Statistics
Spring 2023
Lecture 16

Feb 19-8:47 AM

A box has 4 Red, 6 White, and 10 Blue balls.

If we randomly select one ball,

1) $P(\text{Red}) = \frac{4 \text{ Red}}{20 \text{ balls}} = \frac{4}{20} = \frac{1}{5} = .2$

2) $P(\text{White}) = \frac{6 \text{ White}}{20 \text{ balls}} = \frac{6}{20} = \frac{3}{10} = .3$

3) $P(\text{Blue}) = \frac{10 \text{ Blue}}{20 \text{ balls}} = \frac{10}{20} = \frac{1}{2} = .5$

Sum of all Prob. is 1.

4) $P(\overline{\text{Red}}) = 1 - P(\text{Red}) = 1 - .2 = .8$

5) $P(\overline{\text{White}}) = 1 - P(\text{White}) = 1 - .3 = .7$

6) $P(\overline{\text{Blue}}) = 1 - P(\text{Blue}) = 1 - .5 = .5$

7) $P(\overbrace{\text{Red}}^{4} \text{ OR } \overbrace{\text{Blue}}^{10}) = \frac{14}{20 \text{ balls}} = \frac{14}{20} = \frac{7}{10} = .7$

8) $P(\underbrace{\text{Red and Blue}}_{\text{Impossible Event}}) = 0$ Do not use Ø for Zero.

Mar 6-7:15 AM

Exam 1 is coming up very soon

Suppose $P(A) = .5\%$

1) write $P(A)$ in decimal.

$.5\% = .5(.01) = \boxed{.005}$

2) write $P(A)$ in reduced fraction.

$.5\% = \frac{.5}{100} = \boxed{\frac{1}{200}}$

3) find $P(\bar{A})$ in %.

$P(\bar{A}) = 1 - P(A) = 1 - .5\%$

$= 1 - .005 = .995 = 99.5\%$

Mar 6-7:25 AM

Addition Rule: $\boxed{P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)}$

Keyword : OR

Single Action event

Ex: $P(A) = .6$, $P(B) = .7$,

$P(A \text{ and } B) = .5$

$P(\bar{A}) = 1 - P(A) = 1 - .6 = \boxed{.4}$

$P(\bar{B}) = 1 - P(B) = 1 - .7 = \boxed{.3}$

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

$= .6 + .7 - .5 = \boxed{.8}$

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

$= 1 - .8 = \boxed{.2}$

Mar 6-7:29 AM

$P(\text{Coffee}) = .4$

$P(\text{Eggs}) = .5$

$P(\text{coffee and Eggs}) = .3$

$P(\overline{\text{Coffee}}) = 1 - P(\text{Coffee}) = 1 - .4 = \boxed{.6}$

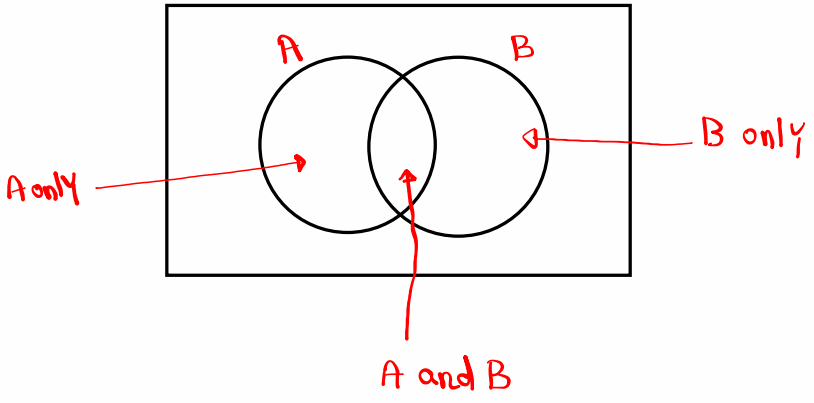
$P(\overline{\text{Eggs}}) = 1 - P(\text{Eggs}) = 1 - .5 = \boxed{.5}$

$P(\text{coffee or eggs}) = P(\text{coffee}) + P(\text{Eggs}) - P(\text{coffee and eggs})$

$= .4 + .5 - .3 = \boxed{.6}$

Mar 6-7:36 AM

Addition Rule with Venn Diagram:



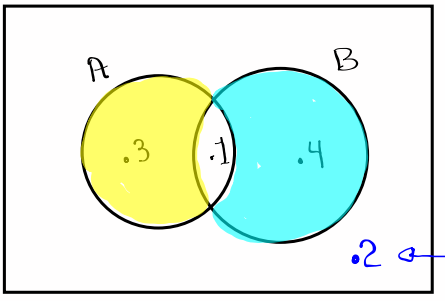
Inside of Circles → A or B

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

Total Prob. = 1

Mar 6-7:41 AM

Consider the Venn Diagram below



Is the total Prob. 1?
NO, it is .8

$1 - .8 = .2$

$P(A \text{ only}) = .3$ $\quad P(A) = .3 + .1 = \boxed{.4}$

$P(B \text{ only}) = .4$ $\quad P(B) = .4 + .1 = \boxed{.5}$

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

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

Mar 6-7:44 AM

$P(A) = .8$, $P(B) = .7$, $P(A \text{ and } B) = .6$

1) $P(\overline{A}) = 1 - P(A) = 1 - .8 = \boxed{.2}$

2) $P(\overline{B}) = 1 - P(B) = 1 - .7 = \boxed{.3}$

3) $P(\overline{A \text{ and } B}) = 1 - P(A \text{ and } B) = 1 - .6 = \boxed{.4}$

4) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
$= .8 + .7 - .6 = \boxed{.9}$

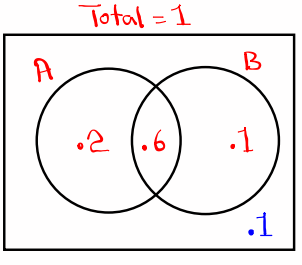
5) $P(\overline{A \text{ or } B}) = 1 - P(A \text{ or } B) = 1 - .9 = \boxed{.1}$

6) Make Venn Diagram

Start with overlap A and B

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

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



Mar 6-7:51 AM

P(Math) = .4

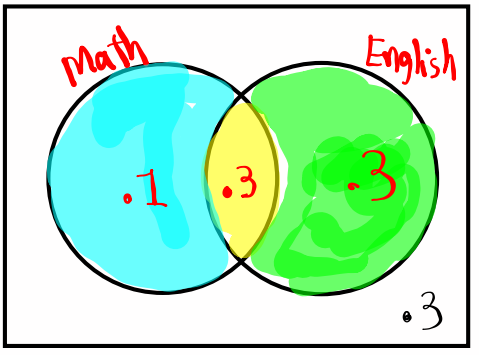
P(English) = .6

P(Math and English) = .3

P(Math only) = .4 − .3 = .1

P(English only) = .6 − .3 = .3

Make Venn Diagram



Total = 1

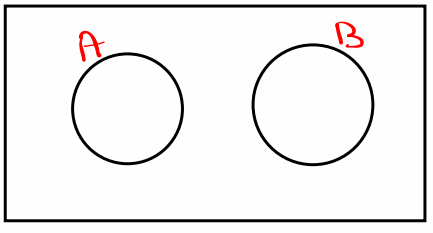
P(Math only OR English only) = .1 + .3 = .4

Addition Rule

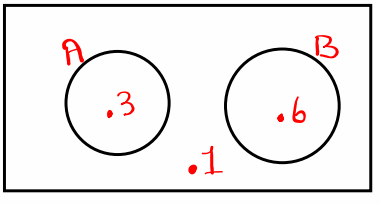
Mar 6-8:00 AM

Mutually Exclusive Events OR Disjointed Events

If A & B are M.E.E., P(A and B) = 0



P(A) = .3 , P(B) = .6 , A & B are disjointed events



Total = 1 ✓

Mar 6-8:08 AM

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

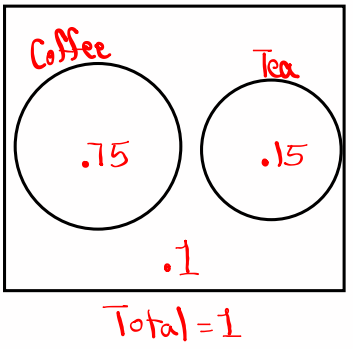
$P(\text{Tea}) = .15$

Assume Coffee & Tea are M.E.E.

$P(\overline{\text{Coffee}}) = 1 - .75 = .25$

$P(\overline{\text{Tea}}) = 1 - .15 = .85$

Make Venn Diagram



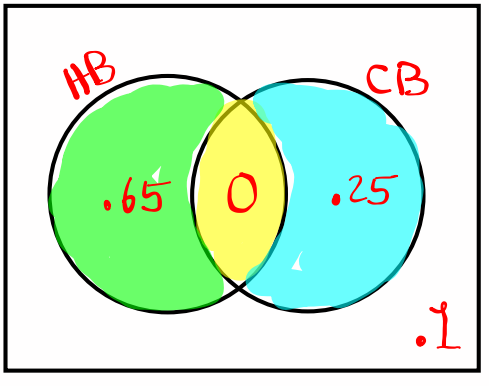
Mar 6-8:12 AM

$P(HB) = .65$

$P(CB) = .25$

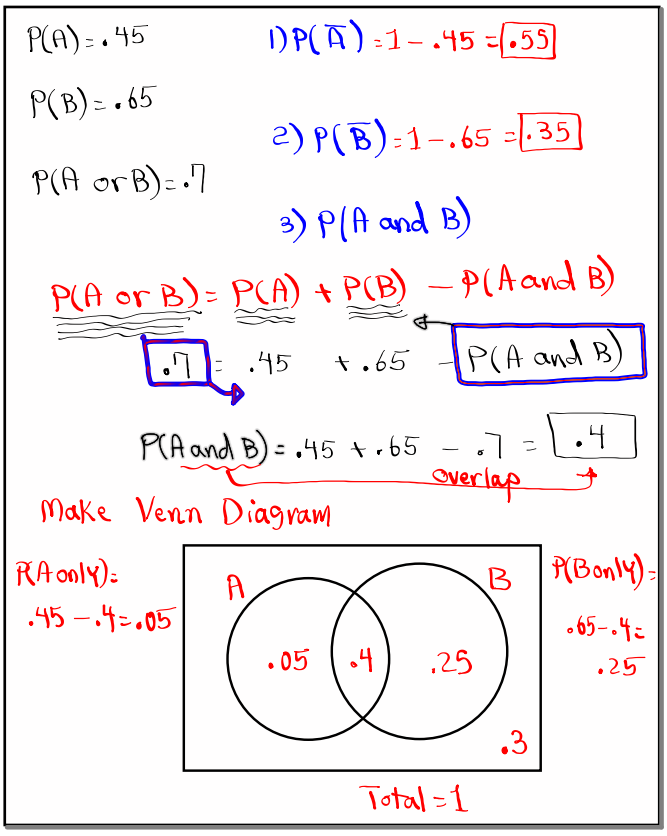
Assume HB & CB are disjointed events

$P(HB \text{ and } CB) = 0$



Total = 1

Mar 6-8:17 AM


P(A) = .45
P(B) = .65
P(A or B) = .7
1) P(Ā) = 1 − .45 = .55
2) P(B̄) = 1 − .65 = .35
3) P(A and B)
P(A or B) = P(A) + P(B) − P(A and B)
.7 = .45 + .65 − P(A and B)
P(A and B) = .45 + .65 − .7 = .4
overlap
Make Venn Diagram
P(A only): .45 − .4 = .05
P(B only): .65 − .4 = .25
A
B
.05
.4
.25
.3
Total = 1

Mar 6-8:20 AM