Probability Day 8 Notes: Conditional Probability Name: _____ Date: _____

Conditional Probability Notatation:

$P(A|B)$ means Probability of A given B

Dependent

Conditional Probability Rule:

If A and B are events then $\mathbf{P}(A \mid B) = \dfrac{\mathbf{P}(A \cap B)}{\mathbf{P}(B)}$

Example 1: Using a Venn Diagram

In a class of 25 students, 14 like pizza and 16 like iced coffee. One student likes neither and 6 students like both. One student is randomly selected from the class. What is the probability that the student:

a likes pizza b likes pizza given that he or she likes iced coffee?

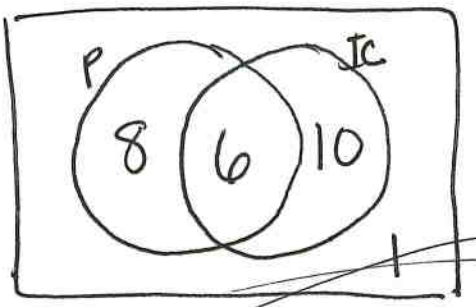
a) 14/25

b) $P(P|IC) = \dfrac{(P(P \cap IC))}{P(IC)}$

$P(P \cap IC) = 6/25$

$P(IC) = 16/25$

$P(P|IC) = \dfrac{6/25}{16/25} \left(\dfrac{25}{16}\right) = \dfrac{6}{16}$



look at IC, then Pizza ∩ IC

Example 2: Using the Algebraic Rule

If $P(A) = 0.4$, $P(A \cup B) = 0.9$, and $P(A \cap B) = 0.1$, find $P(B)$

$P(B) =$

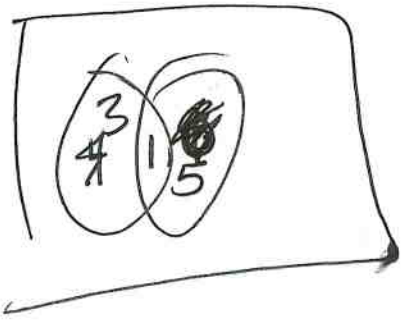
$P(B|A) = \dfrac{P(B \cap A)}{P(A)}$

$P(A) = .4$

$P(A \cup B) = .9$

$P(A \cap B) = .1$

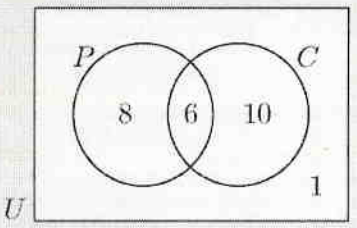
$= \dfrac{.1}{.4}$



P

ANSWERS:

Example 1:



The Venn diagram of the situation is shown.

a Of the 25 students, 14 like pizza.

$\therefore$ P(pizza) $= \frac{14}{25}$

b Of the 16 who like iced coffee, 6 like pizza.

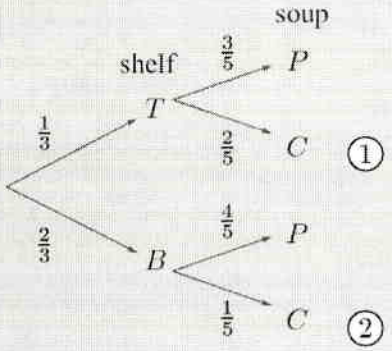
$\therefore$ P(pizza | iced coffee) $= \frac{6}{16}$

Example 2:

P(B)=.6

Example 3:

T represents the top shelf.
B represents the bottom shelf.
P represents the pumpkin soup.
C represents the chicken soup.



a P(soup is chicken)

$= \frac{1}{3} \times \frac{2}{5} + \frac{2}{3} \times \frac{1}{5}$ {paths ① and ②}

$= \frac{4}{15}$

b P(top shelf | chicken)

$= \frac{\text{P(top shelf and chicken)}}{\text{P(chicken)}}$

$= \frac{\frac{1}{3} \times \frac{2}{5}}{\frac{4}{15}}$ ← path ① ← from a

$= \frac{1}{2}$

Example 4:

$P(L|A) = \frac{28}{58}$

$P(L|C) = \frac{55}{72}$

Can confirm with the formula! ☺