

Directions: Please answer all of the questions below. The point values for each problem are indicated in parentheses. Partial credit will be awarded if you show your work. Be careful not to spend too much time on any one part.

1. Career and 2008 season totals for Albert Pujols of the St. Louis Cardinals were obtained from MLB.com and are provided in the table below.

Season	G	AB	R	H	2B	3B	HR	RBI	BB	SO	OBP	AVG
2008	148	524	100	187	44	0	37	116	104	54	.462	.357
Totals	1239	4578	947	1531	342	13	319	977	696	506	.425	.334

a. Suppose that Albert appeared at the plate 4 times in a 2008 game. According to a binomial probability model, what is the probability that Albert gets on base 0, 1, 2, 3, or 4 times in this game? (10)  $2008\ OBP = .462 = p$  Calc > Prob dist > Binomial

Number of times on base	0	1	2	3	4
Probability	.0838	.2878	.3707	.2122	.0456

b. How many times would you expect Albert to get on base when he comes to the plate 4 times in a 2008 game? Explain. (5)

$$E[X] = \mu_x = np = 4(.462) = 1.848$$

c. Find the expected number of games during the 2008 season where Albert gets on base 0, 1, 2, 3, and 4 times. (10) 148 times the probabilities in part (a)

Number of times on base	0	1	2	3	4
Expected Count	12.34	42.59	54.86	31.41	6.74

d. According to a Poisson probability model for Albert's career, what is the probability that Albert gets 0, 1, 2, 3, or 4 hits in a particular game? Explain. (10) Career Avg = .334

Number of hits	0	1	2	3	4
Probability	.7161	<del>.2392</del>	.0399	.0044	.0004

e. Use Albert's career totals to calculate the probability that he hits his first home run in his third at bat later this spring. Please round your estimate of the probability of success to 3 decimal places. Explain. (5)  $P_{HR} = \frac{319}{4578} = .070$  Use Geometric dist with  $p = .07$

Calc > Prob dist > Geometric:  $P(\text{1st HR on 3rd at bat}) = .060543$

f. What is the probability that Albert will hit his 10<sup>th</sup> home run in less than 90 at bats (approximately 1 month)? Explain. (10)

Use  $p = .07$  from part (e) and the Negative Binomial distribution.

Calc > Prob dist > Negative Binomial  $P(\text{10th HR in } < 90 \text{ at bats}) = .0929222$   
cumulative