MIT Introduction to Statistics 18.05 Problem Set 3

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Contents

1 References and License

We are answering questions in the material from MIT OpenCourseWare course 18.05, Introduction to Probability and Statistics.
In this document we are answering questions Orloff and Bloom ask in [1].
Please see the references section for detailed citation information.
The material for the course is licensed under the terms at `http://ocw.mit.edu/terms`.
We use documentation in [3], [2] to write LaTeXsource code for this document.

2 Independence

In this section we answer a problem in [**probSet2**] that involves rolling two six sided dice.

2.1 Pairwise and mutual independence

We define two events, A, and B to be pairwise independent if $P(A \cap B) = P(A)\,P(B)$.
For this problem Orloff and Bloom give us the definition of mutual independence for three events, A, B, and C. A, B, and C are mutally independent if

$$P(A \cap B \cap C) = P(A)\,P(B)\,P(C) \tag{1}$$

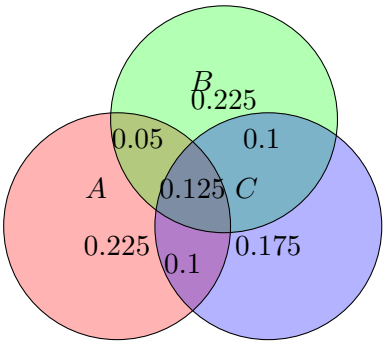
In this section, Orloff and Bloom give the following definitions for events A, B, and C:

- A is the event that we roll an odd number with the first die.
- B is the event that we roll an odd number with the second die.
- C is the event that the sum of the numbers we roll is odd.

A, B, and C are not mutually independent. Whatever the A, B, and C probabilities of A, B, and C are individually, the probability of $P(A \cap B \cap C)$ is 0 since the sum of two odd numbers is always an even number.

2.2 Venn diagram

Orloff and Bloom give the following Venn diagram:



References

[1] Jeremy Orloff and Jonathan Bloom. *18.05 Problem Set 3, Spring 2014*. Available at `https://ocw.mit.edu/courses/mathematics/18-05-introduction-to-probability-and-statistics-spring-2014/assignments/MIT18_05S14_ps3.pdf` (Spring 2014).

[2] StackExchange.com user Paul Gessler. *TikZ: How to set a node on an exact position on a line?* Available at `http://tex.stackexchange.com/questions/147052/tikz-how-to-set-a-node-on-an-exact-position-on-a-line` (2015/2/08).

[3] Texample.net user Till Tantau. *Example: Venn diagram*. Available at `http://www.texample.net/tikz/examples/venn-diagram/` (2006/11/08).