In-Video Quiz Questions for
Unit 8 Frequentist vs. Bayesian Inference

(04:03) – slide 6, after "you might choose to do so and keep your money in your pocket."

1. How many M&Ms would you like to buy?

5, 10, 15, or 20?

There is no correct answer here, but stop and think about the impact of your sample size, and make a decision.

(05:19) – slide 7, after "Remember that the significance level is also the probability of the type one error rate."

2. What is a Type 1 error?

    (a) Failing to reject the null hypothesis when the null hypothesis is true.
    (b) Failing to reject the null hypothesis when the null hypothesis is false.
    (c) Rejecting the null hypothesis when the null hypothesis is true.
    (d) Rejecting the null hypothesis when the null hypothesis is false.

(08:08) – slide 9, after "So, therefore probability that the number of successes is greater than or equal to one, can be calculated 1 minus the probability of successes equaling zero."

3. Assuming that 10% of M&Ms are yellow, which of the following is the correct calculation of the probability of obtaining at least one yellow M&M in a random sample of 5 M&Ms?

    (a) $(1 - 0.9)^5$
    (b) $1 - 0.9^5$
    (c) $1 - 0.1^5$
    (d) $1 - 0.9 \times 5$

(10:03) – slide 11, after "Remember that the significance level is also the probability of the type one error rate."

4. Which of the following is the correct calculation of at least 2 successes in 10

trials? Check **all** that apply.

    (a) $P(K=2)+P(K=3)+\cdots+P(K=10)$
    (b) $P(K=3)+P(K=4)+\cdots+P(K=10)$
    (c) $1-[P(K=0)+P(K=1)+P(K=2)]$
    (d) $1-[P(K=0)+P(K=1)]$

(12:56) – slide 15, after "Given that the probability of success is 10% and we have a sample size of 20."

5. Given that

  H_0: 10% yellow M&Ms

  H_A: 20% yellow M&Ms

If in a random sample of 20 M&Ms there are 4 yellow M&Ms, what is the p-value?

Choose the **closest** answer.

    (a) 0.01
    (b) 0.09
    (c) 0.13
    (d) 0.59

(20:06) – slide 17, after "That is one success out of five trials, if the true probability of success was, instead of 10, 20%."

6. What is the probability of 1 yellow M&M in a random sample of 5 M&Ms if 20% of the M&Ms are yellow? Choose the closest answer.

    (a) 0.0064
    (b) 0.41
    (c) 0.5
    (d) 0.67

(12:56) – slide 21, after "Our posterior probability for the hypothesis that percentage of yellow M&Ms is 10% was 0.44."

7. If the posterior probability of the hypothesis that states that the population has 10% yellow M&Ms is 0.44, what is the posterior probability of the

hypothesis that states that the population has 20% yellow M&Ms?

    (a) -0.44
    (b) 0.44
    (c) 0.5
    (d) 0.56

(22:50) – slide 22, after "In this case remember we have said our sample size is ten and our number of successes is two."

8. What is the probability of obtaining 2 yellow M&Ms in a random sample of 10 M&Ms if 10% of M&Ms are yellow?

    (a) 0.01
    (b) 0.09
    (c) 0.13
    (d) 0.59

(24:30) – slide 24, after "And once again, what changes are going to be the probability of the observed data given p is equal to 10 or 20%."

9. What is the posterior probability of the hypothesis that states that 10% of M&Ms are yellow if the prior probability for this hypothesis is 0.5, and in the data we observed 3 yellow M&Ms in a random sample of 15 M&Ms?

    (a) 0.13
    (b) 0.25
    (c) 0.34
    (d) 0.5
    (e) 0.66

(26:30) – slide 24, after "Which yields a posterior probability of 29% roughly."

10. Take a moment to think about how these probabilities were calculated, and if you're not sure, review earlier portions of the video and try calculating the probabilities yourself.

See below for calculations:

P(4 yellow M&Ms in 20 | p = 10%) = $\binom{20}{4} \times 0.10^4 \times 0.90^{16} \approx 0.09$

In R: dbinom(4, 20, 0.10)

P(4 yellow M&Ms in 20 | p = 20%) = $\binom{20}{4} \times 0.20^4 \times 0.80^{16} \approx 0.22$

In R: dbinom(4, 20, 0.20)

Answers:

2. c
3. b
4. a,d
5. c
6. b
7. d
8. a
9. c

Explanation: Prior: P(10% yellow) = 0.5

Data: n = 15, k = 3

$P(data \mid p = 10\%) = P(K=3) = \binom{15}{3} \times 0.10^3 \times 0.90^{12} \approx 0.13$

$P(data \mid p = 20\%) = P(K=3) = \binom{15}{3} \times 0.20^3 \times 0.80^{12} \approx 0.25$

Posterior: $P(p = 10\% \mid data) = 0.13 \times 0.05 / (0.13 \times 0.5 + 0.25 \times 0.5) = 0.34$