Name: _____

Skew The Script

Statistics Handout: Lesson 8.9

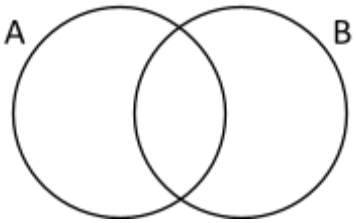
Topics: unions & intersections, the addition rule in multiple formats, mutually exclusive events

Lesson 8.9 Guided Notes

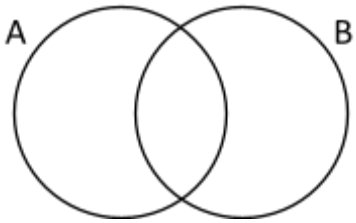
Unions & Intersections

For each of the following probability expressions, take notes on what the notation means **and** shade the Venn Diagram:

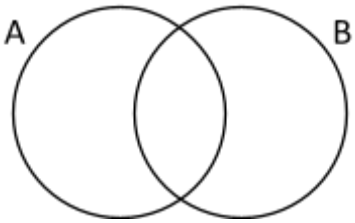
1. P(A):



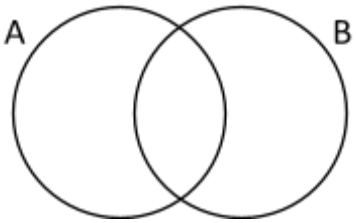
2. P(B):



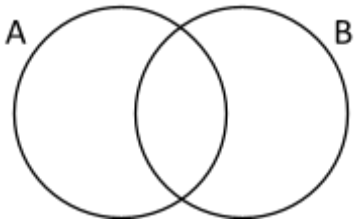
3. $P(A^C)$:



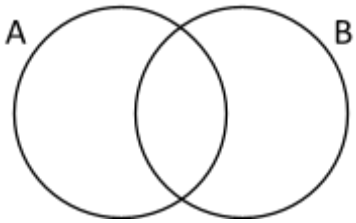
4. $P(A \cap B)$:



5. $P(A \cup B)$:



6. $P((A \cup B)^C)$:



The Addition Rule in Probability Models

The OKCupid Dataset - https://github.com/wetchler/okcupid

This dataset is composed of public online dating profiles from 2012 on OKCupid. We filtered for people who identified as age 36, male, and heterosexual, living in the San Francisco area. After filtering, we collected data for each profile that reported their height and yearly earnings.

We'll categorize the 192 men in the OKCupid dataset using the following convention:

	Earns less than median ($)	Earns more than median ($)
Shorter than median	**Short Low-Earner**	**Short High-Earner**
Taller than median	**Tall Low-Earner**	**Tall High-Earner**

Socially de-valued
Socially valued

Estimated 2012 median yearly earnings for individual men in San Francisco county: **$59,397**. Male median height (U.S.): **69.2 in. (5'9"). 1. Earnings median** is an upper-bound estimate based on median earnings for workers in San Francisco county per the 2012 American Community Survey (data.census.gov). **2. Height median** is from the CDC: *National Health Statistics Reports*, "Mean Body Weight, Height, Waist Circumference, and Body Mass Index Among Adults: United States, 1999–2000 Through 2015–2016." Center for Disease Control and Prevention, 2018.

In the OkCupid data, we find 21 short low-earners, 22 tall low-earners, 48 short high-earners, and 101 tall high-earners.

Category	short low-earner	tall low-earner	short high-earner	tall high-earner
Probability	$\frac{21}{192} = 0.109$	$\frac{22}{192} = 0.115$	$\frac{48}{192} = 0.250$	$\frac{101}{192} = 0.526$

a) Check that this is a valid probability model:

Let: T = event of selecting a tall man
H = event of selecting a high-income earner

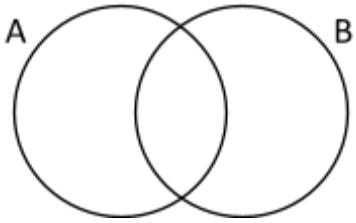
1. P(T) =

2. P(T∩H) =

3. P(T∪H) =

Simple Addition Rule: "Or" means _____

- The _____ P(A∪B) brings together A, B, and A∩B. So you add the probabilities together.
- Think unions □ _____



The Addition Rule in Two-Way Tables

	low-earner	high-earner	**total**
short	21	48	69
tall	22	101	123
total	43	149	192

1. $P(T \cap H^C)$ =

2. P(H) =

3. P(T∪H) =

Formal Addition Rule: P(A∪B) = P(A) + P(B) – P(A∩B)

_____ **Addition Rule:**

- "Or" means add
- Avoid _____

The Addition Rule in Venn Diagrams

T	low-earner	high-earner	H total
short	21	48	69
tall	22	101	123
total	43	149	192

22 101 48

21

1. P(H) =

2. P(H∩T) =

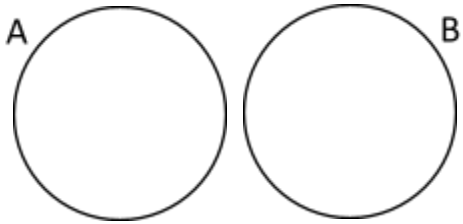
3. P(H∩T^C) =

4. P(H^C) =

5. P(T∪H) =

Mutually Exclusive Events

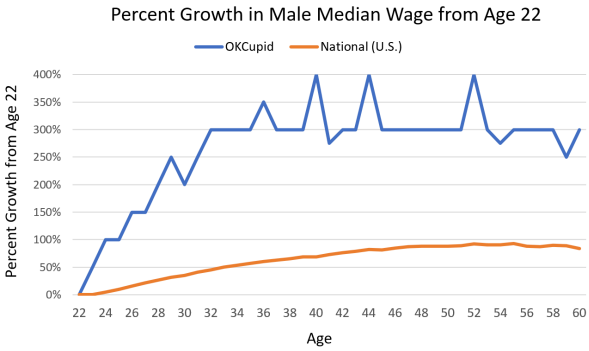
Mutually exclusive: when events that have no _____ (i.e. they cannot _____ occur)



For mutually exclusive events only:
P(AB) = P(A) + P(B)

- Don't have to worry about _____

Lesson 8.9 Discussion



Discussion Question: Do you believe many of the men on OKCupid are lying on their profiles? Provide a statistical explanation for your answer.