Statistics

Lecture 6

Feb 19-8:47 AM

In-Person QZ 4

Use the chart below

MP (Midpoints)	F (freq.)
18	5
30	8
42	12
54	6

L1: MP column; L2: F column

1-Var Stats with L1 & L2

Find

1) $\bar{x} = 37.355 \approx 37$

2) $S = 11.870 \approx 12$

3) $n = 31$

4) $S^2 = \frac{4368}{31}$

Round to whole #

Red. fraction

VARS | 5: Statistics | 3: S_x

x^2 | MATH | 1: ▶Frac | Enter

Jul 2-6:58 PM

Consider the chart below

x	y
3	5
2	4
3	8
4	10
5	10
5	12

$x \to L1$, $y \to L2$

Use [2-Var Stats] with L1 & L2

$\Sigma x = 22$ $\quad \Sigma y = 49$

$\Sigma x^2 = 88$ $\quad \Sigma y^2 = 449$

$n = 6$ $\quad \Sigma xy = 197$

Now use [8: LinReg(a+bx)] with L1 & L2 to find

$a = -.5$

$b = 2.364$

$\Rightarrow \boxed{y = -.5 + 2.4x}$

$r^2 = .839 \Rightarrow \boxed{r^2 \approx 84\%}$ 84% of Y-values are explained by x-values

$r = .916 \Rightarrow \boxed{r = .916}$

Predict y when $x = 5$

a) Assume r is Significant.

use regression line $y = -.5 + 2.4(5) = \boxed{11.5}$

b) Assume r is not Significant. $\boxed{\bar{y} \approx 8.2}$

use $\bar{y} \Rightarrow$ [VARS] [5: Statistics] [5: $\bar{y}$] [Enter]

Jul 3-4:38 PM

Intro. to probabilities: SG 10

$E \to$ Desired event (outcome)

$P(E) \to$ is the probability that E happens.

$$P(E) = \frac{\text{Total possible of desired outcomes}}{\text{Total possible All outcomes}}$$

24 Students

10 Males

14 Females

If we randomly select one student

$$P(\text{select a female}) = \frac{14 \text{ Females}}{24 \text{ Total Students}} = \frac{7}{12}$$

Jul 3-4:50 PM

A box has 8 red, 10 white and 2 blue balls.

If we randomly select one ball,

1) $P(\text{Select Red}) = \frac{8}{20} = \boxed{\frac{2}{5}}$

2) $P(\text{Select white}) = \frac{10}{20} = \boxed{\frac{1}{2}}$

3) $P(\text{Select Red or white}) = \frac{18}{20} = \boxed{\frac{9}{10}}$

4) $P(\text{Select Red and Blue}) = \frac{0}{20} = \boxed{0}$

Jul 3-4:55 PM

Consider the numbers below

1 2 3 4 5 . . . . 21 22 23 24 25

Randomly Select one number,

1) $P(\text{less than } 5) = \frac{4}{25}$
1, 2, 3, 4

2) $P(\text{at least } 21) = \frac{5}{25} = \frac{1}{5}$
21 22 23 24 25

3) $P(\text{less than } 5 \text{ or at least } 21) = \frac{9}{25}$
4 choices, 5 choices

4) $P(\text{Select an even number}) = \frac{12}{25}$

2, 4, 6, 8, 10,
12, 14, 16, 18, 20, 22, 24

Jul 3-5:00 PM

I surveyed 100 students. I asked them Do you think Pres. Biden should drop out the race due to his health?

	Yes	NO	Total
Males	35	25	60
Females	20	20	40
Total	55	45	100

If we select one of these students,

$P(\text{Male}) = \frac{60}{100} = .6$ $P(\text{Yes}) = \frac{55}{100} = .55$

$P(\text{Male and Yes}) = \frac{35}{100} = .35$ $P(\text{Male or Yes}) = \frac{80}{100} = .8$

Acceptable Forms of Answers:

1) Reduced fraction
2) Rounded to 3-decimal places
3) Scientific Notation

Jul 3-5:06 PM

A standard deck of playing cards has 52 cards, 26 red, 12 face cards, 4 Aces.

Let's draw one card,

1) $P(\text{Red}) = \frac{26}{52} = \frac{1}{2}$ 2) $P(\text{face}) = \frac{12}{52} = \frac{3}{13} \approx .231$

3) $P(\text{Ace}) = \frac{4}{52} = \frac{1}{13} \approx .077$ 4) $P(\text{Red Ace}) = \frac{2}{52} = \frac{1}{26} = .038$

Jul 3-5:16 PM

Some rules & terminologies:

1) $0 \le P(E) \le 1$

2) Sum of all prob. is always 1.

3) $P(E) = 0$ $\Longleftrightarrow$ Impossible Event

4) $P(E) = 1$ $\Longleftrightarrow$ Sure event

5) $0 < P(E) \le .05$ $\Longleftrightarrow$ Rare event

E → Desired Event

$\overline{E}$ → E-bar → Not E → E Complement

$P(E) + P(\overline{E}) = 1$ Complement Rule

Jul 3-5:21 PM

There are 12 Red, 25 white, 13 blue balls in a box.

we Select 1 ball,

$$P(\text{Red}) = \frac{12}{50} = .24$$

$$P(\overline{\text{Red}}) = \frac{38}{50} = .76$$

Jul 3-5:27 PM

Given $P(E) = .025$

1) Write $P(E)$ in reduced fraction.

.025 MATH 1:▶Frac Enter $\frac{1}{40}$

2) Write $P(E)$ in % notation.

$.025(100) = 2.5\%$

3) Find $P(\bar{E})$

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

$= 1 - .025$

$= .975 = \frac{39}{40} = 97.5\%$

Jul 3-5:30 PM

I randomly selected one student,

find the Prob. that

1) he/she has a birthday today. $\frac{1}{365}$

✓ SG 10

2) he/she has a birthday this week. $\frac{1}{52}$

3) he/she has a birthday this month. $\frac{1}{12}$

Jul 3-5:33 PM

Addition Rule

Keyword OR

Single Action Event

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

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

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

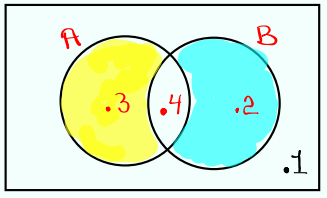
2) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

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

3) Make a Venn Diagram

$.7 - .4 = .3$

$.6 - .4 = .2$



Total = 1

4) $P(\text{A only} \text{ OR } \text{B only}) = .3 + .2 = \boxed{.5}$

Jul 3-5:57 PM

$P(HB) = .65$

$P(FF) = .45$

$P(HB \text{ and } FF) = .3$

1) $P(\overline{HB}) = 1 - P(HB) = 1 - .65 = \boxed{.35}$

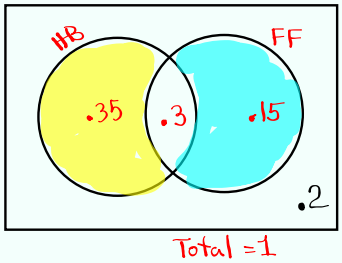
2) $P(HB \text{ or } FF) = P(HB) + P(FF) - P(HB \text{ and } FF)$

$= .65 + .45 - .3 = \boxed{.8}$

3) $P(\overline{HB \text{ or } FF}) = 1 - P(HB \text{ or } FF)$

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

4) Draw Venn Diagram



Total = 1

Jul 3-6:05 PM

Mutually Exclusive Events

Disjointed Events

A & B are M.E.E. $\Leftrightarrow$ P(A and B) = 0

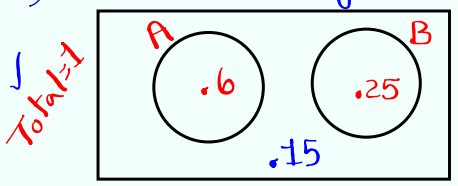
Ex: P(A) = .6 , P(B) = .25 , A & B are M.E.E.

1) $P(\overline{A}) = 1 - .6 = .4$ 2) $P(\overline{B}) = 1 - .25 = .75$

3) P(A and B) = 0

4) P(A or B)
= P(A) + P(B) − P(A and B)
= .6 + .25 − 0
= .85

5) Draw Venn Diagram



Jul 3-6:12 PM

De Morgan's Law:

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

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

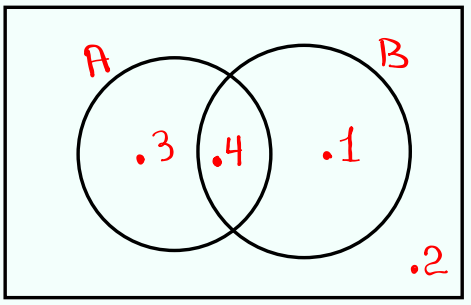
Jul 3-6:20 PM

$P(A) = .7$

$P(B) = .5$

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

1) Make Venn Diagram



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

$P(A) + P(B) - P(A \text{ and } B) =$ Total 1

$.7 + .5 - .4 = \boxed{.8}$

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

De Morgan's Law

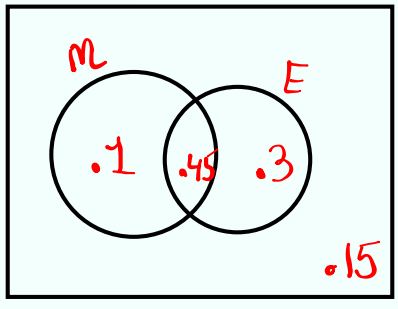
$P(\overline{A} \text{ or } \overline{B}) = P(\overline{A \text{ and } B}) = 1 - .4 = \boxed{.6}$

Jul 3-6:22 PM

$P(\text{Math}) = .55$

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

$P(\text{Math and English}) = .45$



$P(\overline{M} \text{ OR } \overline{E}) = P(\overline{M \text{ and } E}) = 1 - .45 = .55$

De Morgan's Law

$P(\overline{M} \text{ and } \overline{E}) = P(\overline{M \text{ or } E}) = 1 - .85 = \boxed{.15}$

SG 11

Jul 3-6:28 PM

Intro to odds:

I flipped a coin 25 times.

It landed 10 Tails & 15 Heads.

odds in favor of landing tails are

10 Tails : 15 $\overline{\text{Tails}}$

2 : 3

odds

odds against Tails → 3 : 2

odds in favor of event E are

E : # $\overline{E}$

Always Simplify

Jul 3-6:35 PM

A deck of playing cards has 40 cards, 15 reds, 10 faces, and 2 Aces.

Find odds in favor of drawing a red card. # Reds : # $\overline{\text{Reds}}$

15 : 25 → 3 : 5

Find odds in favor of drawing a face card. # face : # $\overline{\text{face}}$

10 : 30 → 1 : 3

against 3 : 1

Jul 3-6:39 PM

Suppose odds in favor of event E are

$$a : b$$

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

odds in favor of Lakers to win championship Next Year is 1:24.

$$P(W) = \frac{1}{1+24} = \frac{1}{25} = .04$$

$$P(\overline{W}) = \frac{24}{1+24} = \frac{24}{25} = .96$$

Jul 3-6:43 PM

If $P(E)$ is given, odds in favor of event E are

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

Always Simplify

$P(E) = .12 \qquad P(\overline{E}) = .88$

odds in favor of event E are

$$.12 : .88 \qquad 3:22$$

.12 [o/o] .88 [MATH] [1:▶Frac] [Enter] $\frac{3}{22}$

Jul 3-6:48 PM

Suppose $P(\text{Angels win}) = .001$

$P(\bar{W}) = .999$

odds → $P(W) : P(\bar{W})$

$.001 : .999$

$1 : 999$

You bet $1 ↑ Your net profit $999

Jul 3-6:51 PM

$P(A) = .35$, $P(B) = .75$, $P(A \text{ or } B) = .85$

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

2) $P(\bar{B}) = \boxed{.25}$

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

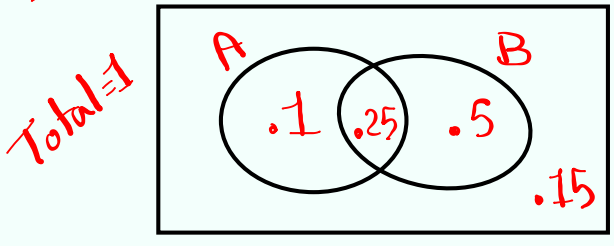
$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$.85 = .35 + .75 - P(A \text{ and } B)$

$P(A \text{ and } B) = .35 + .75 - .85$

$= \boxed{.25}$

Total = 1



Jul 3-6:54 PM

In-Person QZ 5

x	y
6	10
8	15
10	25
5	10
9	12
5	12

Find

$a = -.4$

$b = 2.0$

$r^2 = 57\%$

$r = .756$

} Round to 1-decimal

} Round to whole %

} round to 3-decimal.

Jul 3-7:00 PM