# Statistics

# Lecture 7

Feb 19-8:47 AM

## Class QZ 8

| class MP | class F |
|---|---|
| 15 | 8 |
| 25 | 12 |
| 35 | 15 |
| 45 | 10 |
| 55 | 5 |

class MP → L1

class F → L2

Find

1) $\bar{x} = 33.4 \approx 33$

2) $S = 12.182 \approx 12$

} Round to whole #

3) $n = 50$

4) $S^2 = \frac{7272}{49}$ } Reduced fraction

STAT → CALC

1:1-Var Stats

with Menu

List: L1

Freqlist: L2

Calculate

No Menu

L1 , L2

Enter

2nd 1

2nd 2

VARS

5: Statistics

3: $S_x$ $\chi^2$

MATH 1: ▶Frac Enter

Mar 12-9:16 PM

SG 12

## Intro. to odds

odds in favor of event $E$ are

$a : b$

$a$: # of times $E$ happens

$b$: # of times $E$ does not happen.

odds in favor of event $E$ are

$3 : 17$

3 times $E$ happens

17 times $E$ does not happen.

odds against event $E$ are $17 : 3$

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A standard deck of playing cards has 52 cards with 12 face cards.

Odds in favor of drawing a face card are

13 times drawing

3 face cards

10 face cards

$12 : 40 \rightarrow 3 : 10$

12 face cards

40 not face cards

odds against drawing a face card are $10 : 3$.

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odds in favor of event $E$ are

$P(E) : P(\overline{E})$ Always Simplify

on a loaded coin,

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

$P(\overline{\text{Tails}}) = .6$

odds in favor of landing tails are

$.4 : .6$

.4 ÷ .6 Math 1:▶Frac Enter

$\frac{2}{3}$

$2 : 3$

odds against landing tails are

$3 : 2$

If You flip the coin 5 times

2 Tails

3 $\overline{\text{tails}}$

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How to find $P(E)$ & $P(\overline{E})$ when odds are given:

odds in favor of event $E$ are $a : b$

$$P(E) = \frac{a}{a+b} \quad , \quad P(\overline{E}) = \frac{b}{a+b}$$

Suppose odds in favor of LA Lakers win the championship this year are $3 : 37$.

1) $P(W) = \frac{3}{3+37} = \frac{3}{40}$

2) $P(\overline{W}) = \frac{37}{3+37} = \frac{37}{40}$

3) odds against win → $37 : 3$

Let's look at betting → $3 : 37$

$3 bet

$37 Net Profit

Vegas

+225 → $100 bet → $225 Net Profit

−150 → $150 bet → $100 Net profit

Mar 19-7:08 PM

Multiplication Rule:

Key word AND

Multiple Action event

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

A happens then B happens

Given

A box has 4 Red & 6 Blue balls.

Select 2 balls with replacement

$P(2 \text{ Red balls}) = P(RR) = \frac{4}{10} \cdot \frac{4}{10} = .16$

$P(2 \text{ Blue balls}) = P(BB) = \frac{6}{10} \cdot \frac{6}{10} = .36$

Total Prob. = 1

$P(1R \text{ and } 1B) = P(RB \text{ or } BR) = \frac{4}{10} \cdot \frac{6}{10} + \frac{6}{10} \cdot \frac{4}{10} = .48$

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4 Red, 6 Blue, Select 2 balls, NO replacement

$P(2 \text{ Reds}) = \frac{4}{10} \cdot \frac{3}{9} = \frac{2}{15}$

4 ÷ 10 × 3 ÷ 9 Math 1:▶Frac Enter

$P(2 \text{ Blue}) = \frac{6}{10} \cdot \frac{5}{9} = \frac{1}{3}$

$P(1R \text{ & } 1B) = P(RB \text{ or } BR) = 2\left(\frac{4}{10} \cdot \frac{6}{9}\right) = \frac{8}{15}$

Total Prob

2 ÷ 15 + 1 ÷ + 8 ÷ 15 Enter → 1

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## Multiplication Rule

1) Independent Events: one outcome does not change the prob. of next outcome.

Newborn babies $P(B)=.5$

$P(G)=.5$

Multiple choice exams with 4 choices and one correct choice per question.

$P(\text{guess Correctly}) = \frac{1}{4} = .25$

$P(\text{guess } \overline{\text{Correctly}}) = \frac{3}{4} = .75$

If A and B are independent events, then

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

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Suppose $P(A)=.4$, $P(B)=.7$, and A and B are independent events.

1) $P(\overline{A}) = 1 - P(A)$
$= .6$

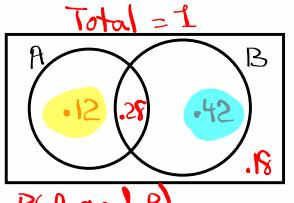
2) $P(\overline{B}) = 1 - P(B)$
$= .3$

3) $P(A \text{ and } B) = P(A) \cdot P(B) = (.4)(.7) = .28$

4) Construct Venn Diagram

$.4 - .28 = .12$

$.7 - .28 = .42$




5) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
$= .4 + .7 - .28 = .82$

6) $P(A \text{ only or } B \text{ only}) = .12 + .42 = .54$

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You toss a loaded coin twice.

P(Tails) = .3

P(Heads) = .7

TT
TH
HT
HH
} Sample Space ⇒ Complete list of all possible outcomes

P(TT) = (.3)(.3) = .09
P(TH) = (.3)(.7) = .21
P(HT) = (.7)(.3) = .21
P(HH) = (.7)(.7) = .49
} Total = 1

P(at least 1) = 1 − P(None)

P(at least 1 tail) = 1 − P(No tails)
= 1 − P(HH) = 1 − .49 = .51

P(at least 1 head) = 1 − P(No heads)
= 1 − P(TT) = 1 − .09 = .91

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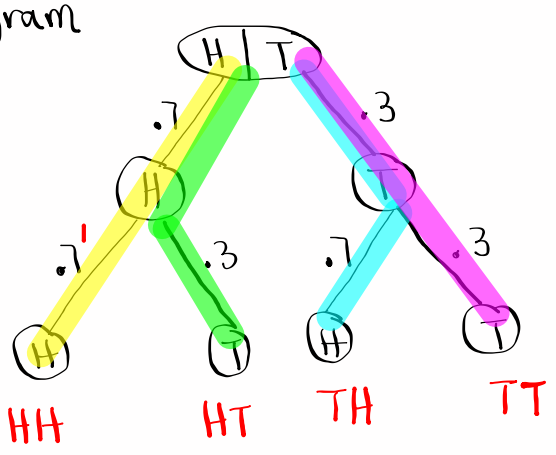
Tree diagram




P(HH) = (.7)(.7) = .49

P(TT) = (.3)(.3) = .09

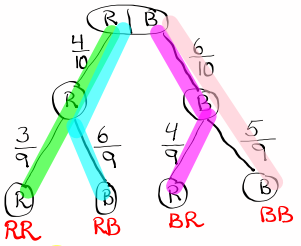
P(HT) = (.7)(.3) = .21

P(TH) = (.3)(.7) = .21

Mar 19-8:00 PM

A box has 4 Red and 6 Blue balls.

Select 2 balls without replacement




$P(RR) = \frac{4}{10} \cdot \frac{3}{9} = \frac{12}{90}$ $\quad P(BR) = \frac{6}{10} \cdot \frac{4}{9} = \frac{24}{90}$

$P(RB) = \frac{4}{10} \cdot \frac{6}{9} = \frac{24}{90}$ $\quad P(BB) = \frac{6}{10} \cdot \frac{5}{9} = \frac{30}{90}$

$\frac{12}{90} + \frac{24}{90} + \frac{24}{90} + \frac{30}{90} = \frac{90}{90} = 1$

$P(\text{at least 1 Red}) = 1 - P(\text{No Red})$

$= 1 - P(BB) = 1 - \frac{30}{90} = \frac{2}{3}$

$P(\text{at least 1 Blue}) = 1 - P(\text{No Blue})$

$= 1 - P(RR) = 1 - \frac{12}{90} = \frac{13}{15}$

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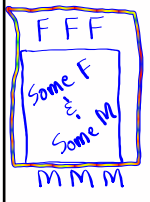
There are 3 Females and 7 males.

Select 3 different People,




$P(FFF) = \frac{3}{10} \cdot \frac{2}{9} \cdot \frac{1}{8} = \frac{1}{120}$

$P(MMM) = \frac{7}{10} \cdot \frac{6}{9} \cdot \frac{5}{8} = \frac{7}{24}$

$P(\text{at least 1 Female}) = 1 - P(\text{No Females})$

$= 1 - P(\text{All Males})$

$= 1 - \frac{7}{24} = \frac{17}{24}$

$P(\text{at least 1 Male}) = 1 - P(\text{No males})$

$= 1 - P(\text{All Females})$

$= 1 - \frac{1}{120} = \frac{119}{120}$

FFF
FFM
FMF
FMM
MFF
MFM
MMF
MMM

Sample Space

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**Dependent Events:** one outcome changes the Prob. for next outcome.

Selecting balls without replacement

Multiplication Rule

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

with some algebra

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

Conditional Prob.

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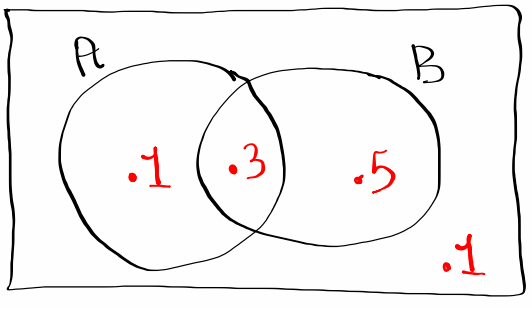
$P(A) = .4$ , $P(B) = .8$ $P(A \text{ and } B) = .3$




Total = 1

$$P(B|A) = \frac{P(A \text{ and } B)}{P(A)} = \frac{.3}{.4} = \boxed{.75}$$

$$P(A|B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.3}{.8} = \boxed{.375}$$

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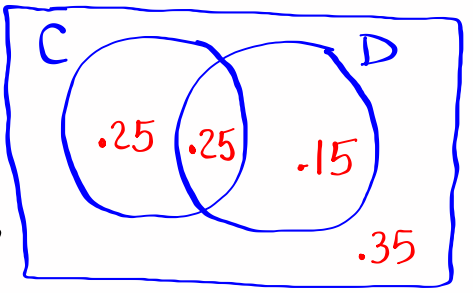
$P(\text{Coffee}) = .5$

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

$P(\text{Coffee and Donut}) = .25$




Total = 1

$$P(\text{Donut} \mid \text{Coffee}) = \frac{P(C \text{ and } D)}{P(C)} = \frac{.25}{.5} = .5$$

$$P(\text{Coffee} \mid \text{Donut}) = \frac{P(C \text{ and } D)}{P(D)} = \frac{.25}{.4} = .625$$

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$P(\text{Shirt}) = .6$

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

$P(\text{Shirt} \mid \text{Pants}) = .8$

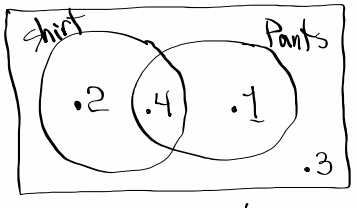
$P(\text{Shirt and Pants})$

$$P(\text{Shirt} \mid \text{Pants}) = \frac{P(\text{Shirt and Pants})}{P(\text{Pants})}$$

$$.8 = \frac{P(\text{Shirt and Pants})}{.5}$$

Cross-Multiply

$P(\text{Shirt and Pants}) = .4$




Total = 1

$$P(\text{Pants} \mid \text{Shirt}) = \frac{P(S \text{ and } P)}{P(S)}$$

1) More notes coming Your way $= \frac{.4}{.6}$

2) watch videos on the right Side of SG 10 – SG13 $= \frac{2}{3} = .667$

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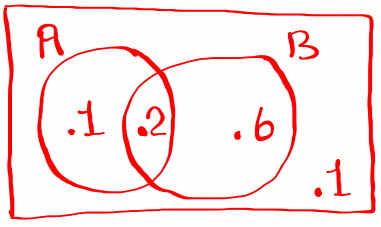
Class QZ 9 Box Your Final Ans.

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

1) Construct Venn Diagram




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

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

4) $P(A \text{ only or } B \text{ only}) = .1 + .6$
$= \boxed{.7}$

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