PROB

DISCRETE OUTCOMES

- TOSS A DIE   OUTCOMES: $\{1, 2, 3, 4, 5, 6\}$

- TOSS A COIN UNTIL YOU SEE
  A HEAD
  OUTCOME: THE # OF THAT TOSS
  OUTCOMES: $\{1, 2, 3, 4, \cdots\cdots\}$
  ∞ NUMBER.

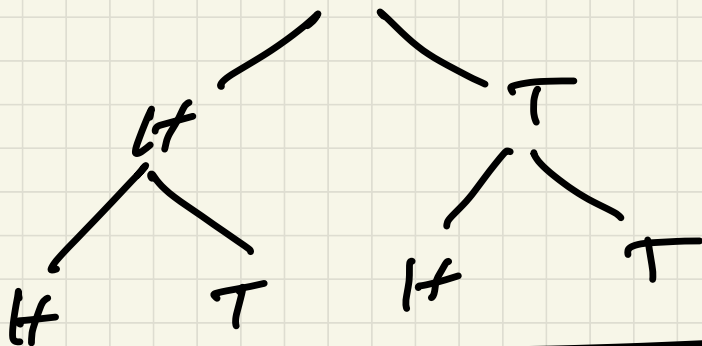## CONTINUOUS OUTCOMES

- TEMPERATURE
- THROW A PAPER AIRPLANE
  LOCATION OF LANDING (x, y)

- YOU CANNOT LIST ALL OUTCOMES.

- WE NEED DIFFERENT MATH HERE.

- MATH: COUNTABLE   VS
        UNCOUNTABLE INFINITY.

-

TREE DIAGRAM OF
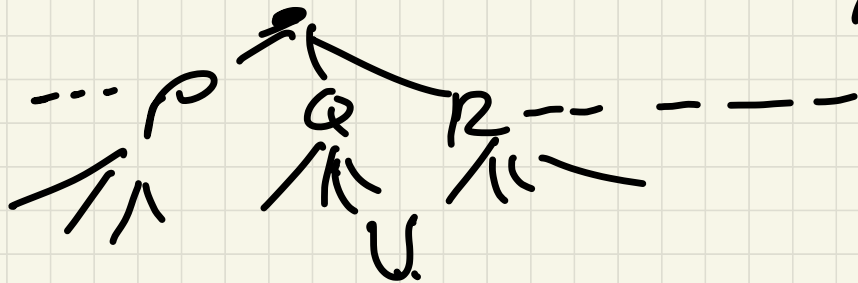SUCCESSIVE DISCRETE EXPERIMENTS

TOSS COIN   1ST TOSS

2ⁿᵈ TOSS

                H   T   H   T

ENGLISH LANG TEXT
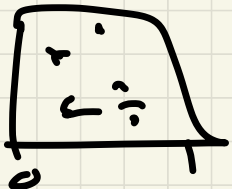1ST LOOK AT RANDOM POINT IN
                                          TEXT

2ⁿᵈ   --- P   Q   R -- - - - -
                      U.

→ MARKOV MODELS .

SAMPLE SPACE

SET OF ALL OUTCOMES

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

COIN $\quad S = \{H, T\}$

PAPER AIRPLANE $\{(x, y) : 0 \leq x \leq 1, \; 0 \leq y \leq 1\}$

EVENT — USEFUL SET OF OUTCOMES

DIE $\quad$ EVENT : DIE $\leq 2 \quad \{1, 2\}$

$\qquad$ DIE IS PRIME : $\{2, 3, 5\}$
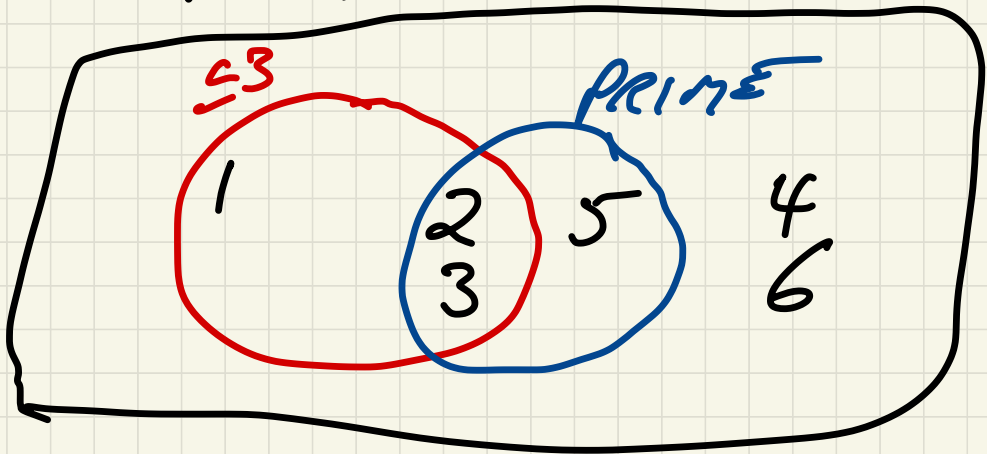
$\qquad$ DIE $> 10 \quad \{\}$

PAPER AIRPLANE

$\{(x, y) : 0 \leq x \leq \frac{1}{2}, \; 0 \leq y \leq \frac{1}{2}\}$

$$x^2 + y^2 \leq 1$$

WITH CONTINUOUS SPACE, YOU
HAVE TO WORK WITH EVENTS,
NOT OUTCOMES.

VENN DIAGRAM FOR DIE

REGULARITY

TOSS COIN N TIMES

N	#HEADS	FRACT
4	3	.75
10	4	.4
100	55	.55
1000	502	.502

$$\downarrow \rightarrow .5$$

LAW OF LARGE NUMBERS

AS WE TOSS MORE COINS

FRACTION OF HEADS

$$\rightarrow 50\%$$

MOST DISTRIBS DO THIS

SOME IMPORTANT ONES
DO NOT

THAT'S MOSTLY BEYOND
THIS COURSE.
STOCK MARKET PROBABLY.