4.1 What is Probability?

1. Summary box on page 137 pretty much sums up the key points.
2. A statistical experiment is any random activity that results in a definite outcome. Give examples like drawing cards, rolling dice, spinning the big wheel on "The Price is Right", etc.
   - Sample space - The set of all outcomes of an experiment
   - Simple event - a single element of the sample space
   - Event - any subset of the sample space
   - Give an example of these terms say with dice rolling, playing cards, roulette, etc.
   - Probability will always be a value between 0 and 1 (inclusive). State what is means when an event has probability 0 or 1.
   - I don't care if students use fractions, decimals, or percentages.
3. Notation
   - $P(A)$.
   - $P(A^c)$.
   - $P(A) + P(A^c) = 1$.
4. Computed by
   - Theoretical design and counting simple events. Be sure to emphasize formula of

     $$P(A) = \frac{\text{Number of outcomes in } A}{\text{Number of all possible outcomes.}}.$$

   - Empirical data and relative frequencies. Include the statement of the law of large numbers. Also emphasize that these methods will always **approximate** the probability of an event and is possible to never attain the exact value with such methods.
5. Why is probability relevant to statistics?
   - Probability is about assigning a likelihood to a particular outcome of an unknown experiment. The most relevant situation is assigning probabilities to sampling from a **known** population.
   - Statistics is about using the results of sampling to infer information about an **unknown property** of the population.

4.2 Some Probability Rules—Compound Events

1. There are some formulas in this section, but often I try to de-emphasize them in trade for "careful counting".

2. The concept of conditional probability is always tricky for students. Carefully explain the concept with emphasis that for $P(A|B)$, the event B is **known** to have happened.

3. Note the two key terms

   - Mutually exclusive - $P(A \text{ and } B) = 0$
   - Independent - $P(A|B) = P(A)$ or equivalently $P(B|A) = P(B)$.
   - Over emphasize that $P(A \text{ and } B) = P(A) \cdot P(B)$ **only when A and B are independent events**.

4. Be sure to explain the difference between to conjunctions **or** and **and**. The use of a Venn diagram will be of help.

5. Describe a standard deck of 52 cards.

   - Show how to compute $P(\text{Ace})$, $P(\text{Heart})$,
     $P(\text{Ace or Heart})$, $P(\text{Ace and Heart})$, $P(\text{Ace}|\text{Heart})$.

6. Provide a contingency table and compute some probabilities with it.

	Political Affiliation			
Employee Type	Democrat (D)	Republican (R)	Independent (I)	Row Total
Executive (E)	5	34	9	48
Production Worker (PW)	63	21	8	92
Column Total	68	55	17	140

- $P(D)$ and $P(E)$.
- $P(D \text{ and } E)$.
- $P(D|E)$.