Statistics

Lecture 6

Feb 19-8:47 AM

Class QZ 8

40 balls

A box contains $\boxed{4 \text{ Red}}$, $\boxed{12 \text{ white}}$ and $\boxed{24 \text{ Blue}}$ color balls. If you randomly select one ball, find the Prob. that it is

All Answers in Reduced fraction.

1) Red $\quad P(\text{Red}) = \frac{4}{40} = \boxed{\frac{1}{10}}$

2) Not white $\quad P(\text{white}) = \frac{12}{40} = \frac{3}{10}$

$P(\overline{\text{white}}) = 1 - P(\text{white}) = 1 - \frac{3}{10} = \boxed{\frac{7}{10}}$

3) Red or White

$P(\text{Red or white}) = \frac{4+12}{40} = \frac{16}{40} = \boxed{\frac{2}{5}}$

Oct 3-6:35 PM

Class QZ 7

Use the chart below

x	y
2	8
4	12
5	15
5	18
8	20

$x \to L1$

$y \to L2$

STAT → CALC

8: LinReg(a+bx)

Use L1 & L2

Find

$a = 4.775 \approx \boxed{5}$

$b = 2.053 \approx \boxed{2}$

Round to whole #

$\boxed{y = 5 + 2x}$

$r^2 = .869 \approx \boxed{87\%}$ Round to whole %.

$r = \boxed{.932}$ Round to 3-decimal places

Sep 26-9:09 PM

Suppose $y = 24 + 5x$ and $\bar{y} = 62$

Predict y when $x = 8$ if

1) r is significant

Use Regression line

$y = 24 + 5(8) = 24 + 40 = \boxed{64}$

2) r is not significant

Use $\bar{y}$

$\boxed{\bar{y} = 62}$

Oct 3-7:15 PM

More on Probability

$\boxed{\text{Addition Rule}}$

Keyword : OR

Single action event

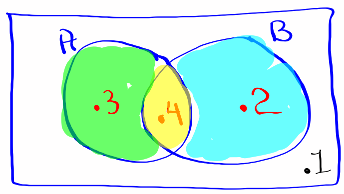
$\boxed{P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)}$

Suppose $P(A) = .7$, $P(B) = .6$, $P(A \text{ and } B) = .4$

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

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

$= .7 + .6 - .4 = \boxed{.9}$



Total Prob. = 1

$P(A \text{ only}) = .7 - .4 = .3$

$P(B \text{ only}) = .6 - .4 = .2$

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

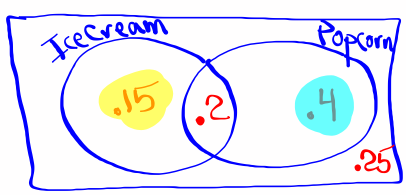
$= .3 + .2 = \boxed{.5}$

Oct 3-7:18 PM

$P(\text{Ice Cream}) = .35$

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

$P(\text{Ice Cream and Popcorn}) = .2$



Total = 1

$.35 - .2 = .15$

$.6 - .2 = .4$

$P(\overline{\text{Ice Cream}}) = 1 - P(\text{Icecream}) = 1 - .35 = \boxed{.65}$

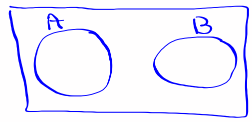
$P(\text{Ice Cream Only OR PopCorn Only}) =$

$= .15 + .4 = \boxed{.55}$

Oct 3-7:24 PM

Mutually Exclusive Events $\Leftrightarrow P(A \text{ and } B) = 0$

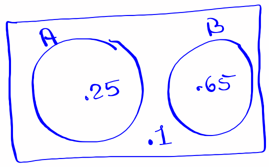
"Disjoint events"



Suppose $P(A) = .25$

$P(B) = .65$

A & B are M.E.E. $\rightarrow P(A \text{ and } B) = 0$



Total = 1

$P(\bar{A}) = 1 - .25 = \boxed{.75}$

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

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

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

$.25 + .65 - 0 =$

$\boxed{.9}$

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

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

To Complete SG 11

You must watch the video called

De Morgan's Law, located to the right of SG 11 in my website

Oct 3-7:29 PM

Introduction to odds:

odds in favor of event E are

$a : b.$

a = # of times E happens

b = # of times E $\overline{\text{happen}}$.

There are 15 Females & 25 Males.

odds in favor of choosing a female

Females : # $\overline{\text{Females}}$

15 : 25

Divide by 5 $\rightarrow \boxed{3:5}$

odds against 5:3

Oct 3-7:38 PM

A standard deck of playing Cards

52 Cards   4 Aces   26 Red Cards

odds in favor of selecting an ace.

$\# \text{Aces} : \# \overline{\text{Aces}}$

$4 : 48 \rightarrow 1:12$

odds against $12:1$

odds in favor of selecting a red Card

$\# \text{Red} : \# \overline{\text{Red}}$

$26 : 26 \rightarrow 1:1$

Oct 3-7:42 PM

If odds in favor of event E are $a:b$, then

$$P(E) = \frac{a}{a+b} \qquad P(\bar{E}) = \frac{b}{a+b}$$

Given odds in favor of event E are 7:13

$$P(E) = \frac{7}{7+13} = \boxed{\frac{7}{20}} = \boxed{.35} \qquad P(\bar{E}) = \frac{13}{7+13} = \boxed{\frac{13}{20}} = \boxed{.65}$$

Oct 3-7:47 PM

If we have $P(E)$, then odds in favor of event E are

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

then Simplify

Suppose $P(E) = .04$

$P(\overline{E}) = 1 - .04 = .96$

odds in favor of event E are

$$P(E) : P(\overline{E})$$
$$.04 : .96$$
$$4 : 96 \Rightarrow 1 : 24$$

$4 \boxed{\div} 96$ $\boxed{\text{MATH}}$ $\boxed{1{:}\blacktriangleright}$ $\boxed{\text{Enter}}$ $\frac{1}{24}$

odds against $\boxed{24 : 1}$

Oct 3-7:50 PM

Suppose P(Dodgers win the World Series) $= .25$

$P(W) = .25$ $\quad$ $P(\overline{W}) = .75$

odds in favor of them To win

$$P(W) : P(\overline{W})$$
$$.25 : .75 \rightarrow \boxed{1 : 3}$$

\$1 bet, You gain \$3

odds against $\boxed{3 : 1}$

Oct 3-7:54 PM

Multiplication Rule:

Keyword: AND

Multiple - Action Event

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

A happens, then B happens

Given

Independent Events ⇒ when one outcome does not change the Prob. of next outcome

If A and B are independent events, then $P(A \text{ and } B) = P(A) \cdot P(B)$

Oct 3-8:09 PM

A box has 4 Red and 6 Blue balls.

P(draw one Red Ball in one attempt)

$$= \frac{4}{10} = \boxed{\frac{2}{5}}$$

Suppose we draw 2 balls, with replacement

$$P(2 \text{ Red Balls}) = \frac{4}{10} \cdot \frac{4}{10} = \frac{2}{5} \cdot \frac{2}{5} = \boxed{\frac{4}{25}}$$

Suppose we draw 3 balls with replacement,

$$P(\text{All Red}) = \frac{4}{10} \cdot \frac{4}{10} \cdot \frac{4}{10} = \frac{2}{5} \cdot \frac{2}{5} \cdot \frac{2}{5} = \boxed{\frac{8}{125}}$$

Oct 3-8:13 PM

A standard deck of playing cards has 52 cards, 4 Aces.

If we draw one card

$$P(\text{Ace}) = \frac{4}{52} = \boxed{\frac{1}{13}}$$

If we draw two cards with replacement

$$P(\text{Both are aces}) = \frac{4}{52} \cdot \frac{4}{52} = \frac{1}{13} \cdot \frac{1}{13} = \boxed{\frac{1}{169}}$$

$$P(\text{we don't get any aces}) = \frac{48}{52} \cdot \frac{48}{52} = \boxed{\frac{144}{169}}$$

Ace 4

$\overline{\text{Ace}}$ 48

48 ÷ 52 $\boxed{\times}$ 48 $\boxed{÷}$ 52

$\boxed{\text{Math}}$ $\boxed{\text{1: ▶Frac}}$ $\boxed{\text{Enter}}$

Oct 3-8:19 PM

Suppose $P(A) = .3$, $P(B) = .4$

A & B are independent events

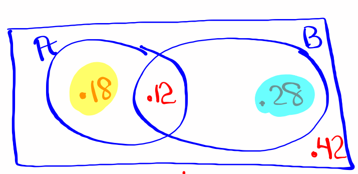
$P(\overline{A}) = \boxed{.7}$ $P(\overline{B}) = \boxed{.6}$

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

$= (.3)(.4) = \boxed{.12}$

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

$= .3 + .4 - .12 = \boxed{.58}$



$.3 - .12 = .18$

$.4 - .12 = .28$

Total = 1

$P(A \text{ only OR } B \text{ only}) = .18 + .28 = \boxed{.46}$

Oct 3-8:24 PM

Prob. of Passing a Math class is .4

Let's randomly Select 2 Students.

$P\,P$

$P\,\bar{P}$

$\bar{P}\,P$

$\bar{P}\,\bar{P}$

Sample Space ⇒ A complete list of all possible outcomes.

$P(P\,P) = (.4)\cdot(.4) = \boxed{.16}$ ✓

$P(\bar{P}\,P) = (.6)\cdot(.4) = \boxed{.24}$ ✓

$P(P\,\bar{P}) = (.4)(.6) = \boxed{.24}$ ✓

$P(\bar{P}\,\bar{P}) = (.6)\cdot(.6) = \boxed{.36}$ ✓

verify total Prob. is 1

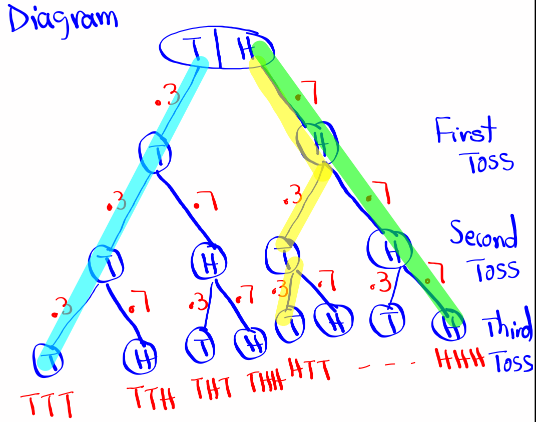
Oct 3-8:33 PM

A loaded Coin is tossed 3 times.

fair coin → P(T)=.5 , P(H)=.5

P(T)=.3 , P(H)=.7

Tree Diagram



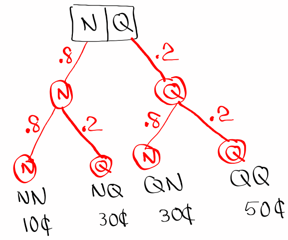
$P(\text{All tails}) = (.3)(.3)(.3) = \boxed{0.027}$

$P(\text{All heads}) = (.7)(.7)(.7) = \boxed{.343}$

Oct 3-8:38 PM

A box has 8 nickels & 2 quarters.

Draw 2 Coins with replacement



$P(10¢) = P(NN) = (.8)(.8) = \boxed{.64}$

$P(30¢) = P(NQ \text{ OR } QN) = (.8)(.2) + (.2)(.8)$

$= \boxed{.32}$

$P(50¢) = P(QQ) = (.2)(.2) = \boxed{.04}$

L1	L2
10	.64
30	.32
50	.04

STAT → CALC
1: 1-Var Stats

List: L1
Freq List: L2
Calculate

L1, L2
enter

$\bar{x} = 18$

S_x = blank

$n = 1$ ← Total Prob.

SG 12 ✓

Oct 3-8:46 PM

4 Females & 6 Males   3 & 6

we need to select 2 people

F F

F M

M F

M M

P(Both are Females) =

$$\frac{4}{10} \cdot \frac{3}{9} = \frac{2}{5} \cdot \frac{1}{3} = \boxed{\frac{2}{15}}$$

P(Both are males) =

$$\frac{\cancel{6}^{2}}{\cancel{10}_{2}} \cdot \frac{\cancel{5}^{1}}{\cancel{9}_{3}} = \boxed{\frac{1}{3}}$$

P(1F & 1M) =

$$P(FM \text{ or } MF) = \frac{4}{10} \cdot \frac{6}{9} + \frac{6}{10} \cdot \frac{4}{9}$$

$$= \boxed{\frac{8}{15}}$$

Oct 3-8:58 PM

A deck of cards has 52 cards, 12 face cards. Draw 2 cards without replacement

P(Both are face cards) = P(FF)

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

51 11

12 $\boxed{\div}$ 52 $\boxed{\times}$ 11 $\boxed{\div}$ 51 $\boxed{\text{MATH}}$ $\boxed{\text{1:▶Frac}}$ $\boxed{\text{Enter}}$

~~52~~ 51 ~~40~~ 39

P(we get no face Cards) =

$P(\bar{F}\,\bar{F}) = \frac{40}{52} \cdot \frac{39}{51}$

$= \boxed{\frac{10}{17}}$

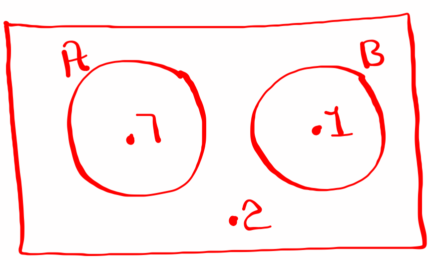
Oct 3-9:05 PM

Class QZ 9

Given $P(A) = .7$, $P(B) = .1$

A and B are disjoint events.

1) Draw Venn Diagram



2) Find P(A and B)

$= \boxed{0}$

3) Find P(A or B)

$= .7 + .1 - 0$

$= \boxed{.8}$

Oct 3-9:12 PM