An **experiment** is a repeatable observation.
The **sample space** is the set of all possible results of an experiment.
An **event** is a set of possible results.

1. The experiment is to roll a single six-sided die, and observe which face is up. The sample space is {⚀, ⚁, ⚂, ⚃, ⚄, ⚅}. Describe the event "the number rolled is less than 4."

2. The experiment is to survey families with one child and two biological parents and observe the hair colors (light or dark) of the mother, father, and child. The sample space is

$$\{(L,L,L),(L,L,D),(L,D,L),(L,D,D),(D,L,L),(D,L,D),(D,D,L),(D,D,D)\}.$$

Describe the event "the father and child have the same hair color."

Probability assigns every event a number between 0 and 1 with the following two properties: the probability of the sample space is 1 and the probability of mutually exclusive events is the sum of their individual probabilities.

If every result in the sample space is equally likely, then probability is just two counting problems: $\Pr(E) = n(E)/n(S)$ where E is the event, and S is the sample space. A probability problem is just two counting problems.

1. The experiment is to roll a single six-sided die, and observe which face is up. The sample space is {⚀, ⚁, ⚂, ⚃, ⚄, ⚅}. If the die is "fair" then each result in the same space is equally likely. Describe the probability of the event "the number rolled is less than 4."

2. The experiment is to survey families with one child and two biological parents and observe the hair colors (light or dark) of the mother, father, and child. The sample space is

$$\{(L,L,L),(L,L,D),(L,D,L),(L,D,D),(D,L,L),(D,L,D),(D,D,L),(D,D,D)\}.$$

Describe the probability of the event "the father and child have the same hair color."

1. An experiment consists of rolling two fair dice, one white (with sides ⚀, ⚁, ⚂, ⚃, ⚄, ⚅) and one black (with sides ⚀, ⚁, ⚂, ⚃, ⚄, ⚅), and observing which sides are face up. What is the probability that the white die is ⚁ and the blue die is ⚄?

2. (Slightly tricky) A raffle sells tickets numbered 1 through 100 and selects one uniformly at random. (In other words, the experiment consists of selecting a number from 1 to 100, the sample space are those 100 numbers, and the probability of any one number coming up is equal, 1%.) What are the odds that the ticket number is divisible by 5 or 7?

3. A survey of home-owners found that 48% own less than 2 cars, 70% own less than 3 cars, and 27% own 4 or more cars.

(a) What is the probability that a randomly chosen home-owner owns 2 or 3 cars?

(b) What is the probability that a randomly chosen home-owner owns exactly 2 cars?