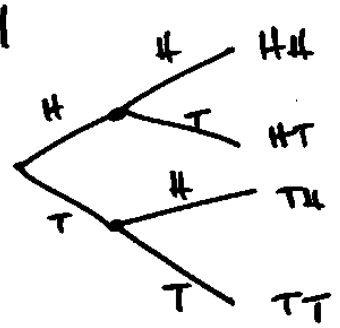
243

① 10-10

Quiz 1 $\bar{x} = 15.6$

$Q_2 = 17$

p.81 #11



(c)

p.85 later...

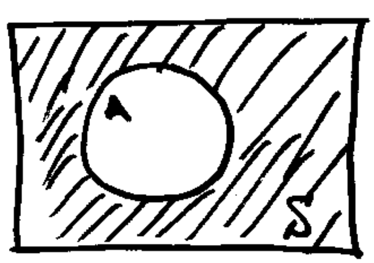
②

Review

$\bar{A}$: A complement (NOT in A)

$A \cap B$: A intersect B (A AND B)

$A \cup B$: A union B (A OR B)

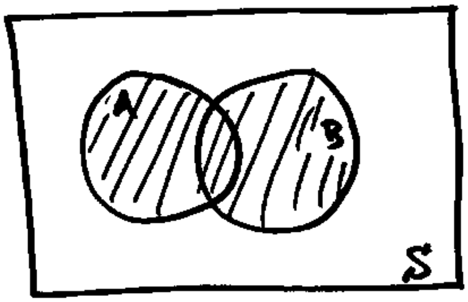


$\bar{A}$

$$P(A) + P(\bar{A}) = P(S) = 1$$

$$\boxed{P(\bar{A}) = 1 - P(A)}$$ Complement Rule

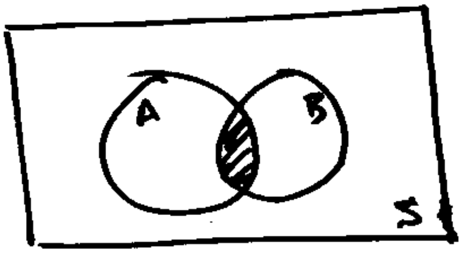
3



$A \cup B$

Union Rule

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$



$A \cap B$

4

p.85

#21 A: TV ad $P(A) = .25$

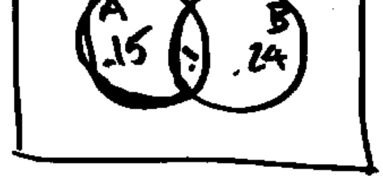
B: Radio ad $P(B) = .34$

$A \cap B$: both $P(A \cap B) = .10$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$= .25 + .34 - .10$$

$$= .49$$



#23 A: college $P(A) = \frac{380}{550}$

B: vocational $P(B) = \frac{412}{550}$

$A \cap B$: both $P(A \cap B) = \frac{357}{550}$

$$P(A \cup B) = \frac{380}{550} + \frac{412}{550} - \frac{357}{550} = \frac{435}{550} = .79$$

Conditional Probability

Gender \ Salary	Low	Mid	High	
M	30	40	30	100
F	60	50	40	150
	90	90	70	250

Cross-tabulation

Experiment: Select 1 person at random from the 250 in the study.

7

$$P(M) = \frac{100}{250} = \frac{n(M)}{n(S)} = .4$$

$$P(H) = \frac{70}{250} = \frac{n(H)}{n(S)} = .28$$

marginal probabilities

Find the prob. that the person selected is male and has a high salary.

$$P(M \cap H) = \frac{30}{250} = \frac{n(M \cap H)}{n(S)} = \underbrace{.12}_{\text{joint probability}}$$

8

Find the prob. that the person selected is either male or has a high salary (or possibly both)

$$P(M \cup H) = P(M) + P(H) - P(M \cap H)$$
$$= .4 + .28 - .12$$
$$= .56$$

Alternate solution: $P(M \cup H) = \frac{n(M \cup H)}{n(S)}$

$$= \frac{30+40+30+40}{250}$$

$$= \frac{140}{250} = .56$$

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Assume, Given

Suppose that the person selected is male.

Find the probability that he has a high salary.

$$P(H \mid M) = \frac{30}{100} = .3$$

"given"

$$= \frac{n(H \cap M)}{n(M)}$$

Conditional Probability : $P(A \mid B) = \dfrac{n(A \cap B)}{n(B)}$

10

Find the probability that the person is female, given that he or she has a high salary.

$$P(F \mid H) = \frac{40}{70} = \frac{4}{7}$$

$$= \frac{n(F \cap H)}{n(H)}$$

$$P(A \mid B) = \frac{n(A \cap B)}{n(B)} = \frac{n(A \cap B)/n(S)}{n(B)/n(S)} = \frac{P(A \cap B)}{P(B)}$$

$\boxed{P(A \cap B) = P(B)\,P(A \mid B)}$ Intersection Rule

(11)

Example of intersection rule:

Experiment: Draw 2 cards from a standard deck of 52.

Find the probability that both cards are aces.

A: 1^{st} is ace

B: 2^{nd} is ace

$$P(A \cap B) = P(A)P(B|A) = \frac{4}{52} \cdot \frac{3}{51} = .0045$$

(12)

<u>Definition</u>: If $P(A|B) = P(A)$, then we say that A and B are <u>independent</u>.

<u>Definition</u>: If the intersection of A and B is empty, then we say that A and B are <u>mutually</u> <u>exclusive</u>.

If A and B are independent, then

$$P(A \cap B) = P(A)\,P(B)$$

If A and B are mutually exclusive, then

$$P(A \cap B) = 0$$

HW p.90 #33
p.95 #41, 43

Lab #1 is due
10/19