Quiz 2

Due Jan 31 at 11:59pm   **Points** 100   **Questions** 6

Available Jan 28 at 10am - Jan 31 at 11:59pm 4 days   **Time Limit** 120 Minutes

Attempt History

	Attempt	Time	Score
LATEST	[Attempt 1](#)	23 minutes	100 out of 100

⚠ Correct answers will be available on Feb 1 at 12pm.

Score for this quiz: **100** out of 100

Submitted Jan 31 at 8:11pm

This attempt took 23 minutes.

Question 1   **20 / 20 pts**

In baseball, a player tries to hit a ball thrown by another player. The probability of hit θ for a player is an important statistic. Using θ as the parameter (i.e., probability of success) in binomial distribution, we can model the the number of hits (H) and number of misses (M) of a player, where the total number of trials of a player is given by $N = H + M$.

Given the probability mass function of binomial distribution, $p(\theta) = \theta^H (1-\theta)^M$, which one below gives the maximum likelihood (ML) estimate of hit probability θ ?

○ H/M

◉ H/N

○ H/(N+M)

○ M/N

Question 2

15 / 15 pts

Given the dataset below, who is the most successful player according to the maximum likelihood estimation?

Player	#Hits (H)	#Trials (N)
V	2	2
W	0	5
X	150	1000
Y	3600	10000
Z	33	100

○ X

○ Z

○ Y

○ W

◉ V

Question 3

15 / 15 pts

Given the dataset above, who is the least successful player according to the maximum likelihood estimation?

○ X

◉ W

○ V

○ Z

○ Y

Question 4   **20 / 20 pts**

The maximum likelihood (ML) estimation without regularization may cause overfitting with small number of trials. One way to regularize the ML estimation is to use a prior distribution for the parameter θ. This parameter estimation is called the maximum a posteriori (MAP) estimation.

For the binomial distribution parameter θ, the most appropriate prior is known to be the beta distribution, which provides a priori numbers of hit (H_0) and miss (M_0). For the dataset given in the previous question, these a priori numbers are computed as $H_0 = 100$ and $M_0 = 300$ based on historical data.

Given that in MAP estimation θ is estimated with $\frac{H_0 + H}{H_0 + M_0 + N}$, who is the most successful player in the above dataset?

○ Z

◉ Y

○ X

○ V

○ W

Question 5   **15 / 15 pts**

Given the dataset above, who is the least successful player according
to the MAP estimation?

⦿ X

○ Y

○ Z

○ V

○ W

Question 6   **15 / 15 pts**

According to the MAP estimation, what is the hit probability of players X
and W, respectively?

○ 0.15 and 0

○ 0.20 and 0.10

○ 0.15 and 0.25

⦿ 0.18 and 0.25

Quiz Score: **100** out of 100