Chapter 6 Probability

6.1-6.3

March 22, 2016

Coin Tosses

An experiment consists of tossing a coin 3 times and observing the result as a sequence of heads and tails.

- Let E be the event: More heads than tails occur.
- Let F be the event: The first toss is a head.

1. What is the sample space for the experiment?
2. Are the events E and F mutually exclusive?
3. Does the event (T, H, H) belong to the event $E \cup F$?

Dice

Consider the experiment in which a 6-sided dice is rolled three times, and the result is recorded as a sequence.

- For example, one possible outcome is $(1, 4, 3)$.
- Suppose that E is the event: At least two of the rolls are the same.

1. How large is the sample space?
2. Describe the complement of E.

Probabilities

Outcome	Probability
s_1	p_1
s_2	p_2
$\vdots$	$\vdots$
s_n	p_n

This table is called the **probability distribution** for the sample space $S = \{s_1, s_2, \ldots, s_n\}$

Example

Is this a probability distribution?

Outcome	Probability
s_1	.3
s_2	.2
s_3	.4
s_4	.2

Example

Is this a probability distribution?

Outcome	Probability
s_1	.2
s_2	.2
s_3	.7
s_4	-.1

Example

Is this a probability distribution?

Outcome	Probability
s_1	.2
s_2	0
s_3	.7
s_4	.1

Example

An experiment with outcomes s_1, s_2, s_3, s_4 has the following probability distribution:

Outcome	Probability
s_1	.1
s_2	.6
s_3	.1
s_4	.2

Let $E = \{s_1, s_2\}$ and $F = \{s_2, s_4\}$.

1. Determine $Pr(E)$.
2. Determine $Pr(F')$.
3. Determine $Pr(E \cap F)$.
4. Determine $Pr(E \cup F)$.

Example

A factory needs two raw materials to operate.

- The probability of event E = having an adequate supply of material A is .95.
- The probability of F = having an adequate supply of material B is .97.
- The probability that the factory has an adequate supply of either material A or material B is .99.

What is the probability that the factory can operate?

Compute Probability

An experiment consists of tossing a coin 3 times and observing the result as a sequence of heads and tails.

- Let E be the event: More heads than tails occur.
- Let F be the event: The first toss is a head.

1. Assuming that all outcomes are equally likely, what is $Pr(E)$? $Pr(F)$?

Compute Probability

Consider the experiment in which a 6-sided dice is rolled three times, and the result is recorded as a sequence.

- For example, one possible outcome is $(1, 4, 3)$.
- Suppose that E is the event: At least two of the rolls are the same.
- The probability of E is...