

WHAT AP STAT STUDENTS NEED TO KNOW ABOUT: PROBABILITY

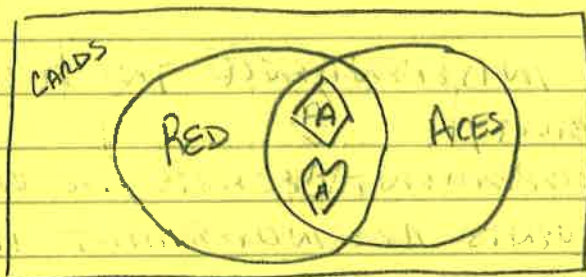
- 1] PROBABILITY IS DEFINED AS THE LONG RUN RELATIVE FREQUENCY OF OCCURANCE
- 2] WE BELIEVE - DEALING WITH THEORETICAL RESULTS - A MODEL
- 3] PROBABILITY INVOLVES RANDOM EVENTS, REPEATED AGAIN AND AGAIN.
- 4] NEED TO UNDERSTAND ENOUGH PROBABILITY TO WORK WITH EXPECTED VALUES AND SAMPLING MODELS
- 5] KNOW 3 BASIC WORDS
 - NOT MEANS SUBTRACT FROM 1
 - OR MEANS ADD (EVENTS MUTUALLY EXCLUSIVE)
 - AND MEANS MULTIPLY (MUST BE INDEPENDENT)
- 6] MUTUALLY EXCLUSIVE AND INDEPENDENT ARE NOT THE SAME
- 7] WHAT CAN GO WRONG "THE LAW OF AVERAGES IS FALSE!! THE LAW OF LARGE NUMBERS IS TRUE!"
- 8] THE LAW OF LARGE NUMBERS, SHORT RUN ANOMALIES GET DROWNED OUT IN THE LONG RUN BASED ON THE LARGE NUMBER OF TRIALS

PROBABILITY (Part 2)

1] MAKE A PICTURE

- VENN DIAGRAMS USEFUL TO DESCRIBE UNIONS AND INTERSECTIONS
- TREE DIAGRAMS AND TABLES USEFUL FOR CONDITIONAL PROBABILITIES

2] ASK "IS CARD DRAWN AT RANDOM IS A RED CARD OR AN ACE?" WE CAN NOT ADD THE $\frac{2}{6}$ RED CARDS AND 4 ACES BECAUSE SOME ACES ARE RED. A VENN DIAGRAM CAN SHOW THIS, AND LEADS TO THE GENERAL ADDITION RULE



3] ASK "WHAT IS THE PROBABILITY OF GETTING TWO ACES IN A ROW?" WE CAN NOT SIMPLY MULTIPLY PROBABILITIES SINCE THE CHANGING COMPOSITION OF THE DECK EFFECTS THE PROBABILITY OF GETTING A SECOND ACE GIVEN 1 ACE IS ALREADY MISSING (THE CONCEPT OF CONDITIONAL PROBABILITY)

4] TWO WAY TABLE IS A GOOD WAY TO DEVELOP THE CONCEPT OF CONDITIONAL PROBABILITY THE NUMBER OF WAYS BOTH HAPPEN GIVEN AN EVENT HAPPENED.

- 5] THE DIRECTION OF THE CONDITIONING IS IMPORTANT
- PROBABILITY THAT A RED CARD IS A HEART !!
 $P(\text{HEART})$ GIVEN RED IS $\frac{1}{2}$
 - PROBABILITY THAT A HEART IS RED
 $P(\text{RED})$ GIVEN HEART IS 1

- 6] REVERSE CONDITIONING ARE THE MOST CHALLENGING FOR STUDENTS
- USE TREE DIAGRAMS AND COMMON SENSE
- ① MAKE A TREE DIAGRAM
 - ② WRITE A CLEAR STATEMENT OF THE CONDITIONAL PROBABILITY

- 7] DEFINE INDEPENDENCE IN TERMS OF CONDITIONAL PROBABILITY
- INDEPENDENT EVENTS DO NOT AFFECT EACH OTHER
 - 2 EVENTS ARE INDEPENDENT IF THE OCCURRENCE OF ONE DOES NOT CHANGE THE PROBABILITY OF ANOTHER.
 - FORMULA FORM PROB B GIVEN A EQUALS PROB B

- 8] CAN MULTIPLY PROBABILITY ONLY IF INDEPENDENT
(THIS IS A BY PRODUCT OF CONDITIONAL RULE)

- 9] MUTUALLY EXCLUSIVE EVENTS (DISJOINT) CAN NOT HAPPEN AT THE SAME TIME (IT'S IMPOSSIBLE)
- INDEPENDENT EVENTS CAN HAPPEN AT THE SAME TIME
- DISJOINT EVENTS CAN NOT BE ~~MUTUALLY~~ INDEPENDENT

- 10] HAVE EXAMPLES "EVENTS NOT DISJOINT ~~MAY~~ MAY OR MAY NOT BE INDEPENDENT" CONSIDER MALE + BLUE EYES
- BECAUSE MALES AND BLUE EYES ARE NOT DISJOINT
 - "SOME MALES HAVE BLUE EYES." $\rightarrow$ KNOWING MALE DOES NOT MAKE ANYMORE LIKELY BLUE OR NOT. $\rightarrow$ NOW COLOR BLIND MALES HIGHLY CORRECTED SO NOT INDEPENDENT