

Grade 7 - Compound Events and Simulations - Lesson

Common Core 7.SP.C.8 · maths-pdf.fr/en/

A **compound event** combines two or more simple events. Its probability is found by counting the favorable outcomes in the sample space, which you can list in an organized list, a table, or a tree diagram. A simulation uses random numbers to estimate the probability when counting is difficult.

Grade 7 · Common Core State Standards: **7.SP.C.8**

Key facts

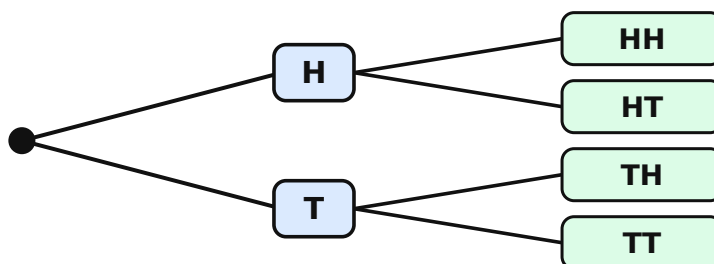
- A compound event has two or more stages, such as two coin tosses.
- The sample space lists every possible outcome.
- Counting principle: $m \times n$ outcomes for two stages with m and n ways.
- Equally likely outcomes: $P = \text{favorable} \div \text{total}$.
- A simulation uses random numbers to estimate a probability.

What is a compound event?

A **compound event** consists of two or more simple events, such as tossing a coin and rolling a die, or rolling two dice. The **sample space** is the set of all possible outcomes.

How do you list the sample space?

Use an **organized list**, a **table**, or a **tree diagram** so that no outcome is missed.



A tree diagram shows every outcome of tossing a coin twice: HH, HT, TH, TT.

For two tosses, the outcomes are HH, HT, TH, and TT. They are equally likely, so

$P(\text{two heads}) = \frac{1}{4}$, and $P(\text{at least one head}) = \frac{3}{4}$ because three outcomes contain a head.

Counting principle

If one event can happen in m ways and a second in n ways, the compound event has $m \times n$ outcomes. Three shirts and two pairs of pants give $3 \times 2 = 6$ outfits.

Shirt \ Pants	Jeans	Shorts
Red	R-J	R-S
Blue	B-J	B-S
Green	G-J	G-S

3 shirts and 2 pants give $3 \times 2 = 6$ outfits.

How do you use a table for two dice?

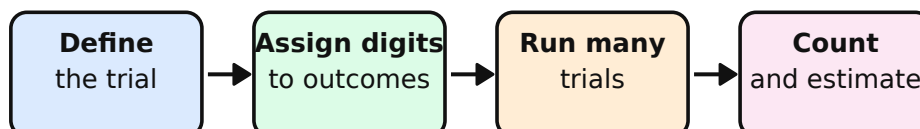
Two dice have $6 \times 6 = 36$ outcomes. A table of sums shows how many ways each sum can occur.

+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

The sum 7 appears 6 times among the 36 equally likely outcomes, so $P(\text{sum } 7) = 6/36 = 1/6$.

What is a simulation?

A **simulation** imitates a chance event with random numbers, a spinner, or coins. If a shooter makes 60% of free throws, let the digits 0 to 5 mean “made” and 6 to 9 mean “missed.” Each pair of digits is one trial of two shots. The fraction of trials with two made shots estimates the probability.



A simulation uses random numbers to model a real chance event.

With replacement means the first item goes back before the second is chosen, so the probabilities do not change. Without replacement, the second probability depends on the first draw. Always say which one is used.

Questions about compound events and simulations

What is a sample space?

It is the set of all possible outcomes of an experiment. For two coin tosses it is HH, HT, TH, and TT.

How do you use a tree diagram?

Draw a branch for each outcome of the first event, then branches from each for the second event. Each path from left to right is one outcome.

How many outcomes do two dice have?

Each die has 6 outcomes, so there are $6 \times 6 = 36$ outcomes.

What is the difference between with and without replacement?

With replacement the first item goes back, so the second draw has the same chances. Without replacement the chances change.

How does a simulation estimate probability?

Assign random digits to outcomes, run many trials, and divide the number of successful trials by the total. More trials give a better estimate.