1. The month of March has 31 days in it. In New York, March has days when it snows, days when it rains, and days when it does both. This breakdown is shown in the Venn diagram below. Based on the diagram, are the events of having snow and having rain dependent or independent?

\[
P(A \text{ and } B) = P(A)P(B)
\]

\[
\frac{5}{31} \neq \left(\frac{8}{31}\right)\left(\frac{13}{31}\right)
\]
dependent

2. Given events A and B such that \(P(A) = 0.6, P(B) = 0.5\) and \(P(A \cup B) = 0.8\), determine whether A and B are independent or dependent.

\[
P(A) = P(A\cap B) + P(A\cap \overline{B})
\]

\[
P(A) = 0.6 + 0.5 - P(A\cap B)
\]

\[
P(A\cap B) = \frac{1}{2}
\]

\[
P(A \& B) = P(A)P(B)
\]

\[
0.3 = (0.6)(0.5)
\]

YES!

3. The spinner below is spun once and the outcome noted. Let E be the event of getting an even, let P be the event of getting a prime, and let L be the event of getting a number less than 5. Find the following probabilities:

a) \(P(E) = \frac{1}{2}\)

b) \(P(E|P) = \frac{P(E \cap P)}{P(P)} = \frac{\frac{1}{2}}{\frac{2}{5}} = \frac{5}{4}\)

c) \(P(E|L) = \frac{P(E \cap L)}{P(L)} = \frac{\frac{1}{2}}{\frac{3}{5}} = \frac{5}{6}\)

d) Which event does E depend on, P or L? Explain.

\[\text{depends on } P \text{ because } P(E|P) \neq P(E)\]

4. Sean’s team has a baseball game tomorrow. He pitches 50% of the games. There is a 40% chance of rain during the game tomorrow. If the probability that it rains given that Sean pitches is 40%, it can be concluded that these two events are

1) independent 2) dependent 3) mutually exclusive 4) complements

\[
P(R) = 0.40 \quad P(E|P) = 0.40
\]

\[
P(E) = P(E|P) = 0.40
\]

**REVIEW**

5. Create the equation of a cubic whose x-intercepts are given by the set \([-2, -3, 5]\) and which passes through the point (3, 36). Note that your leading coefficient in this case will be a non-integer. Sketch your graph below.

\[
y = a(x+2)(x+3)(x-5)
\]

\[
36 = a(5)(8)(-8)
\]

\[
a = \frac{36}{(5)(8)(-8)}
\]

\[
a = -\frac{3}{5}
\]

6. The largest root of \(x^3 - 9x^2 + 12x + 22 = 0\) falls between what two consecutive integers?

\[
7) \quad x^3 - 9x^2 + 2x + 4 = 0
\]

\[
(x-1)(x^2 - 4) = 0
\]

\[
(x+1)(x-1)(x+2)(x-2) = 0
\]

\[
x = -1, x = 1 \quad x = -2, x = 2
\]
Aim 96 How do we pick a random sample?

Kaboff Which survey is least likely to contain bias?
- 1) Surveying a sample of people leaving a movie theater to determine which flavor of ice cream is the most popular
- 2) Surveying the members of a football team to determine the most watched TV sport
- 3) Surveying a sample of people leaving a library to determine the average number of books a person reads in a year
- 4) Surveying a sample of people leaving a gym to determine the average number of hours a person exercises per week

Definitions:
- Bias: systematic favoritism present in data collection, analysis or reporting of quantitative research. Random sampling, variability, and large samples help reduce bias.
- Population: the entire set of subjects in which there is an interest.
- Sample: a subset of the population.
- Random sample: a sample that gives each subject of the population an equal chance of being selected.

Suppose we would like to know the average number of hours a Manhasset student spends doing homework for his/her Algebra 2 course.

How might we go about finding this information?
- Survey Alg 2 Students:
  - What is the population?
  - Is it possible to reach the entire population?

If we want to use a sample of this population, how could we avoid bias?

How could we pick a random sample?

Suppose there are 234 Manhasset students taking Algebra 2 and we want to pick a random sample of 20 of these students to fill out our survey.

Types of Studies:
- An observational study records the values of variables for members of a sample.
- A survey is a type of observational study that gathers data by asking people a number of questions. A census is a survey that attempts to reach an entire population.
- An experiment assigns subjects to treatments for the purpose of seeing what effect the treatments have on some response. There should be two groups (experimental and control). Only experimental studies can offer insight about cause and effect relationships.

Practice
1. A doctor wants to test the effectiveness of a new drug on her patients. She separates her sample of patients into two groups and administers the drug to only one of these groups. She then compares the results. Which type of study best describes this situation?
   - 1) Census
   - 2) Survey
   - 3) Observation
   - 4) Controlled experiment

2. Which statement about statistical analysis is false?
   - 1) Experiments can suggest patterns and relationships in data.
   - 2) Experiments can determine cause and effect relationships.
   - 3) Observational studies can determine cause and effect relationships.
   - 4) Observational studies can suggest patterns and relationships in data.

Post Game Report
- There are 2 main ways to collect data: observational studies and experimental studies.
- Only experimental studies can tell us about cause and effect.
- Randomization is important to avoid variability from bias.
- A table of random digits is a listing of the numbers 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. The first property is that every digit from 0 to 9 is just as likely to appear in every entry of the table. The second property is that the entries are independent of each other. A table of random digits can help us randomly pick a sample.