GER1000 Quiz 7

1. Alicia observed “6 spots” 3 times out of 6 rolls of a six-sided die. Betty suggested that the die is biased towards “6 spots”. In order to quantitatively evaluate Betty’s suggestion, Alicia set up the null hypothesis that

a. P(“6 spots”) is more than 1/6.
b. P(“6 spots”) is equal to 1/6.
c. P(“6 spots”) is more than 3/6.
d. P(“6 spots”) is equal to 3/6.

Answer: b

In order to compute the probabilities of the die, we need to assume that the die is fair. In other words, we need to assume that the probability of the die showing any side is equal to 1/6. The null hypothesis exactly is this assumption: P(“6 spots”) is equal to 1/6. [Unit 4, slide 5]

2. Which of the following choices has exactly those events that are equally or more extreme than the observed event?

a. Getting “6 spots” 1, 2, or 3 times
b. Getting “6 spots” 0, 1, 2, or 3 times
c. Getting “6 spots” 3, 4, 5, or 6 times
d. Getting “6 spots” 4, 5, or 6 times
d. Getting “6 spots” 3 times

Answer: c

When finding the p-value, we wish to find events that are equally or more extreme than the observed event. This p-value that we have computed is based on the assumption that the null hypothesis is true (null hypothesis: The die is fair).

For this case, the observed value is getting “6 spots” 3 times. More extreme events are 'getting "6 spots" 4, 5, or 6 times'.

[Unit 4, slide 4]

3. In a class of 30 people, 16 people study German, and 17 people study Japanese (some study multiple languages). The table below shows the data for the class. Suppose we pick a student at random from the class, i.e., everyone has the same probability of being chosen. We denote the probability that this student studies German as P(German)." Likewise, the probability that the student studies Japanese is P(Japanese). The probability that the student studies both German and Japanese is P(German and Japanese).

	Study Japanese	**Do not study Japanese**
Study German	13	3
Do not study German	4	10

We can fill in the following blank:

P(German) x P(Japanese) _____ P(German and Japanese)

a. <
b. =
c. >
d. Cannot be determined

Answer: a

P(German) = 16/30

P(Japanese) = 17/30

P(German) * P(Japanese) = (16/30) * (17/30) = 0.302

P(German and Japanese) = 13/30 = 0.433

[Unit 2, slide 11]

4. Rachel is playing a game of darts. In the game, she has to throw 2 darts, A and B, at 2 separate boards. Given she hits the bullseye with dart A, the probability of her hitting the bullseye with dart B is 0.6. The probability of her hitting the bullseye with dart A and missing the bullseye with dart B is 0.3. What is the probability of Rachel hitting the bullseye with dart A?

a. 0.12
b. 0.21
c. 0.5
d. 0.75
e. Unable to determine

Answer: d

Write the conditional probability of B hitting bullseye, given A hits bullseye, as P(B|A). Since P(B|A) = 0.6, P(not B|A) = 1 - 0.6 = 0.4, the conditional probability of B missing bullseye, given A hits bullseye.

P(A and not B) = 0.3 = P(not B and A).

Since P(not B|A) = P(not B and A) / P(A), it follows that P(A) = P(not B and A) / P(not B|A) = 0.3/0.4 = 0.75.

[Unit 2, slide 11]

5. Every resident in a town underwent a new HIV test. The sensitivity and specificity of the test are 90% and 99% respectively. Among those tested positive, 60% are infected with HIV virus. What is the base rate for HIV infection in this town?

a. 60%
b. 16%
c. 1.6%
d. 0.16%
e. None of the above

Answer: c

In the table below, the sequence that the calculations should be done is presented by ❶❷❸❹.

	Positive result	Negative result	Total
With HIV	600 ❷		667 ❸
Without HIV	400		40000 ❹
Total	1000 ❶		40667

❸ P(Positive | With HIV) = 90% -> 600/x = 90% -> x = 667

❹ P(Negative | Without HIV) = 99% -> P(Positive | Without HIV) = 1% -> 400/x = 1% -> x = 40000

Base rate = 667/40667 = 0.016 = 1.6%