Homework 01 - STAT416

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Chapter 1 Problem 4

Let E, F, G be three events. Find expressions for the events.

Part a

Only F occurs:

$$E^c \cap F \cap G^c$$

Part b

Both E and F but not G occur:

$$(E \cup F) \cap G^c$$

Part c

At least one event occurs:

$$E \cup F \cup G$$

Part d

At least two events occur:

$$(E \cap F) \cup (E \cap G) \cup (F \cap G)$$

Part e

All three events occur:

$$E \cap F \cap G$$

Part f

None occurs:

$$(E \cup F \cup G)^c$$

Part g

At most one occurs (Also the complement of at least two):

$$((E \cap F) \cup (E \cap G) \cup (F \cap G))^c$$

Part h

At most two occur (Also the complement of all three):

$$(E \cap F \cap G)^c$$

Chapter 1 Problem 11

If two fair dice are tossed, what is the probability that the sum is $i, i = 2, 3, ...12$.

Recall the pmf of a single die. The likelihood of each digit is $p(x) = \frac{1}{6}$. Since each digit has an equal likelihood of returning, we only have to count the total number of ways to sum to i and then divide by the total number of combinations $6 * 6 = 36$ (size of sample space) to get the probability of the event to be that sum.

For example, for i = 7, we have 2 ways to get 1 and 6, 2 ways to get 2 and 5, and 2 ways to get 3 and 4. This would give i = 7 6 instances out of 36 total instances for a $p(i) = \frac{1}{6}$.

i	p(i)
2	$\frac{1}{36}$
3	$\frac{2}{36} = \frac{1}{18}$
4	$\frac{3}{36} = \frac{1}{12}$
5	$\frac{4}{36} = \frac{1}{9}$
6	$\frac{5}{36}$
7	$\frac{6}{36} = \frac{1}{6}$
8	$\frac{5}{36}$
9	$\frac{4}{36} = \frac{1}{9}$
10	$\frac{3}{36} = \frac{1}{12}$
11	$\frac{2}{36} = \frac{1}{18}$
12	$\frac{1}{36}$

We can see that the pmf outline above is valid, because all probabilities are between 0 and 1, and the sum of all probabilities is 1.

Chapter 1 Problem 20

Chapter 1 Problem 21

Chapter 1 Problem 26

Chapter 1 Problem 29

Chapter 1 Problem 38

Chapter 1 Problem 42

Chapter 1 Problem 46

Chapter 2 Problem 5

Chapter 2 Problem 9

Chapter 2 Problem 10