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Probability and Statistics

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OUTCOMES AND EVENTS

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Whenever we do an experiment like flipping a coin or rolling a die, we get an **outcome**. For example, if we flip a coin we get an outcome of heads or tails, and if we roll a die we get an outcome of 1, 2, 3, 4, 5, or 6. Unless we're rolling a 20-sided die, in which case we're likely playing Dungeons & Dragons, and the outcome is that we won't go on a date for a few years yet. Ouch.

We call the set (http://www.shmoop.com/functions/sets.html) of all possible outcomes of an experiment the **sample space**. The sample space for the experiment of flipping a coin is

{heads, tails}

and the sample space for the experiment of rolling a die is

{1, 2, 3, 4, 5, 6}.

An **event** is a set of outcomes. The event of rolling an even number with a die is the set

{2, 4, 6}.

If you were looking for odd numbers, it wouldn't be called an "oddent." Still called an "event." Sorry if that's confusing.

Each of the outcomes in this set is an even number, so if we get any of the outcomes in this set we have successfully rolled an even number. Come on...cat's eyes!

An experiment is called **random** or **fair** if any outcome is equally likely. Unlike the grand experiment that is life, which is both random and *not* fair.

If we flip a fair coin, it means either heads or tails is equally likely. No weighted coins allowed, Mr. Trickster Man. If we draw a card at random from a deck, it means any one of the 52 cards (assuming no jokers) is equally likely to be drawn.

When we talk about finding probabilities, we mean finding the likelihood of events. They're different than the skills certain aliens possess, which are generally referred to as "probe abilities." Important distinction.

If an experiment is random/fair, the probability of an event is the number of favorable outcomes divided by the total number of possible outcomes:

$$\frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

A **favorable outcome** is any outcome in the event whose probability you're finding (remember, an event is a set).

Sample Problem

If you roll a standard 6-sided die, assuming each side is equally likely to land upwards, the probability of rolling a 1 is

$$\frac{\text{the number of ways to roll 1}}{\text{the number of possible faces that could land facing up}} = \frac{1}{6}.$$

Sample Problem

What's the probability of rolling an even number on a 6-sided die?

If you're finding the probability of the event of rolling an even number, any even number is considered a favorable outcome. Especially if it means you can move ahead four spaces and buy Boardwalk.

The probability of rolling an even number on a standard 6-sided die is

$$\frac{\text{the number of ways to roll an even number}}{\text{the number of possible faces that could land facing up}}.$$

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Since there are 3 ways to roll an even number on a standard die, the probability of rolling an even number is

$$\frac{3}{6} = \frac{1}{2}.$$

This makes intuitive sense, since half the numbers on a die are even, and half are odd. Although we can't be entirely sure that's true, as we've never been able to look at all six sides at once, and we're always suspicious they keep changing on us when we aren't looking. Okay, so maybe we're paranoid.

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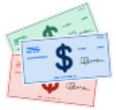

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