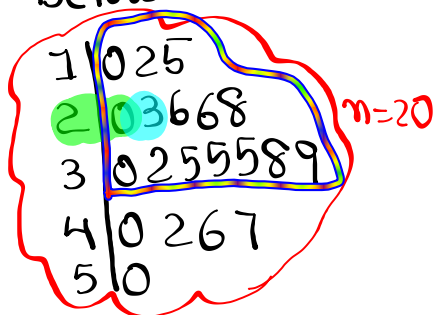


Statistics
Spring 2022
Lecture 6



Class QZ 6

Use the STEM plot below to answer



1) Estimate $S \approx \frac{\text{Range}}{4} = \frac{50-10}{4} = \boxed{10} \checkmark$

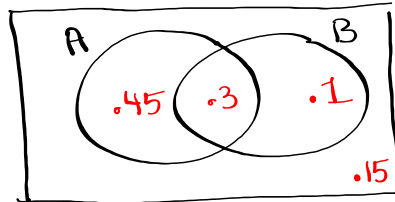
2) Find $P_{20} = \frac{4\text{th} + 5\text{th}}{2}$
 $L = \frac{20}{100} \cdot 20 = 4 = \frac{20 + 23}{2} = \boxed{21.5}$

3) Find k such that
 $P_k = 40$ $\boxed{P_{75} = 40}$

$k = \frac{B}{n} \cdot 100 = \frac{15}{20} \cdot 100 = 75$

Suppose $P(A) = .75$ $P(B) = .4$

$P(\text{A and B}) = .3$
overlap



Total = 1

$P(A \text{ only}) = .75 - .3 = .45$

$P(B \text{ only}) = .4 - .3 = .1$

$P(\bar{A}) = 1 - P(A) = .25$

$P(\bar{B}) = 1 - P(B) = .6$

$P(A \text{ only OR } B \text{ only}) = .45 + .1 = \boxed{.55}$

$P(\bar{A} \text{ and } \bar{B}) = P(\overline{A \text{ or } B}) = \boxed{.15}$

De Morgan's Law

$P(\bar{A} \text{ OR } \bar{B}) = P(\overline{A \text{ and } B}) = \boxed{.7}$

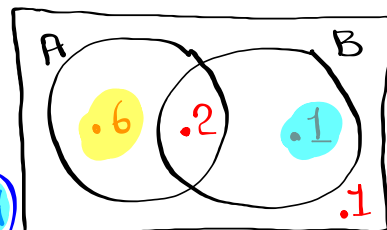
$P(A) = .8$ $P(B) = .3$ $P(A \text{ and } B) = .2$

1) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
 $= .8 + .3 - .2 = \boxed{.9}$

2) $P(\overline{A \text{ or } B}) = 1 - P(A \text{ or } B) = 1 - .9 = \boxed{.1}$

3) $P(A \text{ or } B, \text{ not both})$

$= P(A \text{ only OR } B \text{ only})$



$= .6 + .1 = \boxed{.7}$

Multiplication Rule

Keyword: AND

Multiple action event

1) Independent Events

$$P(A \text{ and } B) = P(A) \cdot P(B)$$

A happens first, then B happens.

outcome of first event does not
change the prob. of the next event.

Family of two kids

BB

BG

GB

GG

$$P(B) = .5, P(G) = .5$$

$$P(\text{Two Boys}) = (.5)(.5) = \boxed{.25}$$

Suppose a loaded coin is tossed twice.

HH

HT

TH

TT

$$P(\text{Land Tail}) = .7$$

$$P(\bar{T}) = .7$$

$$P(H) = .3$$

$$P(TT) = (.7)(.7) = \boxed{.49}$$

$$P(HH) = (.3)(.3) = \boxed{.09}$$

Draw two cards from a standard deck of playing cards. with replacement
 52 cards, 4 Aces.

$$P(\text{Draw two Aces}) = P(\text{Ace and Ace}) \\ = \frac{4}{52} \cdot \frac{4}{52} = \boxed{\frac{1}{169}}$$

How about draw 2 cards with replacement

$P(\text{Two Face Cards}) =$

$$P(\text{Face and Face}) = \frac{12}{52} \cdot \frac{12}{52} \\ = \boxed{\frac{9}{169}}$$

Dependent events

when first outcome

changes the prob.

of the next outcome

$$P(A \text{ and } B) = P(A) \cdot P(B|A)$$

Given

Draw two cards without replacement,

$$P(2 \text{ Aces}) = P(\text{Ace and Ace})$$

$$= \frac{4}{52} \cdot \frac{3}{51} = \boxed{\frac{1}{221}}$$

$$P(2 \text{ Face Cards}) = \frac{12}{52} \cdot \frac{11}{51} = \boxed{\frac{11}{221}}$$

There are 2 Quarters, 3 Dimes, 5 Nickels
in a box. Shake it to get 2 random Coins.

$$P(50¢) = P(QQ) = \frac{2}{10} \cdot \frac{1}{9} = \frac{1}{45}$$

$$P(10¢) = P(NN) = \frac{5}{10} \cdot \frac{4}{9} = \frac{2}{9}$$

$$P(30¢) = P(QN \text{ OR } NQ) =$$

$$\frac{2}{10} \cdot \frac{5}{9} + \frac{5}{10} \cdot \frac{2}{9} = \boxed{\frac{2}{9}}$$