DSO101 Lesson 2: Probability Exam Study Guide:

Q 1. In this lesson, we spent considerable time describing probability in its simplest form or interpretation: The number of successes divided by the number of opportunities.

Probability plays a crucial role in data science. It provides a framework for making statistical inferences and predictions from data. However**, If you don't enjoy math, you may consider yourself fortunate because the Basic Statistics module is the only Data Science course where you will need to manually calculate probability values. However, if you love math, it may be unfortunate because future lessons will include programming code that automatically calculates probability or p-values.**

Here are examples to help you with many of the exam questions.

Q 2. On a lottery ticket with 30 spaces, each space has a prize. The prizes have the following frequencies: 6 toasters, 1 car, 8 vacations, 10 dinner gift cards, and 5 empty soda cans.

What is the probability of scratching a space with a vacation?

> .267: Probability of selecting a vacation prize = (number of vacation prizes) / (total number of prizes)
>
> = 8 / 30
>
> = 4 / 15
>
> = 0.2667 (rounded to 4 decimal places)

Q 3. On a lottery ticket with 30 spaces, each space has a prize. The prizes have the following frequencies: 6 toasters, 1 car, 8 vacations, 10 dinner gift cards, and 5 empty soda cans.

What is the probability of selecting a door with a toaster or a door with a gift card?

> Since this is an "or" problem, you will add. There are six toasters and 10 gift cards.
>
> 10 + 6 = 16 total possibilities for success.
>
> 16/30 opportunities is .533.

Q 4. On a lottery ticket with 30 spaces, each space has a prize. The prizes have the following frequencies: 6 toasters, 1 car, 8 vacations, 10 dinner gift cards, and 5 empty soda cans.

What is the probability of selecting a door with anything except a soda can?

> This is a "not" problem. 30 opportunities - 5 soda cans is 25 successes.
>
> 25/30 = .833.

Q 5. In a standard deck of playing cards, what is the probability that a randomly selected card is a 3, 8, or red card?

The “And” Boolean operator multiplies two different probabilities together?

> This is an "or" multiple event probability problem. There are 26 black cards, 4 cards displaying a 3, and 4 cards displaying a 8. That is 34/52. However, 2 of the 3s and 2 of the 8s are red cards. So you need to subtract 4, leaving 30/52.

Q 6-9: Boolean Operators: An expression of logic, to include "and", "or", and "not".

> And: Possibility of multiple events happening together (multiply).
>
> Or: Possibility of one or another event happening (add).
>
> Not: Possibility of anything except a particular event happening (subtract).

Q 10. When rolling a 6-sided die, what is the probability of rolling an odd number?

> 3/6 There are 3 successes (rolling a 1, 3, and 5) out of a total of six sides of the die.

Q 11: When rolling a 6-sided die, what is the probability of rolling an odd number **and** a number greater than 4?

> 1/6: This is an "and" multiple event probability problem, so you need to multiply the probability of rolling an even number by the probability of rolling a number greater than four. There are three chances to roll an even number (1,3,5), so that is 3/6. There are also two chances of rolling a number greater than 4 (5 and 6), so that is 2/6. 3/6 x 2/6 is 6/36, which reduces to 1/6.

Q 12: When rolling a 6-sided die, what is the probability of rolling an odd number **or** a number greater than 4?

> 4/6 : This is an "or" problem, so you need to add the probabilities together. The chances of getting an even number are 3/6 (1,3,5), and the chances of getting a number greater than 4 are 2/6 (5 and 6). 3/6 + 2/6 = 5/6. However, one of those overlaps - the number 5 is both an odd number and greater than four, so you subtract. 5/6-1/6 = 4/6.

Q 13. In a company of 11 employees, how many ways can you select a team of 3 people to represent the company in a competition?

> 990 This uses the permutation equation because you want all of the possible orders of all the possible combinations. n = 11, since there are 11 employees, and x = 3, because there are three member teams.

Q 14. How many ways can you select 3 chocolates from a box that contains 11 chocolates?

165: This uses the combination equation because you want all the possible combinations, but order doesn't matter. n = 11, because there are 11 total chocolates, and x = 3, because you want to eat 3 chocolates.

Q 15. In a bag, there are 3 red balls, 2 blue balls, and 2 yellow balls. Victor picked a blue ball and doesn't put it back. What is the probability Tanya chooses a blue ball?

1/6 : This is a probability without replacement problem. Once it is Tanya's turn to pick, there are no longer 7 balls, but instead 6, because one blue ball is no longer in the bag. So there is one blue ball left out of a total of 6 balls.

Q 16 – 18: The probability of one event does not affect the other. Events are independent, so Boolean operators can be used.

Boolean Operators: An expression of logic, to include "and", "or", and "not".

And: Possibility of multiple events happening together (multiply).

Or: Possibility of one or another event happening (add).

Not: Possibility of anything except a particular event happening (subtract).