

Math 140: Thursday, Oct 10th, Day 14 Notes

Agenda for Thursday, Oct 10th, 2024

Chapter 3 Probability

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Coming up

- ! Online HW 7 due Today
- ! Written HW 4 due Tuesday
- Office Hour **tomorrow 12-1:15pm** in C162 (not today at 1pm)
- **Exam 2** on Thursday Oct 17th - Study guide and Practice Exam posted by end of Friday
- Carrera de los Lancers - 5k this Saturday; meet in front of gym at 10am

Recall: See probability flow chart

Probabilities involving "AND" continued

Independent events revisited:

1. Consider drawing two cards (one at a time) from a deck of cards **with replacement**. Let K_{1st} be the event of "drawing a King the first time" and K_{2nd} be the event of "drawing a King the second time". Find:

$$P(K_{2nd}) =$$

$$P(K_{2nd}|K_{1st}) =$$

Event A and B are independent if and only if:

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2. Consider drawing two cards (one at a time) from a deck **without replacement**. Let K_{1st} be the event of "drawing a King the first time" and K_{2nd} be the event of "drawing a King the second time". Find:

$$P(K_{2nd}|K_{1st}) =$$

General Multiplication Rule

The probability that two events A and B will occur in sequence is

$$P(A \text{ and } B) = P(A) \cdot P(B|A).$$

If events A and B are independent, then the rule can be simplified to

$$P(A \text{ and } B) = P(A) \cdot P(B).$$

Example 1. In a survey, 510 adults were asked if they drive a pickup truck and if they drive a Ford. The results showed that one in six adults surveyed drives a pickup truck, and three in ten adults surveyed drive a Ford. Of the adults surveyed that drive Fords, two in nine drive a pickup truck.

1. Find the probability that a randomly selected adult drives a pickup truck, **given** that the adult drives a Ford.
2. Are the events “driving a Ford” and “driving a pickup truck” independent or dependent? Explain.
3. Find the probability that a randomly selected adult drives a Ford pick up truck.

Using Tree Diagrams

The kind of picture that helps us look at conditional probabilities and multiplication rule for dependent events is called a **tree diagram**.

Example 2. According to a study 44% of college students engage in binge drinking, 37% drink moderately, and 19% abstain entirely. Another study finds that among binge drinkers, 17% have been involved in an alcohol-related automobile accident, while among non-bingers of the same age, only 9% have been involved in such accidents.

1. Build a tree diagram with corresponding probabilities on each possible outcome.
2. What's the probability that a randomly selected college student will be a binge drinker **and** has had an alcohol-related car accident?
3. What's the probability that a randomly selected college student will have an alcohol-related car accident **given** they are a moderate drinker?
4. What's the probability that a randomly selected college student will be a moderate drinker **and** has had no alcohol-related car accident?