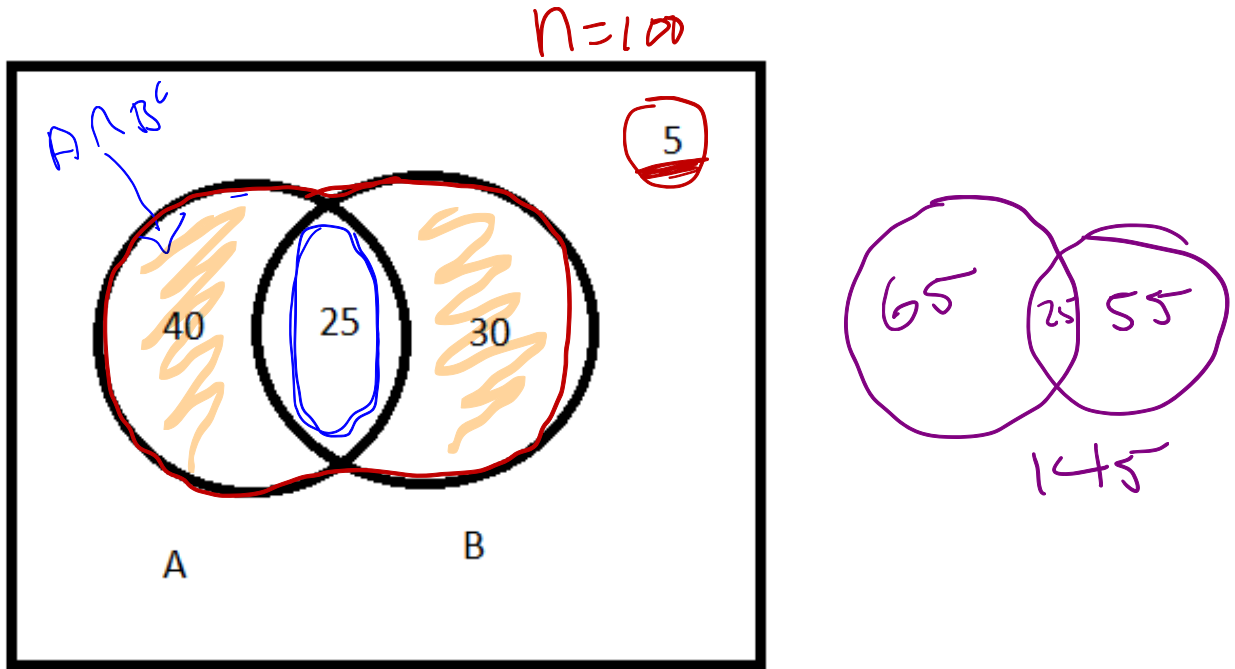


Ch 2.1 Practice: Probability Basics

Solutions

1. One hundred voters were asked their opinions of two candidates, A and B , running for mayor. Their responses to three questions are: 65 said they like candidate A , 55 said they like B , and 25 said that they like both.

a. Draw a Venn diagram that depicts the above situation.



b. What is the probability that someone likes neither?

$\$ (100 - (40 + 25 + 30)) / 100$

$5 / 100$

[1] 0.05

Or...

5/100

[1] 0.05

c. What is the probability that someone likes exactly one?

(40+30)/100

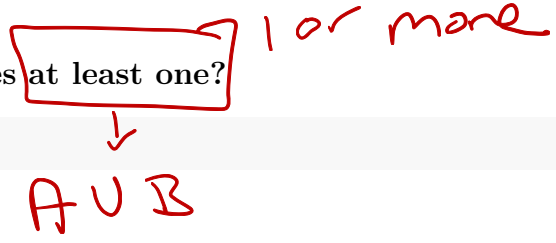
$\frac{70}{100}$

[1] 0.7

d. What is the probability that someone likes at least one?

(40+25+30)/100

[1] 0.95



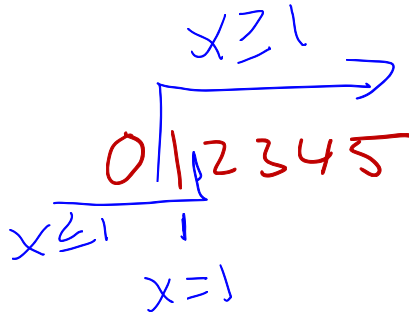
e. What is the probability that someone likes at most one?

(100-25)/100

[1] 0.75

$\frac{0 \text{ or } 1}{5 + 70}$

$S - A \cap B$



2. Consider two events, A and B , with $P(A) = 0.4$ and $P(B) = 0.7$. Determine the maximum and minimum values for $P(A \cap B)$ and the conditions under which of these values is attained.

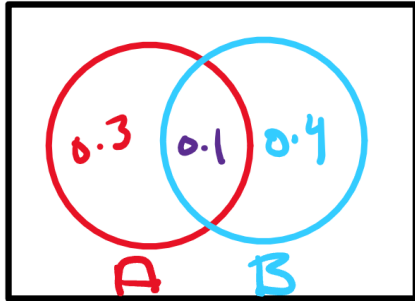
Since probabilities can't be less than 0, if $P(A \cap B) = 0$ then A and B would be disjoint. This isn't possible because the $P(A) + P(B) \geq 1$.

Since $P(A) + P(B) = 1.1$, which is greater than 1 (which also can't happen), the minimum value that $P(A \cap B)$ can be is 0.1.

The maximum value for $P(A \cap B)$ is 0.4 and this only happens when $A \subset B$.

3. Let A and B be any two events defines on S . Suppose that $P(A) = 0.4$, $P(B) = 0.5$, and $P(A \cap B) = 0.1$. What is the probability that A or B but not both occur?

= Exactly 1



$$P(A) = 0.4$$

$$P(B) = 0.5$$

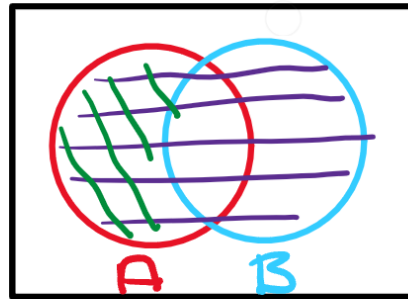
$$P(A \cap B) = 0.1$$

$$P(A^c \cap B) = 0.4$$

$$P(A \cap B^c) = 0.3$$

$$0.7$$

4. Let A and B be two events defined on S . If the probability that at least one of them occurs is 0.3 and the probability that A occurs but B does not occur is 0.1, what is $P(B)$?



$$P(\text{at least 1}) = P(A \cup B) = 0.3$$

$$P(A \cap B^c) = 0.1$$

$$P(B) = 0.3 - 0.1 = 0.2$$