Chapter 2, Section 4

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Outline

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- Review: What is an equally likely experiment?
- Computing probabilities in equally likely experiments

Review: Sec 2.1: Equally Likely Experiments

An experiment is called an equally likely experiment (some call these uniform experiments) if each of its possible outcomes has the same chance of occurring and is thus assigned the same probability.

- A single card is dealt from a well shuffled deck and the rank and suit noted.
- A fair die is rolled and the number showing is recorded.

Equally likely experiments

If S is the sample space of an equally likely experiment, then the probability of **every individual** outcome $\mathcal{O}$ in this experiment is given by

$$\Pr[\mathcal{O}] = \frac{1}{n(S)}.$$

If $E \subset S$ is an event in an equally likely experiment, then

$$\Pr[E] = \frac{n(E)}{n(S)}.$$

Everything depends on counting two sets!

Example

A box contains 8 slips of paper numbered 1 through 8. Three slips of paper are selected one after the other without replacement, and the number of each is noted.

- Describe the sample space S and compute $n(S)$.
- What is the probability the slips are selected in the order 8,7,1?
- What is the probability the slip numbered 5 is selected second?
- What is the probability the 3 is selected first and the 6 is drawn third?
- What is the probability all three slips selected are odd numbers?

Example

Two fair dice, a red one and a green one, are rolled.

- What is the probability the sum of the numbers on the dice is 9? What is the probability the sum of the numbers on the dice is 14?
- What is the probability the sum of the numbers is at least 5?
- What is the probability the red die is odd or the sum of the dice is at least 6?
- What is the probability the sum is even or is at most 7?

Example

A box contains 3 red, 4 blue and 5 green balls. A set of 3 balls is selected at random from the box.

- Let E denote the event that exactly 3 green balls are selected. Find $\Pr[E]$.
- Let F denote the event that exactly 2 green and 1 red are selected. Find $\Pr[F]$.
- Let A denote the event that at least 2 green balls are selected. Find $\Pr[A]$. (Note that $E \cup F \subset A$.)

Example

A 5-card poker hand is dealt at random from a standard deck of cards.

- What is the probability that exactly 2 kings are in the hand?
- What is the probability that exactly 3 of the cards are clubs?
- What is the probability that at least 3 of the cards are clubs?
- What is the probability the hand has 2 kings and 3 jacks?

A legislative committee consists of 4 conservatives and 2 liberals. A subcommittee of 3 is to be selected. If the subcommittee members are selected at random, what is the probability that the subcommittee contains at least one liberal and at least one conservative?