STAT 340 Final Exam Solutions, Spring 2023

MC1	a	**MC2**	e	**MC3**	c	**MC4**	e
MC5	b,c	**MC6**	b	**MC7**	d	**MC8**	c
MC9	d						

SA1

a. P(A) = 6/16
b. P(B) = 8/16
c. P(A&B)=3/16
d. A and B are independent because P(A&B)=P(A)P(B)

SA2

a. Incorrect: Using 0.01 may be better to use because it gives a lower rate of false positives, but it also gives a higher rate of false negatives. It depends on what you are looking for.
b. Incorrect: For a computed 95% confidence interval for mu, we are 95% confident that the interval captures mu.
c. Incorrect: You can decide whether or not to include an interaction term by checking if the p-value for the interaction is low.
d. Incorrect: If two events are independent then they cannot be mutually exclusive

SA3

a. 95% CI for the interaction term is -6.557 +/- 1.96*2.6179; because this does not include zero we are 95% confident that the true coefficient is nonzero.
b. 27.62 – 9.38 + 0.017731*500
c. Approximately 70.72% of the change in the response variable is explained by the change in predictors
d. The QQ plot indicates that the residuals are not normally distributed, violating the normality assumption. Also we have much higher variation of residuals in the center than we do towards the ends of the fitted values, indicating we do not have constant variance.

SA4

a. TP = n*p*s
b. TN = n*(1-p)*(1-alpha)
c. FP = n*(1-p)*alpha
d. FN = n*p*(1-s)

SA5

a. The most significant predictor in the model seems to be the intercept, Pclass3 and Sexmale;
    a. Intercept: 3.777 is the log-odds of survival for a 1st class female 0 year old (meaningless)
    b. Pclass2: -1.31 is the log(odds-ratio) of survival for a 2nd class passenger compared to an otherwise identical 1st class passenger
    c. Pclass3: -2.58 is the log(odds-ratio) of survival for a 3rd class passenger compared to an otherwise identical 1st class passenger
    d. Sexmale: -2.522781 is the log(odds-ration) of survival for a male passenger compared to an otherwise identical female passenger
    e. Age: -.037 is the change in log-odds of survival for a 1 year increase in age.
b. A 95% CI for Sexmale is -2.52 +/- 1.96*.207391; we are 95% confident that the true coefficient value is in this range.
c. Predicted log-odds = 3.777 -2.523 – 0.037*20
d. Probability = 1/(1+e^(-LO))

SA6

1. Calculate lambda_hat = mean(data)
2. Create an empty vector of simulated_lambda_hat values
3. For loop NMC=10000 times:
    a. Generate 100 values from Poisson(lambda_hat)
    b. Calculate the mean, save it in the vector of simulated_lambda_hat's
    c. Repeat
4. Calculate the 2.5th and 97.5th percentiles from the vector of simulated_lambda_hat's; these represent the bounds of the 95% confidence interval for lambda.

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