3.4 Conditional Probability

Def: Conditional Probability occurs when the outcome of event A is dependent on the outcome of B.

Ex: A bag has 3 red marbles and 2 blue. Take one out and do not replace it. total # marbles = 5

What is the probability of choosing blue on the next choice?

1st marble $P(\text{Blue}) = \frac{2}{5}$

2nd marble:

if the 1st was red, $P(B) = \frac{2}{4} = \frac{1}{2}$

if the 1st was blue, $P(B) = \frac{1}{4}$

In general, for two events A and B, the Probability of A occuring given that B has occured can be found using:

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

"The Probability of A, given B"

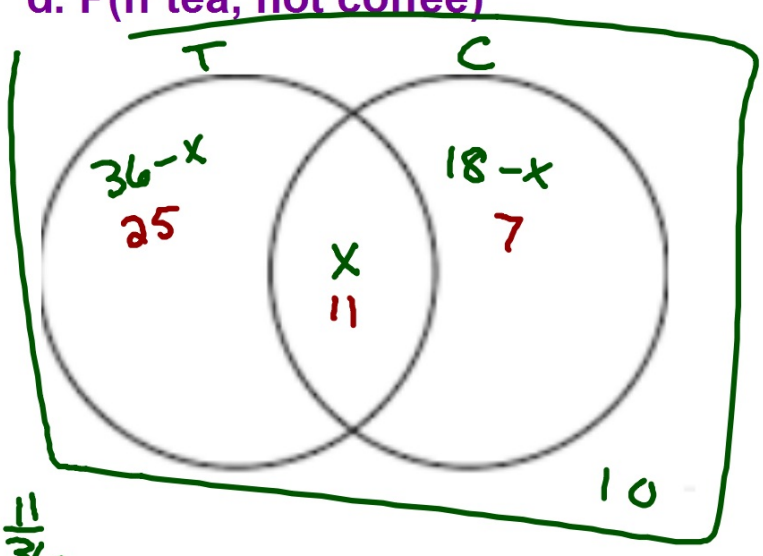
or $P(A \cap B) = P(A|B) \cdot P(B)$

* if A and B are independent events,

then $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{P(A) \cdot P(B)}{P(B)} = P(A)$

Ex: 53 people
36 drink tea
18 drink coffee
10 drink neither

a. How many drink both? 11
b. P(Tea not coffee)
c. P(If tea, coffee too)
d. P(if tea, not coffee)



a) $36-x+18-x+x+10=53$
$64-x=53$
$-x=-11$
$x=11$

b) $P(T \cap C') = \frac{25}{53}$

c) $P(C|T) = \frac{P(C \cap T)}{P(T)}$
$= \frac{\frac{11}{53}}{\frac{36}{53}} = \frac{11}{36}$

d) $P(C'|T) = \frac{P(C' \cap T)}{P(T)} = \frac{\frac{25}{53}}{\frac{36}{53}} = \frac{25}{36}$

3.6 p. 87-88
#1,4,9