

Set 4: Probability, Sections 3.1, 3.2

We think of an *experiment* as any action that produces data.

The *sample space* is the set of all possible outcomes of the experiment.

An *event* is a subset of the sample space.

Example 1: flipping a coin three times.

Example 2: number of auto accidents in BC in a year

Example 3: lifespan in hours of 2 electronic components

Set theory for events and Venn diagrams:

- “ A union B ” \equiv “ A or B ” $\equiv A \cup B$
- “ A intersect B ” \equiv “ A and B ” $\equiv A \cap B \equiv AB$
- “ A complement” $\equiv \bar{A} \equiv A' \equiv A^c$
- the empty set, ϕ .

Definition: A and B are *mutually exclusive* (*disjoint*) if $A \cap B = \phi$.

DeMorgan's Law: $\overline{A \cup B} = \bar{A} \cap \bar{B}$

We can often use tree diagrams to help us find all possible outcomes.

Example: Suppose that a box contains red, blue, and green marbles (several of each colour). Two marbles are selected one at a time from the box, and the sequence of colours is noted. What is the sample space?

$$S = \{RR, RG, RB, GR, GG, GB, BR, BG, BB\}$$

Example: Suppose $S = \{1, 5, 7\}$. List all events associated with this sample space.

The only event with 0 sample points is:
 \emptyset .

The events with 1 sample point are:
 $\{1\}$, $\{5\}$, and $\{7\}$.

The events with 2 sample points are:
 $\{1, 5\}$, $\{1, 7\}$, and $\{5, 7\}$.

The only event with 3 sample points is:
 S .

Something to think about: Probability is used in everyday language yet it is not well defined. What is meant by the statement “the probability of rain today is 0.7”?

Oxford English Dictionary definition of probability: extent to which an event is likely to occur, measured by the ratio of favourable cases to the whole number of cases possible