Drill Set 1

1. Calculate the probability of flipping a balanced coin four times and getting each pattern: HTTH, HHHH and TTHH.
    - Total of 16 outcomes
      Answer:
    - P(HTTH) = ½ * ½ * ½ * ½ = 1/16
    - P(HHHH) = ½ * ½ * ½ * ½ = 1/16
    - P(TTHH) = ½ - ½ - ½ - ½ = 1/16

2. If a list of people has 24 women and 21 men, then the probability of choosing a man from the list is 21/45. What is the probability of not choosing a man?
    - Not choosing a man = choosing a woman
    - **Answer:** woman/total = 24/45

3. The probability that Bernice will travel by plane sometime in the next year is 10%. The probability of a plane crash at any time is 0.005%. What is the probability that Bernice will be in a plane crash sometime in the next year?
    - P(travel by plane) = 10% (or 0.01)
    - P(plane crash) = 0.005% (or 0.0005)
    - **Answer:** P(travel by plane & plane crash) = 10% * 0.005% = 0.0005% (or 0.000005)

4. A data scientist wants to study the behavior of users on the company website. Each time a user clicks on a link on the website, there is a 5% chance that the user will be asked to complete a short survey about their behavior on the website. The data scientist uses the survey data to conclude that, on average, users spend 15 minutes surfing the company website before moving on to another things. What is wrong with this conclusion?
    - **Answer:** while the chance of user being asked to complete a website if 5%, that does not provide enough information for the data scientist to conclude how many minutes users spend surfing the company before moving on to other things. The two are totally uncorrelated elements

Drill Set 2

Q) A diagnostic test has a 98% probability of giving a positive result when applied to a person suffering from Thripshaw's Disease, and 10% probability of giving a (false) positive when applied to a non-sufferer. It is estimated that 0.5% of the population are sufferers. Suppose that the test is now administered to a person whose disease status is unknown. Calculate the probability that the test will:

1. Be positive
    - P(sufferers) = 98% (or 0.98) * 0.5% (or 0.005) = 0.49% (or 0.0049)
    - P(non-sufferers) = 10% (0.10) * 99.5% (or 0.995) = 9.95% (or 0.0995)
    - **Answer:** 10.44% (0.1044)

2. Correctly diagnose a sufferer of Thripshaw's
    - **Answer:** 98% (0.98)

3. Correctly identify a non-sufferer of Thripshaw's
    - 100% - 10% (false positive)
    - **Answer:** 90% (or 0.9)

4. Misclassify the person
    - 98% * 0.5% = 0.49% (or 0.0049)
    - 90% * 95.5% = 89.55% (or 0.8955)

    Answer: 100% - (0.49% + 89.55%) = 9.96% (or 0.0996)