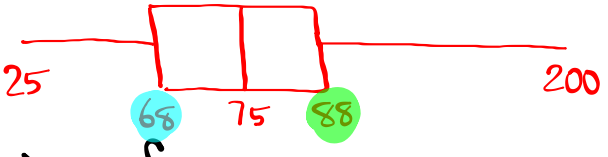
Math 110
Winter 2021
Lecture 7

Class QZ 4

A Sample has the following 5-Number Summary:

25, 68, 75, 88, 200

1) Draw Box Plot



2) IQR

$= Q_3 - Q_1 = 20$

3) Upper Fence

$UF = Q_3 + 1.5(IQR) = 118$

4) Lower Fence

$LF = Q_1 - 1.5(IQ3) = 38$

5) Discuss outliers. 25 to 38 and 118 to 200

A box Contains 3 Red, 7 white, and 10 Blue balls.

If we randomly Select one ball, find

1) $P(\text{Red}) = \frac{3 \text{ Red}}{20 \text{ Balls}} = \boxed{\frac{3}{20}} = \boxed{.15}$

2) $P(\text{white}) = \frac{7 \text{ white}}{20 \text{ balls}} = \frac{7}{20} = \boxed{.35}$

3) P(Red or Blue)

$= \frac{3 + 10}{20 \text{ balls}} = \boxed{\frac{13}{20}}$

4) P(white and Blue)

$= \frac{0}{20 \text{ Balls}} = \boxed{0}$

Do not use $\emptyset$ for 0.

A four-sided fair die is numbered 1, 2, 3, 4.

Roll it twice.

List of all possible outcomes is called Sample Space.

1,1	1,2	1,3	1,4
2,1	2,2	2,3	2,4
3,1	3,2	3,3	3,4
4,1	4,2	4,3	4,4

1) $P(\text{Sum}=1) = \frac{0}{16} = \boxed{0}$

2) $P(\text{Sum} \leq 3) = \boxed{\frac{3}{16}}$

3) $P(\text{Sum} > 5) = \frac{6}{16} = \boxed{\frac{3}{8}}$

4) $P(2 \leq \text{Sum} \leq 8) = \frac{16}{16} = \boxed{1}$

5) $P(2 < \text{Sum} < 8) = \frac{14}{16} = \frac{7}{8} = \boxed{.875}$

$E \rightarrow$ Desired outcome (Event)

$\bar{E} \rightarrow$ E-bar, Not E, E-Complement

$P(E) + P(\bar{E}) = 1$, $P(\bar{E}) = 1 - P(E)$ Complement Rule

$P(\text{Rains}) = .1 = 10\%$. $P(\text{Pass}) = .68$

$P(\overline{\text{Rain}}) = .9 = 90\%$. $P(\overline{\text{Pass}}) = 1 - P(\text{Pass}) = 1 - .68 = .32$

$P(\text{Accident}) = \frac{2}{11}$ $P(\overline{\text{Accident}}) = 1 - P(\text{Accident})$

$= 1 - \frac{2}{11} = \frac{9}{11}$

1 − 2 ÷ 11 Math 1: Enter

True or False:

1) $P(A) = .325$ & $P(\bar{A}) = .775$ False $P(A) + P(\bar{A}) \neq 1$

2) ~~$P(A) = 1.25$~~ & ~~$P(\bar{A}) = -.25$~~ False $0 \leq P(A) \leq 1$

3) $P(A) = .5\% = .005$ & $P(\bar{A}) = 99.5\% = .995$ True

$P(A) + P(\bar{A}) = .005 + .995 = 1$ ✓

$0 \leq P(A) \leq 1$, $0 \leq P(\bar{A}) \leq 1$

Addition Rule:

Keyword: OR

Single Action Event

Formula $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

A, B, or Both — A & B both

Ex: $P(A) = .65$ $P(B) = .55$ $P(A \text{ and } B) = .25$

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$= .65 + .55 - .25 = .95$

$P(\bar{A}) = 1 - P(A) = 1 - .65 = .35$

$P(\bar{B}) = 1 - P(B) = 1 - .55 = .45$

$P(\overline{A \text{ and } B}) = 1 - P(A \text{ and } B) = 1 - .25 = .75$

$P(\overline{A \text{ or } B}) = 1 - P(A \text{ or } B) = 1 - .95 = .05$

$P(\text{Coffee}) = .58$ $\quad P(C) = .58$

$P(\text{Eggs}) = .42$ $\quad P(E) = .42$

$P(\text{Coffee and eggs}) = .35$ $\quad P(C \text{ and } E) = .35$

1) $P(\overline{\text{Coffee}})$

$P(\bar{C}) = 1 - P(C) = \boxed{.42}$

2) $P(\overline{\text{Eggs}})$

$P(\bar{E}) = 1 - P(E) = \boxed{.58}$

3) $P(\text{Coffee or Eggs})$

$P(C \text{ or } E) = P(C) + P(E) - P(C \text{ and } E)$

$= .58 + .42 - .35 = \boxed{.65}$

If events A and B cannot happen together, they are called Mutually Exclusive Events or Disjoint Events, and $P(A \text{ and } B) = 0$

Given $P(A) = .7$, $P(B) = .2$, and A & B are M.E.E.

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

$= \boxed{.3}$

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

$= \boxed{.8}$

3) $P(A \text{ and } B) = \boxed{0}$

4) $P(A \text{ or } B)$

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

$= .7 + .2 - 0 = \boxed{.9}$

Addition Rule with Venn Diagram

$P(A) = .8$

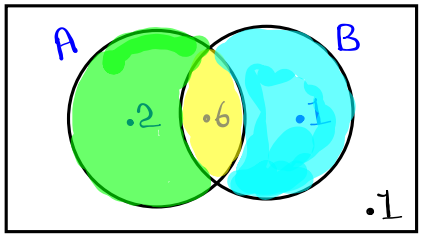
$P(B) = .7$

$P(A \text{ and } B) = .6$

$P(A \text{ only}) = .8 - .6 = .2$

$P(B \text{ only}) = .7 - .6 = .1$

Construct the Venn Diagram



$\sum P(E) = 1$

whatever is Colored $\Rightarrow$ A or B

$P(A \text{ or } B) = .2 + .6 + .1 = .9$

$\overline{A \text{ or } B}$ $\Rightarrow$ outside of Circles

$P(\overline{A \text{ or } B}) = .1$

$P(\text{Math}) = .65$

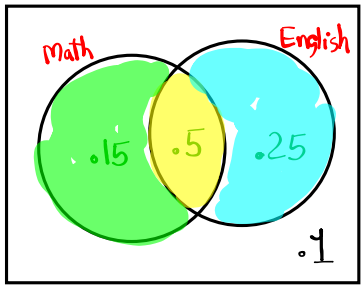
$P(\text{English}) = .75$

$P(\text{Math and English}) = .5$

$P(\text{Math only}) = .65 - .5 = .15$

$P(\text{English only}) = .75 - .5 = .25$

Construct Venn Diagram



$\sum P(E) = 1$

$P(\overline{\text{Math}}) = .35$

$P(\overline{\text{English}}) = .25$

$P(\overline{\text{Math and English}}) = .5$

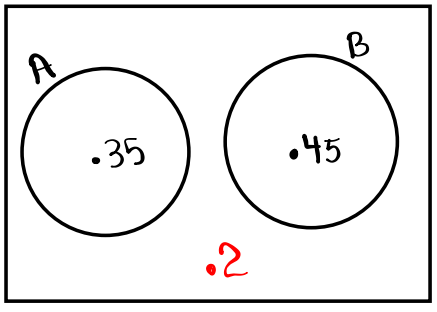
$P(\text{Math or English}) = .15 + .5 + .25 = .9$

$P(\text{Math only or English only, not both}) = .15 + .25 = .4$

Given $P(A)=.35$, $P(B)=.45$, A & B are disjointed events

M.E.E.

1) Construct the Venn Diagram



$\Sigma P(E)=1$

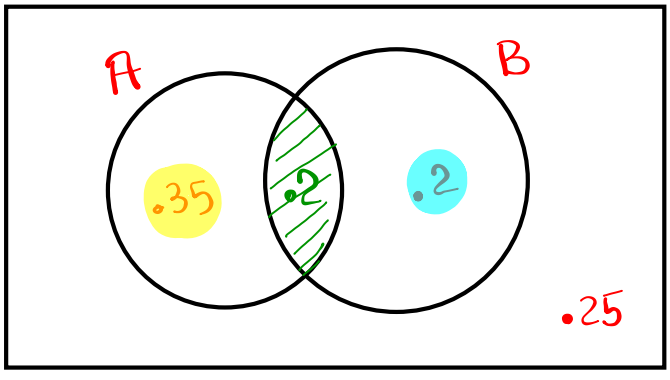
$P(\bar{A})=.45+.2=.65$

$P(\bar{B})=.35+.2=.55$

$P(A \text{ or } B)=.35+.45=.8$

$P(\overline{A \text{ or } B})=.2$

Consider the Venn Diagram below



1) Complete the Venn ✓ Diagram

2) $P(A)=.35+.2=.55$

3) $P(B)=.2+.2=.4$

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

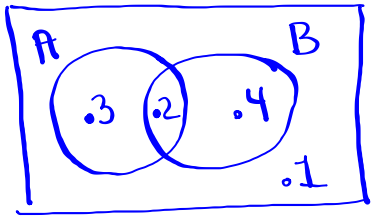
5) $P(A \text{ or } B)=.35+.2+.2=.75$

6) $P(A \text{ only or } B \text{ only})=.35+.2=.55$

De Morgan's Law:

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

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



1) Verify the Venn Diagram $.3 + .2 + .4 + .1 = 1$ ✓

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

3) $P(\bar{A} \text{ or } \bar{B}) = P(\overline{A \text{ and } B}) = .3 + .4 + .1 = \boxed{.8}$

I flip a (fair coin) three times.

Multiple-Action

T → Tails

H → Heads

$P(T) = \frac{1}{2}$

$P(H) = \frac{1}{2}$

Sample Space

TTT
TTH
THT
THH
HTT
HTH
HHT
HHH

$P(\text{3 tails}) = \frac{1}{8}$

$P(\text{2 tails}) = \frac{3}{8}$

$P(\text{1 tail}) = \frac{3}{8}$

$P(\text{No tails}) = \frac{1}{8}$

Consider a full-deck of playing cards

52 Cards, 26 Red, 12 face, 4 Aces.

I draw 2 Cards randomly.

P(Both red) Multiple Action Event

RR
R $\bar{R}$
$\bar{R}$ R
$\bar{R}$ $\bar{R}$

Multiplication Rule

Keyword AND

Multiple Action Event

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

A happens, then B happens.

B Given

Draw 2 Cards,

$P(\text{2 Reds}) = \frac{26}{52} \cdot \frac{26}{52} = \frac{1}{2} \cdot \frac{1}{2} = \boxed{\frac{1}{4}}$

with replacement

without replacement

$= \frac{26}{52} \cdot \frac{25}{51} = \boxed{\frac{25}{102}}$

$P(\text{2 face Cards}) = \frac{12}{52} \cdot \frac{12}{52} = \frac{3}{13} \cdot \frac{3}{13} = \boxed{\frac{9}{169}}$

with replacement

without replacement

$= \frac{12}{52} \cdot \frac{11}{51} = \frac{3}{13} \cdot \frac{11}{51} = \boxed{\frac{11}{221}}$

If we draw 3 Cards,

$P(\text{3 Aces without replacement}) = \frac{4}{52} \cdot \frac{3}{51} \cdot \frac{2}{50}$

$= \frac{1}{5525} = \boxed{1.8 \times 10^{-4}}$

Class QZ 5

Class limits	Class MP	Class F
20 – 30		7
31 – 41		13
42 – 52		15
53 – 63		5

1) Draw freq. Polygon

2) Find

$\bar{x}=$

$s=$ } 3-decimals

s^2 in reduced fraction