were polled?

2. Outcome Spaces

A. Assume that a fair six-sided die is tossed twice. Let the outcome be the sum of the two die values. Make a table to show that 7 is the most likely outcome. What is the second most likely outcome?

B. Suppose that there are 6 nucleotides instead of 4 used to code for amino acids. Suppose also that only 2 nucleotides is needed to encode an amino acid. How many amino acids are possible if the nucleotides can be used with replacement?

3. To win the Powerball Lottery (current jackpot \$186 million), a contestant must pick the correct 5 numbers (white balls) from the numbers 1 to 69 and the correct 6th number from a separate set of numbers from 1 to 26.

A. How many possible outcomes are there?

B. What is the probability of winning the lottery?

4. In a certain population, 10% of people are rich, 5% of people are famous and 3% are rich and famous. For a person picked at random from this population:

A. Draw a Venn diagram of this population.

B. What is the probability that the person is not rich?

C. What is the probability that the person is rich, but not famous?

D. What is the probability that the person is either rich or famous?

5. Let A and B be events such that $P(A) = 0.4$, $P(B) = 0.3$ and $P(A \cap B) = 0.1$. Find the probability of:

A. $A \cup B$

B. A^c

C. B^c

D. $B \cap A^c$

E. $A|B$ (A given B)

6. Counting Principles.

- A. In how many ways can 10 people be seated on a bench if only 4 seats are available?
- B. Suppose that a digit (0-9), a lower case letter (a-z) or a symbol (10 symbols, !@#\$%^&*+=) may be used in only one position to construct a 5 character password. How many computer passwords are now possible?
- C. In bridge played with a standard 52-card deck a hand consists of 13 cards. How many hands are possible?
- D. On the Apple iPhone 7 the password is a sequence of 6 digits chosen from the digits 0 to 9. How many possible passwords are there? What is the probability of guessing someone's iPhone password by chance?
- E. In how many ways can 6 objects be split into two groups containing 2 and 4 objects, respectively?
- F. How many different salads can be made from lettuce, escarole, endive, watercress and chicory?
- G. From 7 consonants and 5 vowels, how many words can be formed consisting of 4 different consonants and 3 different vowels? The words need not have meaning.

7. Different anesthetics are used with different frequencies in a certain community hospital. The probability of using propofol is 0.6, of using sevoflurane is 0.3 and of using dexmedetomidine is 0.1. The likelihood of delirium for someone who has received propofol is 0.5, for sevoflurane is 0.8 and for dexmedetomidine is 0.1.

- A. If these probabilities are correct, what is the probability that there will be delirium due to sevoflurane?
- B. If there is no delirium, what is the probability that the patient received propofol?
- C. If there is delirium what is the probability that it was due to receiving either dexmedetomidine or sevoflurane?

8. Consider the starting 22 players on the MIT men's football team and volleyball team.

- A. Assuming that there are 365 days in the year, how many outcomes are there for the birthdays of the players?
- B. What is the probability that no two players were born on the same day?

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