1. Consider the following modeling scenario: For a single year, researchers measure the number of motor vehicle accidents that result in death in each of the 50 states in the United States. They also record each state's speed limit laws over the same time period, and each state's population. They are interested in the following research question: Are the number of motor vehicle deaths in a given state related to a state's speed limit laws?

   Based on the information given, a reasonable first attempt at answering this question would include:

   A Poisson regression model with an offset term.

   A Poisson regression model without an offset term.

   A binomial regression model without an offset term.

   A binomial regression model with an offset term.

2. Consider the following modeling scenario: researchers would like to construct a model that can predict the number of times an individual would be admitted to a hospital (y_i). The covariate class - the set of predictors - might include age, gender, and other health conditions (e.g., heart conditions, diabetes). Let λ_i be the average number of times individual i was admitted to the hopsital. Individuals were observed for different periods of time (e.g., some for one year, others for two years).

   The correct link function for this model is $\log(\lambda_i) = \log\left(\frac{y_i}{e_i}\right) = \log(y_i) - \log(e_i)$, where η_i is the linear predictor and e_i is the exposure period.

   True

   False

3. For Poisson regression with $Y_i \sim Poisson(\lambda_i), \exp\left(\beta_0 + \beta_1 x_{i,1} + ... + \beta_p x_{i,p}\right) = \lambda_i$.

   True

   False

4. β_0 can be interpreted as the log of the mean of the response when each predictor is set to zero.

   True

   False

5. e^{β_j} is multiplicitive change in the mean of the response for a one unit increase in $x_{i,j}$, fixing (or adjusting for) all other predictors.

   True

   False

6. Consider the following modeling scenario: For an entire year, researchers collect data on fraudulent credit card transactions, including whether or not a particular transaction was ruled as fraudulent, the amount of each purchase, the distance from the card holder's zip code, whether the purchase was online or not, and several other variables. The goal is to use this data to construct a model that will help flag future purchases as potentially fraudulent.

   Based on the information given, a reasonable first attempt at a model would be:

   A Poisson regression, with the amount of each purchase as the response and all other variables as predictors.

   A binomial regression, with the fraudulent/not fraudulent variable as the response and all other variables as predictors.

   A Poisson regression, with the online/not online variable as the response and all other variables as predictors.

   A standard linear regression, with the distance from the card holder's zip code as the response and all other variables as predictors.

7. Consider a model that attempts to explain the number of awards earned by students at a high school in a year based on their math final exam score and the type of program that they are enrolled in. The categorical predictor variable has three levels indicating the type of program in which the students is enrolled. The categorical predictor levels are “Remedial”, “Standard” and “Honors”. Here's some output from a Poisson regression.

   glm(formula = num_awards ~ prog + math, family = "poisson", data = p)

   Coefficients:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-5.2471	0.6585	-7.97	1.6e-15	***
progStandard	1.0839	0.3583	3.03	0.0025	**
progHonors	0.3698	0.4411	0.84	0.4018	
math	0.0702	0.0106	6.62	3.6e-11	***

   Which of the following statements are correct? (Choose all that apply.)

   A one-unit increase in a student's math final exam score is associated with a multiplicative change of approximately 0.07 in the number of awards, adjusting for program type.

   The average number of awards for a student in the "Standard" program and with a zero math final exam score, is approximately 0.016.

   For a student in the "Remedial" program and the lowest math final exam score, the average number of awards is negative.

   A one-unit increase in a student's math final exam score is associated with a multiplicitive change of approximately 1.07 in the number of awards, adjusting for program type.

8. Like standard linear regression, we can estimate the Poisson regression model parameters using least squares.

   True

   False

9. Consider a model that attempts to explain the number of awards earned by students at a high school in a year based on their math final exam score and the type of program that they are enrolled in. The categorical predictor variable has three levels indicating the type of program in which the students is enrolled. The categorical predictor levels are "Remedial", "Standard" and "Honors". Here's some output from a Poisson regression.

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What is the expected number of awards for a student who is in the honors program and who's math final exam score is set to the maximum value of the sample: math = 100? Round to the nearest hundredth place.

0

8.52

0.31

0.21