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Week 5 Reading Questions

I did not work with anyone on these questions.

- **Q1 (2 pts.):** Choose the best words or phrases to fill in the blanks: A probability distribution is a map from the (a)_____ to the (b)_____.

A probability distribution is a map from the events to the likelihoods.

- **Q2 (2 pts.):** How many possible outcomes are there (i.e. what is the sample space) if you flip two coins *sequentially*: a penny and a quarter? Assume that

  - the two coins each have a *head* and a *tail*
  - you care about order
  - the probability of heads or tails is about 0.5 for each coin.

There are 8 possible outcomes. Penny first: penny heads quarter heads, penny heads quarter tails, penny tails quarter heads, penny tails, quarter tails. Quarter first: quarter heads penny heads, quarter heads penny tails, quarter tails penny heads, quarter tails penny tails.

- **Q3 (2 pts.):** How many possible outcomes are there (i.e. what is the sample space) if you flip two quarters *at the same time*? Assume that

  - the two coins are indistinguishable
    - i.e. you just want to know the number of heads or tails for each possible outcome.
  - each have a *head* and a *tail*
  - the probability of heads or tails is about 0.5 for each quarter.

There are three possibilities. Both are heads, one is heads one is tails, or both are tails.

- **Q4 (2 pts.):** How many outcomes are there if you flip a penny three times? If you care about the order flips, how many possible events are there in the sample space?

If you care about the order, there are 8 possibilities, as shown below:

HHH

HHT

HTH

THH

HTT

THT

TTH

TTT

- **Q5 (1 pt.):** Are these *combinations*, or *permutations*?

They're permutations.

- **Q6 (2 pts.):** Now suppose you don't care about the order, and you simply want to know about the number of heads when you flip the penny three times. How many possible events are in the sample space?

If you flip a penny 3 times not caring about the order, there are 4 possibilities, as shown below:

HHH

HHT

HTT

TTT

- **Q7 (1 pt.):** Are these *combinations*, or *permutations*?

They are combinations.

- **Q8 (2 pts.):** What is the size of the sample space?

QM QM

QM QR

QM QA

QR QR

QR QA

QA QA

There is a sample space of six.

- **Q9 (2 pts.):** Given the scenario description, how many ways are to there to collect two acorns of the *same species*?

There are three ways to collect two acorns of the same species.

- **Q10 (2 pts.):** Given the scenario description, how many ways can you collect two acorns of *different species*?

There are three ways to collect two acorns of different species.

QA QA	QR QR	QM QM
QA QR	QR QA	QM QA
QA QM	QR QM	QM QR

- **Q11 (1 pt.):** What is the probability that the acorn in your *left pocket* is *Q. alba*?

3/9 or 1/3

- **Q12 (1 pt.):** What is the probability that the acorn in your *right pocket* is *Q. macrocarpa*?

3/9 or 1/3

- **Q13 (2 pts.):** If you already know that the acorn in your left pocket is *Q. alba*, what is the probability that the acorn in your *right pocket* is also *Q. alba*?

1/9

- **Q14 (2 pts.):** What is the probability that **both** acorns are *Q rubra*?

1/9

- **Q15 (2 pts.):** What is the probability that you collected exactly one each of *Q. alba* and *Q. rubra*?

2/9

- **Q16 (2 pts.):** What is the probability that the acorn in your *left* pocket is *Q. alba* and you have an acorn of *Q. rubra* in your *right* pocket?

1/9

- **Q17 (1 pt.):** Which of the following is the size of the sample space of this Poisson distribution?
    - 10
    - 11
    - 0
    - 2
    - 6
    - $\infty\infty$

The sample size should be infinite for a Poisson distribution.

- **Q18 (2 pts.):** Which of the following is the size of the sample space of this Binomial distribution?

- 10
- 11
- 0
- 2
- 6
- ∞∞

The sample size of the binomial distribution is 10, as 10 is the specified number of trials.

- **Q19 (2 pts.):** Describe a characistic that is common to both the Binomial and Poisson distributions that makes them good models for counts.

Both the Binomial and the Poisson distributions can model a situation where events occur independently of one another. This is good for counts be the occurrence of one member of a species does not affect the probability of the occurrence of other members of the species.

- **Q20 (2 pts.):** Hypothesize a scenario in which a Binomial distribution may be a better count model than a Poisson distribution.

Binomial distributions are typically better with a very limited trial size. The larger the trial size, the more it will approach a Poisson distribution, so if you only have a small sampling, you will want to use the Binomial distribution.