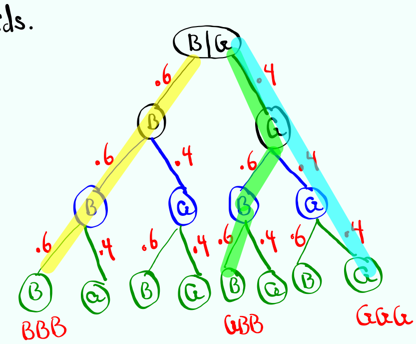
Statistics

Lecture 8

Feb 19-8:47 AM

Suppose $P(\text{boy}) = .6$, Consider a family with 3 kids.



$P(3\text{boys}) = (.6)(.6)(.6) = \boxed{.216}$

$P(\text{exactly } 2 \text{ boys}) = 3(.6)(.6)(.4) = \boxed{.432}$

BBG, BGB, GBB

$P(\text{exactly } 1 \text{ Boy}) = 3(.6)(.4)(.4) = \boxed{.288}$

BGG, GBG, GGB

$P(\text{No Boys}) = (.4)(.4)(.4) = \boxed{.064}$

GGG

Jan 21-4:33 PM

L1 / L2

# Boys	P(# Boys)
3	.216
2	.432
1	.288
0	.064

1) Verify the total prob = 1

$.216 + .432 + .288 + .064 = 1$

Boys → L1

P(# Boys) → L2

Use [STAT] [→] CALC

[1: 1-Var Stats]

List: L1

FreqList: L2

[Calculate]

L1, L2

[enter]

$\bar{x} = 1.8$

$S = S_x =$ Blank

$n = 1$ ← Total Prob.

P(at least 1 boy) = 1 − P(No boys)

= 1 − P(All girls)

$= 1 - .064 = \boxed{.936}$

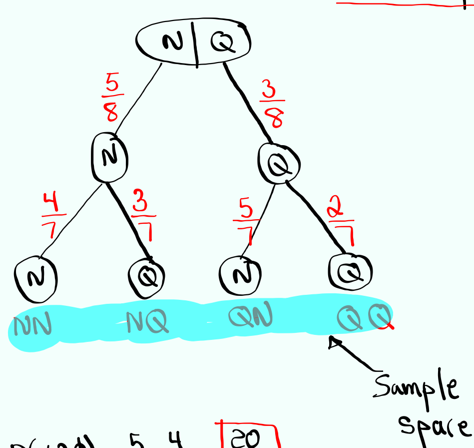
P(at least 1 girl) = 1 − P(No girls)

= 1 − P(All Boys)

$= 1 - .216 = \boxed{.784}$

Jan 21-4:41 PM

A piggy bank has 5 nickels and 3 quarters. take 2 Coins without replacement



$P(NN) = P(10¢) = \frac{5}{8} \cdot \frac{4}{7} = \boxed{\frac{20}{56}}$

$P(1N, 1Q) = P(30¢) = 2 \cdot \frac{3}{8} \cdot \frac{5}{7} = \boxed{\frac{30}{56}}$

$P(QQ) = P(50¢) = \frac{3}{8} \cdot \frac{2}{7} = \boxed{\frac{6}{56}}$

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Total ¢	P(Total ¢)
10¢	20/56
30¢	30/56
50¢	6/56

L1 (Total ¢ column)   L2 (P(Total ¢) column)

$\boxed{\text{STAT}}\ \boxed{\rightarrow}$ CALC

$\boxed{\text{1:1-Var Stats}}$

List: L1

FreqList: L2

$\boxed{\text{Calculate}}$

$\bar{x} = 25$

$S = S_x =$ Blank

$n = 1 \leftarrow$ Total Prob.

Jan 21-4:58 PM

$P(A) = .8$, $P(B) = .4$

A & B are independent events

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

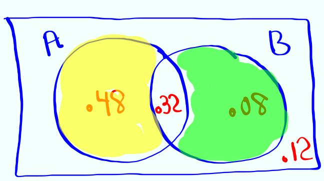
2) $P(\bar{B}) = \boxed{.6}$

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

$= (.8)(.4) = \boxed{.32}$

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

$= .8 + .4 - .32 = \boxed{.88}$



Total = 1 ✓

P(A only) =

$.8 - .32 = \boxed{.48}$

P(B only) =

$.4 - .32 = \boxed{.08}$

Jan 21-5:02 PM

3 Females, 7 Males

Select 2 people (No replacement)

$P(FF) = \frac{3}{10} \cdot \frac{2}{9} = \frac{1}{15}$

$P(MM) = \frac{7}{10} \cdot \frac{6}{9} = \frac{7}{15}$

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

$= 1 - P(MM)$

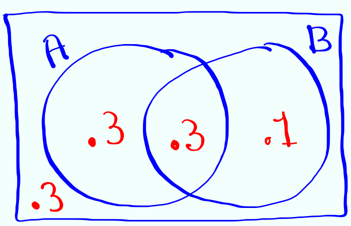
$= 1 - \frac{7}{15} = \boxed{\frac{8}{15}}$

Jan 21-5:08 PM

$P(A) = .6 \qquad P(B) = .4 \qquad P(A \text{ and}) = .3$

1) Draw Venn Diagram

$.6 - .3 = .3$



$.4 - .3 = .1$

Total = 1

$P(B|A) = \frac{P(A \text{ and } B)}{P(A)} = \frac{.3}{.6} = \boxed{.5}$

Given

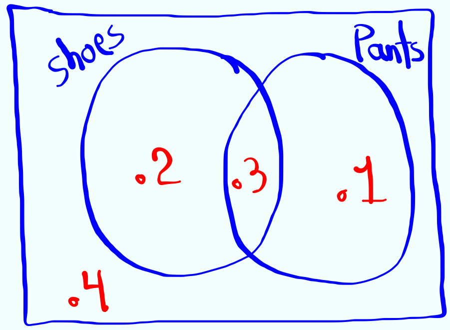
$P(A|B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.3}{.4} = \boxed{.75}$

Jan 21-5:11 PM

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

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

$P(\text{shoes and pants}) = .3$



$$P(\text{Pants} \mid \text{Shoes}) = \frac{P(\text{Shoes and Pants})}{P(\text{Shoes})} = \frac{.3}{.5} = \boxed{.6}$$

$$P(\text{shoes} \mid \text{pants}) = \frac{.3}{.4} = \boxed{.75}$$

Jan 21-5:16 PM

$P(A) = .6$

$P(B) = .5$

$P(A \mid B) = .8$

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

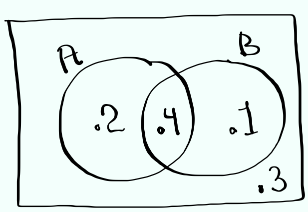
$$.8 = \frac{P(A \text{ and } B)}{.5}$$

Cross-Multiply

$P(A \text{ and } B) = (.5)(.8)$

$= \boxed{.4}$

1) find $P(A \text{ and } B)$



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

$$= \frac{.4}{.6} = \boxed{\frac{2}{3}}$$

$= \boxed{.667}$

SG 12 & 13

Jan 21-5:21 PM

Data
1) Qualitative
2) Quantitative
   1) Discrete
      countable
   2) Continuous
      measureable

Jan 21-5:42 PM

Let x be a discrete random variable with prob. dist. $P(x)$:

what is prob. dist.?

It is a way to give (Provide) Prob. of all possible outcomes.

1) Table
2) Graph
3) Formula
4) Def. of prob.

Jan 21-5:44 PM

Some rules

1) $0 \leq P(x) \leq 1$

2) $\sum P(x) = 1$

3) $P(x) = 1 \Longleftrightarrow$ Sure event

4) $P(x) = 0 \Longleftrightarrow$ Impossible event

5) $0 < P(x) \leq .05 \Longleftrightarrow$ Rare event

Jan 21-5:47 PM

Consider the chart below

x	$P(x)$
1	.2
2	.5
3	.3

1) verify $\sum P(x) = 1$

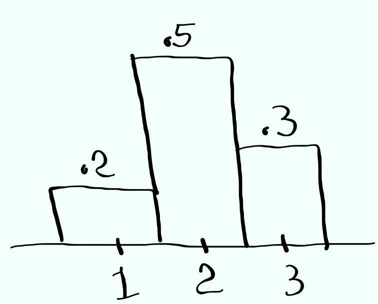
$.2 + .5 + .3 = 1 \checkmark$

2) $P(x \geq 2) = .5 + .3 = \boxed{.8}$

3) Draw Prob. dist. histogram

$x \to$ Midpoint

$P(x) \to$ Rel. F.



Jan 21-5:50 PM

Consider the chart below

x	$P(x)$
1	.1
2	.3
3	.5
4	.1

1) Find $P(x=4)$.

$= 1 - [.1 + .3 + .5]$

$= 1 - .9 = \boxed{.1}$

2) Find $P(x=2 \text{ or } x=4)$

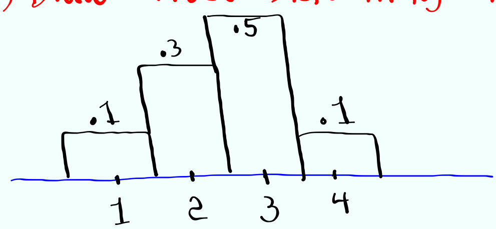
$= P(x=2) + P(x=4)$

$= .3 + .1 = \boxed{.4}$

3) Draw Prob. Dist. Histogram

$x \rightarrow MP$

$P(x) \rightarrow \text{Rel.F.}$



Jan 21-5:54 PM

Complete the chart below

x	$P(x)$	$x\,P(x)$	$x^2P(x)$
1	.3	.3	.3
2	.5	1.0	2.0
3	.2	.6	1.8

1) $\sum P(x) = 1$

2) $\sum x\,p(x) = 1.9$

3) $\sum x^2 p(x) = 4.1$

4) Compute $\sum x^2 P(x) - \left[\sum x\,P(x)\right]^2$

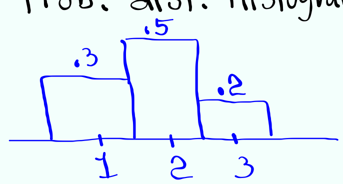
$= 4.1 - 1.9^2 = \boxed{.49}$

5) $\sqrt{\text{last answer}} = \sqrt{.49} = \boxed{.7}$

6) Draw Prob. dist. histogram

$x \rightarrow MP$

$P(x) \rightarrow \text{Rel.F}$



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Complete the chart below

x	$P(x)$	$xP(x)$	$x^2P(x)$
1	.2	.2	.2
2	.3	.6	1.2
3	.4	1.2	3.6
4	.1	.4	1.6

1) $\sum P(x) = 1$

2) $\sum xP(x) = 2.4$

3) $\sum x^2P(x) = 6.6$

4) Compute $\sum x^2p(x) - \left[\sum xP(x)\right]^2$

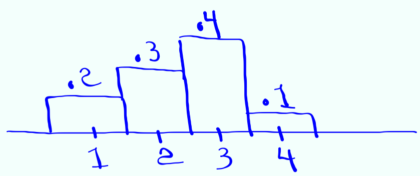
$= 6.6 - 2.4^2 = \boxed{.84}$

5) $\sqrt{\text{Last Answer}} = \sqrt{.84} \approx \boxed{.917}$

6) Draw Prob. dist. histogram.

$x \to$ MP

$P(x) \to$ Rel. F



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Mean μ (mu)

Variance σ^2 (Sigma)

Standard deviation σ (Sigma)

$$\boxed{\mu = \sum x\,p(x)}$$

$$\boxed{\sigma^2 = \sum x^2 p(x) - \mu^2}$$

$$\boxed{\sigma = \sqrt{\sigma^2}}$$

Jan 21-6:14 PM

How to use TI to find μ & σ:

$x \to L1$ [STAT] [→] CALC

$P(x) \to L2$ [1: 1-Var Stats]

x	y
1	.3
2	.5
3	.2

$\mu = \bar{x} = 1.9$ List: L1

$S = S_x$ blank Freq List: L2

$\sigma = \sigma_x = .7$ [Calculate]

$n = 1$ ✓

What about σ^2?

[VARS] [5: Statistics] [4: σ_x] [x^2]

[Math] [1: ▶Frac] [Enter] $\sigma^2 = \frac{49}{100}$

Jan 21-6:18 PM

Consider the chart below

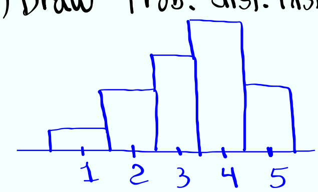
x	$P(x)$
1	.05
2	.15
3	.25
4	.35
5	.20

1) Verify $\sum P(x) = 1$ ✓

2) Find $P(2 \le x \le 4)$

$.15 + .25 + .35 = \boxed{.75}$

3) Draw Prob. dist. hist.



$x \to L1$, $P(x) \to L2$

Use 1-Var Stats with L1 & L2

$\mu = \bar{x} = 3.5$

$\sigma = \sigma_x = 1.118$

$n = 1$ ✓

Find σ^2 in reduced fraction

$\boxed{\sigma^2 = \frac{5}{4}}$

Jan 21-6:24 PM

$\mu \approx 4 \ , \ \sigma \approx 1$

68% Range $\quad \mu \pm \sigma$

$4 \pm 1 \rightarrow \boxed{3 \text{ to } 5}$

Usual Range
95% Range $\quad \mu \pm 2\sigma$

$4 \pm 2(1) \rightarrow \boxed{2 \text{ to } 6}$

Jan 21-6:32 PM

I have TI-84 to give away.

It is worth \$100.

Buy a ticket for \$20.

One ticket will be drawn

the owner of the tickets gets the Calc.

I sold 10 tickets.

Net	P(Net)	
20 − 100	1/10	win
20 − 0	9/10	lose

Net → L1

P(Net) → L2

Use 1-Var Stats

$\mu = \bar{x} = 10$

Expected Value Per ticket

Jan 21-6:35 PM

You are going to a fundraising event.
You buy a ticket for \$100
500 tickets sold
winning ticket gets a new car
worth \$25,000. Expected Value
Per ticket for fundraisers.

Net	P(Net)	
100-25000	1/500	win
100 − 0	499/500	lose

Net → L1
P(Net) → L2

$E.V. = \mu = \bar{x}$

\$50
Per ticket

Jan 21-6:42 PM

Going on a trip.
You pay \$100 to insure your luggage.
Any damages, Airline pays you \$1000.
Prob. of damage is .5%
Find E.V. for Policy sold by airline

Net	P(Net)	
100 − 1000	.5% = .005	Damage
100 − 0	.995	$\overline{\text{Damage}}$

Net → L1
P(Net) → L2
$E.V. = \mu = \bar{x}$

SG 14 & 15 ✓

\$95
Per Policy Sold.

Jan 21-6:48 PM