Lesson #10 (Weeks Topics 1-5)

Probability → Theoretical / Empirical

a) Coin  Two side: Head and Tails

b) If I flip a coin what are the chances of getting Heads? $P(H) = \frac{1}{2}$ → what I want; → total # of choices (sample space) = 50%

Theoretical

c) We all flip 10,000 coins < 8,000 Heads / 2,000 Tails

Empirical

$P(H) = \frac{8000}{10,000} = \frac{8}{10} = \frac{4}{5} = 80\%$ *

* Note: Discrepancy - Why? - The coin is not FAIR

Note2: If you repeat an experiment many times: The Law of large numbers.

Oct 19-2:20 PM

4) Let's throw a fair die 

Sample space 6

SS = {1,2,3,4,5,6}

$P(1) = \frac{1}{6}$, $P(2) = \frac{1}{6}$, $P(3) = \frac{1}{6}$, $P(4) = \frac{1}{6}$, $P(5) = \frac{1}{6}$, $P(6) = \frac{1}{6}$ $\Sigma = \frac{6}{6} = 1$

upper limit for Prob.? 1

$P(7) = 0$

Lowest limit for Prob! 0

Prob has a scale of answers

$0 \leq P(E) \leq 1$

$P(\text{even \#}) = \frac{3}{6}$

opposites: $P(A) + P(\bar{A}) = 1$

$P(\text{\# less than 3}) = \frac{2}{6}$

$P(\text{\# greater or = to 3}) = \frac{4}{6}$

$\Sigma \frac{6}{6} = 1$

Note: P(a dog writing a book) = 0.0000001

P(it will get DARK later today) = 0.999999...

Oct 19-2:52 PM

Find the probability of flipping exactly two heads on 3 coins

Coin1 Coin2 Coin3

$\frac{3}{8}$ (sample space)

2 · 2 · 2 = (8) counting Principle

tree

HHH, HHT, HTH, HTT, THH, THT, TTH, TTT — 3

Oct 19-3:07 PM

Week 5 - Probability

Find the probability of getting an even number on a die or heads on a coin.

6 (even #) or 6 (Heads) / 12

objects: Die (6) Coin (2) = 12

Die: 1 (Heads, Tails), 2, 3, 4, 5, 6

(1H)* (4H)* (1T) (4T) (2H)* (5H) (2T) (5T) (3H) (6T) (3T) (6H)*

and = ∧ / ∩

OR = ∨ / ∪

P(A) = even #

P(B) = Heads

$= \frac{P(A) + P(B) - P(A \text{ and } B)}{12} = \frac{9}{12}$

$P(A \text{ and } B) = \frac{3}{12}$

$P(A \text{ or } B) = \frac{9}{12}$

Oct 23-2:03 PM

1)

Grades of Students

	A	B	C	Total
Male	16	5	9	36
Female	17	13	12	42
Total	33	18	21	72

$P(\text{the student is Female and got a "B"}) = \frac{13}{72} = 13 \div 72 =$

Oct 23-11:14 AM

2)

Grades of Students

	A	B	C	Total
Male	15	4	19	38
Female	18	6	20	44
Total	33	10	39	82

P(the student was Female or got an "A")

$\frac{44 + 33 - 18}{82} = \frac{59}{82}$

$P(A \text{ or } B) = P(A \vee B) = \frac{P(A) + P(B) - P(A \wedge B)}{\text{Total}}$

3)

	A	B	C	total
male	12	15	17	44
female	10	8	4	22
total	22	23	21	66

↓ not B ↓ not B

P(the student did not get "B") $= \frac{43}{66}$

$P(\bar{B}) = \frac{22 + 21}{66} = \frac{43}{66}$

P(the student got C) $= \frac{21}{66}$

Oct 23-2:27 PM

Oct 23-3:14 PM

4) A group of people were asked if they had run red lights in the last year.

485 responded YES
121 responded NO
606

P(a person they have run RED lights) = $\frac{485}{606}$

Oct 23-2:41 PM

5) $P(A/\bar{B}) = \frac{P(A \cap \bar{B})}{P(\bar{B})} = \frac{20+6}{22+33} = \frac{36}{55}$

$P(\bar{B})$ = Not Got C

	A	B	C	total
Male	2	17	14	33
Female	20	16	8	44
total	22	33	22	77

P(A) = Female
P(B) = Got C
P(A/B) = $\frac{8}{22}$

$P(B/A) = \frac{P(B \cap A)}{P(A)} = \frac{8}{44}$

P(One student chosen Random was MALE Given they got an "A")

P(A Given B) = P(A/B) = $\frac{P(A \cap B)}{P(B)} = \frac{2}{22}$

P(A) = MALE
P(B) = Got A

Oct 23-2:46 PM

Definition

Independent events: One event does not change or affect another event.

Dependent events: One event changes or affect another event.

Mutually Exclusive events: events can not happen at the same time

Oct 23-3:05 PM