Notes_2_2_Sample_Space

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Notes_2_2_Sample_S...

2.2 Sample spaces

TERMINOLOGY: Suppose that a **random experiment** is performed and that we observe an outcome from the experiment (e.g., rolling a die). The set of all possible outcomes for an experiment is called the **sample space** and is denoted by S.

flip a coin.

$S = \{\text{head}, \text{tail}\}$

Example 2.2. In each of the following random experiments, we write out a corresponding sample space.

(a) The Michigan state lottery calls for a three-digit integer to be selected:

$$S = \{000, 001, 002, ..., 998, 999\}.$$

$\frac{1}{1000}$

(b) A USC student is tested for chlamydia (0 = negative, 1 = positive):

$$S = \{0, 1\}.$$

Not equal chance rule

(c) An industrial experiment consists of observing the lifetime of a battery, measured in hours. Different sample spaces are:

$$S_1 = \{w : w \geq 0\} \quad S_2 = \{0, 1, 2, 3, ..., \} \quad S_3 = \{\text{defective, not defective}\}.$$

Sample spaces are not unique; in fact, how we describe the sample space has a direct influence on how we assign probabilities to outcomes in this space. □

Power ball

5 + 1

1–69 1–26

Number of possible outcomes

$\frac{69 \times 68 \times 67 \times 66 \times 65}{5 \times 4 \times 3 \times 2 \times 1} \times 26$

$= 292201338$

winning chance

$\boxed{\frac{1}{292,201,338}}$

Probability of being involved in a fatal car accident in SC is $\boxed{\frac{1}{3175}}$

see the difference?

2.3 Basic set theory

TERMINOLOGY: A **countable set** A is a set whose elements can be put into a one-to-one correspondence with $\mathcal{N} = \{1, 2, ..., \}$, the set of natural numbers. A set that is not countable is said to be **uncountable**.

TERMINOLOGY: Countable sets can be further divided up into two types.

- A **countably infinite set** has an infinite number of elements.
- A **countably finite set** has a finite number of elements.