

2.2 Sample Spaces

In probability and statistics, an observation or measurement is referred to as an experiment or trial.

The result of an experiment is called the outcome and the set of all possible outcomes is called the sample space. (usually referred to by S).

Each outcome in the sample space is called an element of the sample space or a sample point.

Sets of outcomes in the sample space are referred to as events.

Ex. Flip a coin.

$$S = \{H, T\}$$

H = heads

T = tails

H, T are sample points.

$\{H\}$, $\{H, T\}$ are events.

Ex. Look at cars in the Fine Arts parking lot today.

$S = \{ \text{cars in Fine Arts Parking Lot} \}$.

A sample point might be my car while an event might be

$A = \{ x \in S \mid x \text{ has a manual transmission} \}$.

Often the sample space is determined by the requirements of the problem.

Ex. Roll a die.

If we want to know the exact outcome we would choose the sample space

$S_1 = \{1, 2, 3, 4, 5, 6\}$.

If we only want to know whether the number rolled is even or odd, we could just choose the sample space

$$S_2 = \{\text{even, odd}\}.$$

Ex. Roll two dice, one red and one green.

Sample space with the most information consists of the 36 points given by

$$S_1 = \{(x, y) \mid x = 1, 2, \dots, 6; y = 1, 2, \dots, 6\}$$

If we're only interested in the total of the two dice, we could instead use

$$S_2 = \{2, 3, 4, \dots, 12\}.$$