# Statistics
# Spring 2023
# Lecture 17

Feb 19-8:47 AM

Given $P(A) = .75$, $P(B) = .45$, $P(A \text{ and } B) = .30$ ← overlap

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

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

3) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ ← addition Rule
$= .75 + .45 - .3 = \boxed{.9}$

4) $P(\overline{A \text{ and } B}) = 1 - P(A \text{ and } B) = 1 - .3 = \boxed{.7}$

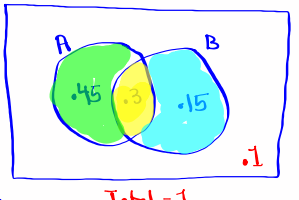
5) $P(\overline{A \text{ or } B}) = 1 - P(A \text{ or } B) = 1 - .9 = \boxed{.1}$

6) Make Venn Diagram.

Overlap → AND →

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

$P(B \text{ only}) = P(B) - P(A \text{ and } B)$
$= .45 - .3 = .15$




Total = 1

7) $P(A \text{ only OR } B \text{ only})$
$= .45 + .15 = \boxed{.6}$

Mar 7-7:17 AM

# De Morgan's Law:

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

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

From Last example $P(A \text{ and } B) = .3$ & $P(A \text{ or } B) = .9$

Find $P(\bar{A} \text{ and } \bar{B}) = P(\overline{A \text{ or } B}) = 1 - P(A \text{ or } B) = 1 - .9 = .1$

Find $P(\bar{A} \text{ or } \bar{B}) = P(\overline{A \text{ and } B}) = 1 - P(A \text{ and } B) = 1 - .3 = .7$

Mar 7-7:28 AM

A standard deck of playing cards has 52 cards, 26 Red, and 12 face cards.

Draw one card. Do not simplify answers.

1) $P(\text{Red}) = \frac{26}{52} = \boxed{\frac{1}{2}}$

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

3) $P(\text{Red and face}) = \frac{6}{52} = \boxed{\frac{3}{26}}$

4) $P(\text{Red or face}) = P(\text{Red}) + P(\text{face}) - P(\text{Red and face})$

$= \frac{26}{52} + \frac{12}{52} - \frac{6}{52} = \frac{32}{52} = \boxed{\frac{8}{13}}$

5) $P(\overline{\text{Red and face}}) = P(\overline{\text{Red or face}})$

By De Morgan's Law $= 1 - \frac{32}{52} = \frac{16}{52} = \boxed{\frac{4}{13}}$

6) $P(\overline{\text{Red or face}}) = P(\overline{\text{Red and face}}) = 1 - \frac{6}{52} = \frac{46}{52} = \boxed{\frac{23}{26}}$

Mar 7-7:32 AM

$P(A) = .8$

$P(B) = .15$

A & B are M.E.E.

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

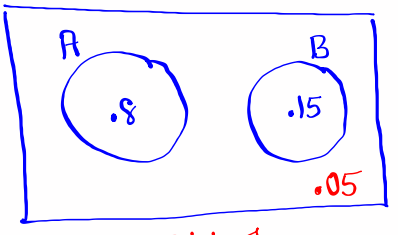
2) $P(\overline{B}) = 1 - P(B) = \boxed{.85}$

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

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

$= .8 + .15 - 0 = \boxed{.95}$

5) Make Venn Diagram




Total = 1

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

By DeMorgan's Law $= 1 - P(A \text{ or } B) = 1 - .95 = \boxed{.05}$

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

$= 1 - 0 = \boxed{1}$

Mar 7-7:44 AM

A Survey was Conducted. Do You text while driving?

1) Complete the chart

| | Yes | NO | Total |
|---|---|---|---|
| Males | 80 | 30 | 110 |
| Females | 15 | 75 | 90 |
| Total | 95 | 105 | 200 |

2) Survey Size 200

If we randomly select one person, find

1) $P(\text{Male}) = \frac{110}{200} = \boxed{.55}$

2) $P(\text{Yes}) = \frac{95}{200} = \boxed{.475}$

3) $P(\text{Male and Yes}) = \frac{80}{200} = \boxed{.4}$

SG. 10 & SG. 11

4) $P(\text{Male or Yes}) = \frac{125}{200} = \boxed{.625}$

5) $P(\overline{\text{Male}} \text{ and } \overline{\text{Yes}}) = P(\overline{\text{Male OR Yes}}) = 1 - .625 = \boxed{.375}$

De Morgan's Law

6) $P(\overline{\text{Male}} \text{ or } \overline{\text{Yes}}) = P(\overline{\text{Male and Yes}}) = 1 - .4 = \boxed{.6}$

Mar 7-7:56 AM

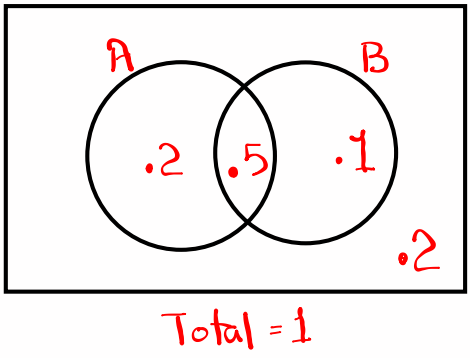
Class QZ 3:

Given $P(A)=.7$, $P(B)=.6$, $P(A \text{ and } B)=.5$

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

2) $P(A \text{ or } B)=$
$.7+.6-.5=\boxed{.8}$

3) Construct Venn Diagram.

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Mar 7-8:11 AM