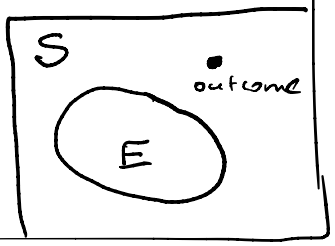
S2 : E1

EVENTS

Def • Consider an experiment.

• The set of all possible outcomes is called the sample space S.

• Subsets of S are called events



• Probability, a number $\in [0,1)$, is assigned to $\forall$ event (next class).

Examples

1. Experiment = flip coin twice

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

   ↖ ↑ ↑ ↗
   4 outcomes

   E = "getting head once" = $\{HT, TH\}$

   Probability $(E) = \frac{1}{2}$ (next class)

2. Experiment = record the time of the first 911 call today

   $S = [0, 24]$

   E = "someone calls 911 by 9:00 am" = $[0, 9]$

   Prob = ?

3. Toss two dice.

$S = \{(i,j) : i,j = 1,\dots,6\}$. $|S| = 36$

$E =$ "the sum of the dice is ≥ 10"

$= \{(4,6), (5,5), (5,6), (6,4), (6,5), (6,6)\}$ $|E| = 6$

$Prob = \frac{6}{36} = \frac{1}{6}$ (next class)

4. Exp: a study is performed on families, the sex of children is recorded (older first)

$S = \{N, B, G, BB, BG, GB, GG, BBB, \dots\}$

N: no children; B: one boy

$E =$ "the older child is a boy" $= \{B, BB, BG, BBB, BBG, \dots\}$

5. Exp.: choose a sample of 10 rats from a lab of 100

$S = \{$all subsets of 10 rats$\}$. $|S| = \binom{100}{10}$

$E =$ "sample has 4 sick, 6 healthy rats"

$E = \{$all subsets of 60 rats with 4 sick, 6 healthy$\}$

$|E| = \binom{40}{4}\binom{60}{6}$, $P(E) = \frac{|E|}{|S|} = 0.26$