Week 1 Quiz

Quiz, 10 questions

4/10 points (40%)

✖ Try again once you are ready.

Required to pass: 80% or higher

You can retake this quiz up to 3 times every 8 hours.

Back to Week 1

Retake

1 / 1 points

1. You draw two balls from one of three possible large urns, labelled A, B, and C. Urn A has 1/2 blue balls, 1/3 green balls, and 1/6 red balls. Urn B has 1/6 blue balls, 1/2 green balls, and 1/3 red balls. Urn C has 1/3 blue balls, 1/6 green balls, and 1/2 red balls. With no prior information about which urn your are drawing from, you draw one red ball and one blue ball. What is the probability that you drew from urn C?

- 1/3
- 5/9
- 6/11

Correct

This question refers to the following learning objective(s):

- Work with the discrete form of Bayes' rule

- 19/36

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1 / 1 points

2. Suppose ten people are sampled from the population and their heights are recorded. Further suppose their heights are distributed normally, with unknown mean μ and unknown variance σ^2 . Which of the following statements best describes the likelihood of the data Y in this situation?

- The probability of observing the data, given the prior beliefs about the distribution of μ and σ^2 .
- The probability of observing the data, given μ , σ^2, and the prior.
- The probability of observing heights with a mean at least as extreme as $\bar{Y}$, given μ and σ^2.
- The probability of observing the data, given μ, σ^2.

Correct
This question refers to the following learning objective(s):

- Define the concepts of prior, likelihood, and posterior probability and identify how they relate to one another

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✖

0 / 1 points

3. You go to Las Vegas and sit down at a slot machine. You are told by a highly reliable source that, for each spin, the probability of hitting the jackpot is either 1 in 1,000 or 1 in 1,000,000, but you have no prior information to tell you which of the two it is. You play ten times, but do not win the jackpot. What is the posterior probability that the true odds of hitting the jackpot are 1 in 1,000?

- 0.269
- 0.475

This should not be selected
Use the binomial distribution to calculate the likelihood. It is important to note that much more data is needed to become certain about the value of p when successes are rare.

This question refers to the following learning objective(s):

- Use Bayes' rule to compare multiple hypotheses about a discrete random variable: Work with the discrete form of Bayes' rule.

- 0.498
- 0.500

✖

0 / 1 points

4. The posterior distribution after repeating the same experiment twice and then analyzing the data from both experiments at the same time is the same as that after running the second experiment with the posterior of the first experiment as the prior.

- True
- False

This should not be selected
A feature of Bayesian statistics is that our posterior beliefs update after each new data point comes in. Our posterior after seeing some data becomes our new prior before we acquire more data

This question refers to the following learning objective(s):

- Update prior probabilities through an iterative process of data collection

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1 / 1 points

5. Which of the following corresponds to a Frequentist interpretation of the statement “the probability of rain tomorrow is 30 percent”?

- Under similar conditions, it has rained 30 percent of the time in the past.
- If we predicted rain tomorrow, we would be 30% confident in our prediction.
- A degree of belief of 0.3, where 0 means rain is impossible and 1 means rain is certain.
- If conditions identical to tomorrow occurred an infinite number of times, we would observe rain on 30 percent of those days.

Correct

This question refers to the following learning objective(s):

- Understand the differences between Frequentist and Bayesian definitions of probability and how they apply to inference

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0 / 1 points

6. Which of the following statements can be used to describe a 95 percent Bayesian credible interval for a parameter μ, but not a 95 percent Frequentist confidence interval?

- The probability that μ falls within the interval is 0.95
- If we ran an infinite number of experiments, 95 percent of our intervals generated this way would contain the true value of μ .

This should not be selected

An advantage of a credible interval, rather than a confidence interval, is that it allows us to express our uncertainty in terms of probabilities.

This question refers to the following learning objective(s):

- Understand the differences between Frequentist and Bayesian definitions of probability and how they apply to inference μ is in this interval 95 percent of the time.

μ is either in the interval, or it is not. More data can increase or decrease our uncertainty that μ is in the interval.

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0 / 1 points

7. Hearing about your brilliant success in working with M&Ms, Mars Inc. transfers you over to the Skittles department. They recently have had complaints about tropical Skittles being mixed in with original Skittles. You decide to conduct a frequentist analysis. If the findings suggest that more than 1% of sampled supposedly original skittles are actually tropical, you will recommend action to be taken and the production process to be corrected. You will use a significance level of $\alpha = 0.1$. You randomly sample 300 supposedly original skittles, and you find that five of them are tropical. What should be the conclusion of your hypothesis test? Hint- $H_0 : p = 0.01$ and $H_1 : p > 0.01$.

Fail to reject H_0, since the p-value is equal to 0.184, which is greater than $\alpha = 0.1$

Reject H_0, since the p-value is equal to 0.027, which is less than $\alpha = 0.1$

This should not be selected
In this case, the p-value is the probability of observing at least 5 tropical Skittles in 300 trials, given that the null hypothesis (H_0) of less than 1\% tropical Skittles is true.

This question refers to the following learning objective(s):

- Conduct both a Bayesian and Frequentist analysis of data to make inferences about a proportion

Fail to reject H_0, since the p-value is equal to 0.101, which is greater than $\alpha = 0.1$

Fail to reject H_0, since the p-value is equal to 0.245, which is greater than $\alpha = 0.1$

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1 / 1 points

8. In the NFL, a professional American football league, there are 32 teams, of which 12 make the playoffs. In a typical season, 20 teams (the ones that don't make the playoffs) play 16 games, 4 teams play 17 games, 6 teams play 18 games, and 2 teams play 19 games. At the beginning of each game, a coin is flipped to determine who gets the football first. You are told that an unknown team won ten of its coin flips last season. Given this information, what is the posterior probability that the team did not make the playoffs (i.e. played 16 games)?

0.556

Correct
This question refers to the following learning objective(s):

- Conduct both a Bayesian and Frequentist analysis of data to make inferences about a proportion

0.589

0.612

0.625

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0 / 1
points

9. You are testing dice for a casino to make sure that sixes do not come up more frequently than expected. Because you do not want to manually roll dice all day, you design a machine to roll a die repeatedly and record the number of sixes that come face up. In order to do a Bayesian analysis to test the hypothesis that p = 1/6 versus p = .175 , you set the machine to roll the die 6000 times. When you come back at the end of the day, you discover to your horror that the machine was unable to count higher than 999. The machine says that 999 sixes occurred. Given a prior probability of 0.8 placed on the hypothesis p = 1/6 , what is the posterior probability that the die is fair, given the censored data? Hint - to find the probability that at least x sixes occurred in N trials with proportion p (which is the likelihood in this problem), use the R command :

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1-pbinom(x-1,N,p)
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0.500

0.684

0.800

This should not be selected
Our likelihood under a given hypothesis is the probability that we observe at least 999 sixes in 6000 trials, given that the hypothesis is true. Use prior probability p = 0.8 and the likelihood to find the posterior probability.

This question refers to the following learning objective(s):

- Use Bayes' rule to compare multiple hypotheses about a discrete random variable

- Work with the discrete form of Bayes' rule

- [ ] 0.881

✖

0 / 1
points

10. Which of the following statements is **false**?

- [ ] In general, the prior becomes less influential as the sample size increases.
- [ ] Bayesian inferences are made using both the prior and the posterior distributions.
- [ ] No matter the likelihood, a prior probability of zero ensures that the posterior probability is also zero.
- [ ] If we were modeling a coin flip, the likelihood would be based on a Binomial Distribution.

This should not be selected
Bayesian inference is conducted only using the posterior distribution, which takes into account the likelihood of the data and the prior.

This question refers to the following learning objective(s):

- Define the concepts of prior, likelihood, and posterior probability and identify how they relate to one another