

MATHEMATICS • CLASS 11

CHAPTER 14

Probability

CHAPTER NOTES



EVENTS AND SAMPLE SPACE

Sample space

A sample space is the set of all possible outcomes of an experiment. It acts as the universal set for that experiment.

S

Event

Any subset of the sample space is called an event.

$E \subseteq S$

When an event occurs

An event occurs when the actual outcome belongs to its set. Otherwise, the event does not occur.

$\omega \in E$: occurs; $\omega \notin E$: does not occur.

On rolling a die, consider the event that the number is less than four.

$S = \{1, 2, 3, 4, 5, 6\}$, $E = \{1, 2, 3\}$

The event occurs for any of the first three numbers, but not for the others.

Outcomes 1, 2, 3: E occurs.

Outcomes 4, 5, 6: E does not occur.

TWO COIN TOSSES: DESCRIBING EVENTS

Toss a coin twice. Keep the order of the tosses in each outcome.

H = head, T = tail

$S = \{HH, HT, TH, TT\}$

Each event is a subset of this sample space.

Exactly one head	$\{HT, TH\}$
Exactly two tails	$\{TT\}$
At least one tail	$\{HT, TH, TT\}$
At most one head	$\{HT, TH, TT\}$
Second toss is not a head	$\{HT, TT\}$
At most two tails	$S = \{HH, HT, TH, TT\}$
More than two tails	$\emptyset$

'At least' means the stated number or more. 'At most' means the stated number or less.

IMPOSSIBLE AND SURE EVENTS

Impossible event

An impossible event has no outcomes in the sample space. It cannot occur.

$$E = \emptyset$$

For a die, no face shows a multiple of seven.

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

$$E = \emptyset$$

Sure event

A sure event contains every outcome in the sample space. It always occurs when the experiment is performed.

$$F = S$$

Every number on a die is either odd or even.

$$F = \{1, 2, 3, 4, 5, 6\} = S$$

The empty set and the whole sample space are also events.

SIMPLE AND COMPOUND EVENTS

Simple or elementary event

A simple event contains exactly one sample point.
There is one simple event for each distinct outcome.

$$n(S) = n \Rightarrow n \text{ simple events}$$

For two coin tosses, the four simple events are:

$$\{HH\}, \{HT\}, \{TH\}, \{TT\}$$

Compound event

A compound event contains more than one sample point.

For three coin tosses:

$$S = \{HHH, HHT, HTH, THH, HTT, THT, TTH, TTT\}$$

Exactly one head:

$$E = \{HTT, THT, TTH\}$$

At least one head:

$$F = \{HHH, HHT, HTH, THH, HTT, THT, TTH\}$$

At most one head:

$$G = \{TTT, HTT, THT, TTH\}$$

Each of these three events contains several outcomes, so each is compound.



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