STUDENT RESOURCES

Word or Phrase	Definition
dependent events	Two events are dependent if the occurrence (or nonoccurrence) of one event affects the likelihood of the other. See independent events
event	An event is a subset of the sample space. See sample space. In the probability experiment of rolling a number cube, "rolling an even number" is an event, because getting a 2, 4, or 6 is a subset (part) of the sample space of {1, 2, 3, 4, 5, 6}.
experimental probability	In a repeated probability experiment, the experimental probability of an event is the number of times the event occurs divided by the number of trials. This is also called empirical probability. If, in 25 rolls of a number cube, we obtain an even number 11 times, we say that the experimental probability of rolling an even number is $\frac{11}{25} = 0.44 = 44\%$.
fair game	A game of chance is a fair game if all players have equal probabilities of winning. A two-person game of chance is a fair game if each player has probability $\frac{1}{2}$ of winning, that is, if each player has the same probability of winning as of losing.
independent events	Two events are independent if the occurrence (or nonoccurrence) of one event does not affect the likelihood of the other. See dependent. In the probability experiment of rolling a number cube and flipping a coin, the event of rolling a 1 is independent of the event of getting heads on the coin flip. The probability of rolling the 1 is $\frac{1}{6}$, no matter what the outcome of the coin flip is. In other words, the cube roll does not depend at all on the coin flip.
outcome	An outcome is a result of a probability experiment. If we roll a number cube, there are six possible outcomes: 1, 2, 3, 4, 5, 6.
percent	A percent is a number expressed in terms of the unit $1\% = \frac{1}{100}$. Fifteen percent = $15\% = \frac{15}{100} = 0.15$. $\frac{5}{6} = 0.8\overline{3} = 83.\overline{3}\%$

Word or Phrase	Definition
probability	The probability of an event is a measure of the likelihood of that event occurring. The probability $P(E)$ of the event E occurring satisfies $0 \le P(E) \le 1$. If the event, E, is certain to occur, then $P(E) = 1$. If the event E is impossible, then $P(E) = 0$. When flipping a fair coin, the probability that it will land on heads is $\frac{1}{2} = 0.5 = 50\%$.
probability experiment	A probability experiment is an experiment in which the results are subject to chance. Rolling a number cube can be considered a probability experiment.
repeating decimal	A repeating decimal is a decimal that ends in repetitions of the same block of digits. The repeating decimal 52.19343434… ends in repetitions of the block "34." An abbreviated notation for the decimal is $52.19\overline{34}$, where the bar over 34 indicates that the block is repeated. The terminating decimal 4.62 is regarded as a repeating decimal. Its value is 4.620000…
sample space	The sample space for a probability experiment is the set of all possible outcomes of the experiment. In the probability experiment of rolling a number cube, the sample space can be represented as the set {1, 2, 3, 4, 5, 6}.
simulation	Simulation is the imitation of one process by means of another process. We may simulate rolling a number cube by drawing a card blind from a group of six identical cards labeled one through six. We may simulate the weather by means of computer models.
terminating decimal	A terminating decimal is a decimal whose digits are 0 from some point on. Terminating decimals are regarded as repeating decimals, though the final 0's in the expression for a terminating decimal are usually omitted. See repeating decimal. $4.62 = 4.62000000\ldots$ is a terminating decimal with value $4 + \frac{6}{10} + \frac{2}{100}$.
theoretical probability	The theoretical probability of an event is a measure of the likelihood of the event occurring. In the probability experiment of rolling a (fair) number cube, there are six equally likely outcomes, each with probability $\frac{1}{6}$. Since the event of rolling an even number corresponds to 3 of the outcomes, the theoretical probability of rolling an even number is 3 out of 6, or $3 \bullet \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$.
trial	Each performance or repetition of a probability experiment is called a trial. Flipping a coin 25 times can be viewed as 25 trials of the probability experiment of flipping a coin once.

Phrases That Describe Probabilities

In their assessment reports on climate change, climate scientists attach the following probabilities to common expressions of likelihood:

Virtually certain:	> 99% probability
Extremely likely:	> 95% probability
Very likely:	> 90% probability
Likely:	> 66% probability
More likely than not:	> 50% probability
About as likely as not:	33 to 66% probability
Unlikely:	< 33% probability
Very unlikely:	< 10% probability
Extremely unlikely:	< 5% probability
Exceptionally unlikely:	< 1% probability

Estimating Probabilities from an Experiment With Equally Likely Outcomes

To estimate the probability of an event E, repeat the experiment a number of times and observe how many times the event occurs. The estimate for the probability of the event E occurring is then given by the fraction:

$$\text{estimate} = \frac{\text{number of times an event } E \text{ occurs}}{\text{number of trials}} = \frac{\text{numerator}}{\text{denominator}}$$

In a probability experiment of rolling a number cube with six equally likely outcomes, each has probability $\frac{1}{6}$.

The event of rolling an odd number corresponds to three outcomes: 1, 3, or 5. Below is data from an experiment where a cube is rolled 10 times.

Trial #	1	2	3	4	5	6	7	8	9	10
Outcome	4	5	6	3	5	2	1	6	4	2

In this experiment, an odd number occurred 4 times.

$\text{estimate(odd)} = \frac{4}{10} = \frac{2}{5} = 40\%$

Since the estimate is based on an experiment, different experiments may lead to different estimates.

Finding Theoretical Probabilities

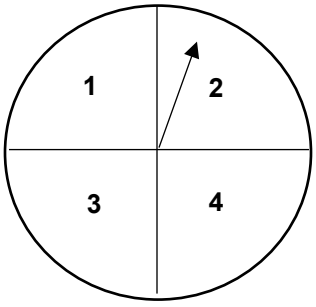
In a probability experiment of rolling a number cube with six equally likely outcomes, each has probability $\frac{1}{6}$.

The event of rolling an odd number corresponds to three outcomes: 1, 3, or 5. Thus the theoretical probability of rolling an odd number is given by the fraction:

$$P(E) = \frac{\text{number of outcomes in an event } E}{\text{total number of outcomes}} = \frac{3}{6} = \frac{1}{2} = 50\%$$

Sample Space Displays

Suppose our experiment is to flip a coin and then spin the spinner.

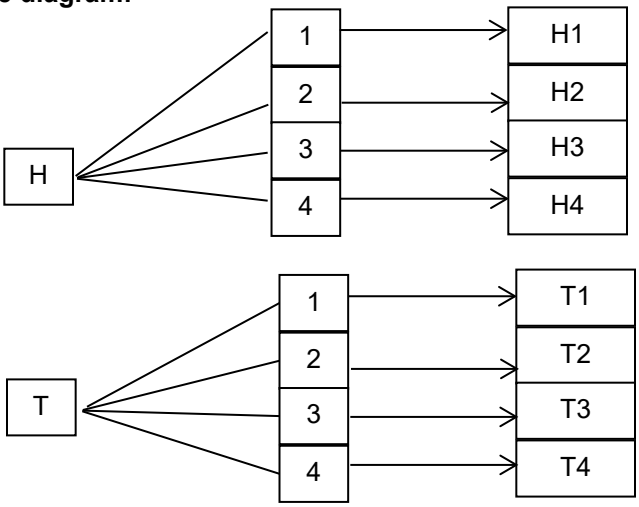


Below are three ways to show all the outcomes (or the sample space) of the experiment.

1. Outcome grid:

		Spinner			
		1	**2**	**3**	**4**
Coin Flip	**Heads (H)**	H1	H2	H3	H4
	Tails (T)	T1	T2	T3	T4

2. Tree diagram:



3. List

H1 H2 H3 H4
T1 T2 T3 T4