5.2 - Probability Rules

Notes provided by E. Kelly Pendleton from Ardrey Kell High School, including:

-the idea of probability
-myths about randomness
-simulation

adjust as you wish
email elizabethk.pendleton@cms.k12.nc.us if you need the flipchart version

5-2: Simple Probability

Sample space - the set of all possible outcomes.

Multiplication principle - used to get the number in a sample space.

If you can do one task in a number of ways and a second task in b number of ways, then both can be done in a*b number of ways.

P(A) = the probability that event A occurs → $\frac{\text{event A}}{\text{sample space}}$

$P(A^c)$ = complement = 1 - P(A)

↙ not A

↓ the prob. that event A does not occur

Multiplication Principle

1. If a license tag consists of 4 letters and 2 digits, how many combinations are possible?

$26 \cdot 26 \cdot 26 \cdot 26 \cdot 10 \cdot 10 = 177{,}517{,}600$

2. If a license tag consist of 3 letters with no repetition and 3 digits, where the first cannot be zero, how many combinations are possible?

$26 \cdot 25 \cdot 24 \cdot 9 \cdot 10 \cdot 10 = 14{,}040{,}000$

3. How many phone numbers are possible with an area code of 704? (Hint: the first digit cannot be 0, the first 3-digits cannot be 411 or 911).

$9 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 9{,}000{,}000$

$411 \rightarrow 1 \cdot 1 \cdot 1 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 10{,}000$

$911 \rightarrow 1 \cdot 1 \cdot 1 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 10{,}000$

$9{,}000{,}000 - 20{,}000 = 8{,}980{,}000$

Rules of Probability

1. $0 \leq P(A) \leq 1$
2. all probabilities in a sample space sum to 1
3. P(A or B) = P(A) + P(B) - P(A and B)
4. mutually exclusive events: P(A and B) = 0

events that share no outcomes

5. independent events: P(A and B) = P(A)*P(B)

events that have no effect on each other

Symbols

$\cup$ $\cap$ ^{c}

a standard deck of cards: 52 total cards
-4 suits (hearts, spades, clubs, & diamonds), 13 of each
-13 cards (2-10, Jack, Queen, King, Ace)
-2 red suits, 2 black suits (26 red, 26 black)

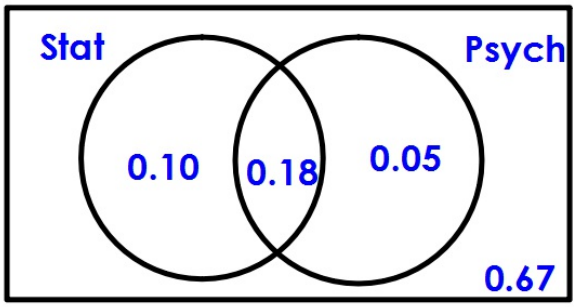
Find the following probabilities:
a) P(red) = 26/52
b) P(Queen) = 4/52
c) P(red and Queen) = 2/52
d) P(red or Queen) = 26/52 + 4/52 - 2/52 = 28/52
e) P(spade) = 13/52
f) P(spade or club) = 13/52 + 13/52 = 26/52

28% of the senior class takes AP Statistics, 23% takes AP Psychology, and 18% take both.

a). Make a two-way table for this scenario.

	AP Stats	not AP Stats	Total
AP Psych	0.18	0.05	0.23
not AP Psych	0.10	0.67	0.77
Total	0.28	0.72	1

b). Make a Venn diagram that models the chance process using event S = the student takes AP Statistics & event P = the student takes AP Psychology.



c). Find the probability that a student is in AP Stats or AP Psych.

P(Stat or Psych) = 0.33

d). Find the probability that a student is in neither AP course.

P(not Stat and not Psych) = 0.67

e). Find the probability that a student is in AP Stats, but not AP Psych.

P(Stat and not Psych) = 0.10

Classwork:

Finish the side of the worksheet titled "Probability Practice"

4f: change to "OR" instead of "AND"

SKIP 5

Then complete pg. 309 #45, 49, 50, 53-60