MATH 11: Discussion Week 3

Apr. 2019

Handout and its solution could be found at `https://kimukook.github.io/teaching/math11sp19/`

More on linear regression

1. **cef** Suppose we have data on students' performances on a Calculus exam and on a Statistics exam. Suppose we use linear regression to predict scores on the Statistics exam from scores on the Calculus exam, and that we get a positively sloped regression line and an R^2 value of 0.37. Which of the following is correct:
a) Because R^2 is so low, linear regression must not be appropriate in this instance.
b) We can conclude that performing well in Calculus causes students to perform better in Statistics.
c) A student who does exceptionally well on the Calculus exam will be predicted to do less well relative to the class on the Statistics exam.
d) The R^2 value tells us that we accurately predict the Statistics scores of 37 percent of students.
e) R^2 measures the success of the regression model in terms of the fraction of the variation of y accounted for by the regression.
f) Because the correlation is always less than 1.0 in magnitude, each predicted y tends to be fewer standard deviations from its mean than its corresponding x was from its mean.

Probability

Review

- If two events A and B are disjoint, then $P(A \text{ or } B) = P(A) + P(B)$.
- If two events A and B are independent, then $P(A \text{ and } B) = P(A) \cdot P(B)$.

1. Suppose that in a town, 54 percent of the people are male, 16 percent of the people are over 6 feet tall, and 24 percent of the males are over 6 feet tall.
(1) What is the probability that a randomly chosen person from the town is both a male and over 6 feet tall?
Solution:
Let A be the event that the person is a male, and let B be the event that the person is over 6 feet tall. The probability that the person is a male and over 6 feet tall is

$$P(A \text{ and } B) = P(A)P(B|A) = (.54)(.24) \approx .13$$

(2) What is the probability that a randomly chosen person from the town is either a male or is over 6 feet tall? *Solution:*

$$\text{This is } P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = .54 + .16 - .13 = .57$$

(3) What is the probability that a randomly chosen person from the town is a male who is not over 6 feet tall? *Solution:*

$$\text{This is } P(A \text{ and } B^c) = P(A) - P(A \text{ and } B) = .54.13 = .41.$$

2. Suppose that a basketball team wins 24 percent of its games. Assume that the outcomes of its games are independent of one another. What is the probability that the team wins at least one of its first 6 games?
Solution:
The probability that the team loses a particular game is .76. Therefore, the probability that the team loses its first 6 games is $(.76)^6 \approx .193$. Therefore, the probability that the team wins at least one of its first 6 games is approximately 1 - .193 = .807.

3. What is the probability that the die with labels (1,3,5,7,9,11) will show a result that is greater than or equal to the result on the die with labels (1,2,3,4,5,6)?
Solution: so we have

results of weird dice	results of normal dice
1	1
3	3
5	5
7	6
9	6
11	6

$$\frac{1+3+5+6+6+6}{36} = \frac{27}{36} = \frac{3}{4}$$