Statistics
Spring 2023
Lecture 25

Feb 19-8:47 AM

More on Conditional Probabilities:

$P(A) = .75$ $P(B) = .6$ $P(A \text{ and } B) = .5$

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

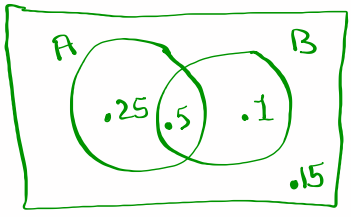
2) $P(\bar{B}) = 1 - P(B) = .4$

$P(A \text{ only}) = .75 - .5 = .25$

$P(B \text{ only}) = .6 - .5 = .1$

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

4) Construct Venn Diagram



5) $P(B|A) = \frac{P(A \text{ and } B)}{P(A)} = \frac{.5}{.75} = .667$ Total = 1 ✓

Conditional Prob.

6) $P(A|B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.5}{.6} = .833$

Mar 22-7:15 AM

$P(HB) = .8$ $\quad P(FF) = .5$ $\quad P(FF|HB) = .6$

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

2) $P(\overline{FF}) = 1 - P(FF) = .5$

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

$P(FF|HB) = \dfrac{P(HB \text{ and } FF)}{P(HB)}$

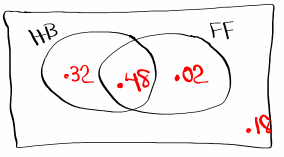
$.6 = \dfrac{P(HB \text{ and } FF)}{.8}$

Cross-Multiply

$P(HB \text{ and } FF) = (.6)(.8)$

$= .48$

4) Venn Diagram



$.8 - .48 = .32$

$.5 - .48 = .02$

Total = 1

5) $P(HB \text{ OR } FF)$

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

$= .8 + .5 - .48 = .82$

6) $P(HB \mid FF)$

$= \dfrac{P(HB \text{ and } FF)}{P(FF)} = \dfrac{.48}{.5} = .96$

Mar 22-7:26 AM

5 Females, 13 Males $\quad n = 18$

we need to Select 4 people for the morning shift $\quad r = 4$

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

FFFF

Some F & Some M

MMMM

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

$= 1 - \dfrac{{}_5C_0 \cdot {}_{13}C_4}{{}_{18}C_4}$

$= 1 - \dfrac{715}{3060}$

$= \dfrac{469}{612} = .766$

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

FFFF

Some F & Some M

MMMM

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

$= 1 - \dfrac{{}_5C_4 \cdot {}_{13}C_0}{{}_{18}C_4} = 1 - \dfrac{5}{3060}$

Original Answer was not Subtracted from 1

$= \dfrac{611}{612} = .998$

Correct Ans. $\quad$ Correct Ans.

Mar 22-7:39 AM

P(2 Females & 2 Males)

FF MM
FM FM
FMMF
⋮
MM FF

$= \frac{{}_5C_2 \cdot {}_{13}C_2}{{}_{18}C_4} = \frac{780}{3060} = \frac{13}{51}$

$P(1F \,\&\, 3M) = \frac{{}_5C_1 \cdot {}_{13}C_3}{{}_{18}C_4}$

$= \frac{1430}{3060} = \frac{143}{306}$

P(3F and 1M)

$= \frac{{}_5C_3 \cdot {}_{13}C_1}{{}_{18}C_4} = \frac{130}{3060} = \frac{13}{306}$

SG 13✓

Mar 22-7:49 AM

Complete the chart below

x	P(x)	x P(x)	x^2 P(x)
1	.1	.1	.1
2	.2	.4	.8
3	.5	1.5	4.5
4	.2	.8	3.2

1) $\sum P(x)$

$= .1 + .2 + .5 + .2 = 1$ ✓

2) $\sum x P(x)$

$= .1 + .4 + 1.5 + .8 = 2.8$

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

$= .1 + .8 + 4.5 + 3.2 = 8.6$

4) find $\sum x^2 P(x) - \left(\sum x P(x)\right)^2$

$= 8.6 - 2.8^2 = .76 = \frac{19}{25}$

Mar 22-7:58 AM

Complete the chart below

x	$P(x)$	$xP(x)$	$x^2P(x)$
1	.2	.2	.2
2	.5	1.0	2.0
3	.3	.9	2.7

1) $\sum P(x)$
$= .2 + .5 + .3 = 1$ ✓

2) $\sum xP(x)$
$= .2 + 1 + .9 = \boxed{2.1}$

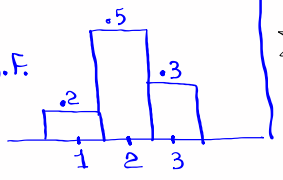
3) $\sum x^2P(x)$
$= .2 + 2 + 2.7 = \boxed{4.9}$

4) $\sum x^2P(x) - (\sum x)^2$
$= 4.9 - 2.1^2 = \boxed{.49} = \frac{49}{100}$

$x \to L1$, $P(x) \to L2$ Use 1-Var Stats with L1 & L2

Find
$\sum x = 2.1 = \sum xP(x)$
$\sum x^2 = 4.9 = \sum x^2P(x)$
$n = 1 = \sum P(x)$

Draw Prob. dist. Histogram
$x \to$ MP
$P(x) \to$ Rel. F.



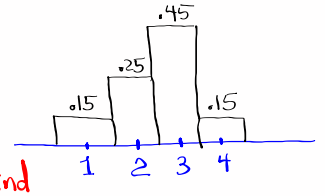
Mar 22-8:07 AM

Consider the chart below

x	$P(x)$
1	.15
2	.25
3	.45
4	.15

1) Verify $\sum P(x) = 1$.
$.15 + .25 + .45 + .15 = 1$ ✓

2) Draw Prob. dist. Histogram



3) $x \to L1$, $P(x) \to L2$
Use 1-Var Stats with L1 & L2 To find

$\sum x = 2.6$
$\sum x^2 = 7.6$
$n = 1$

Compute $\sum x^2 - (\sum x)^2$ then take square root

$7.6 - 2.6^2 = .84$
$\sqrt{.84} \approx \boxed{.917}$

$P(x=2 \text{ or } x=3)$
$= .25 + .45 = \boxed{.7}$

Mar 22-8:18 AM