Statistics

Lecture 10

Feb 19-8:47 AM

Open notes Quiz

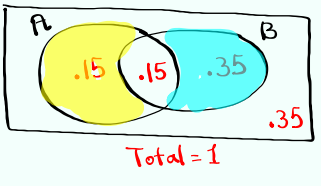
Class QZ 5

$P(A) = .3$ $P(B) = .5$ A & B are independent events

1) $P(\bar{A}) = 1 - P(A) = .7$ ✓

2) $P(A \text{ and } B) = P(A) \cdot P(B) = (.3)(.5) = .15$ ✓

3) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = .3 + .5 - .15 = .65$ ✓



$P(\bar{A} \text{ and } \bar{B}) = P(\overline{A \text{ or } B}) = 1 - .65 = .35$

$P(\bar{A} \text{ or } \bar{B}) = P(\overline{A \text{ and } B}) = 1 - .15 = .85$

$P(A \text{ only or } B \text{ only}) = .15 + .35 = .5$

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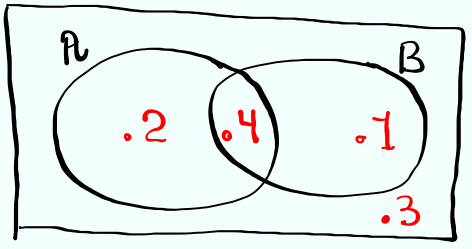
Suppose $P(A) = .6$, $P(B) = .5$, $P(A \text{ and } B) = .4$

1) Make Venn Diagram



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

$= P(A) + P(B) - P(A \text{ and } B) = .6 + .5 - .4 = \boxed{.7}$

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

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

$= \boxed{.667}$

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

$= \dfrac{.4}{.5} = \boxed{\dfrac{4}{5}}$

$= \boxed{.8}$

Mar 16-6:59 PM

A Compay hired 3 females & 5 males.

they need 3 morning, 3 evening, and

2 graveyard shift.

1) P(schedule 3 females for morning shift)

$= \dfrac{3}{8} \cdot \dfrac{2}{7} \cdot \dfrac{1}{6} = \dfrac{1}{56}$

2) P(Schedule 3 males for morning shift)

$= \dfrac{5}{\cancel{8}_2} \cdot \dfrac{\overset{1}{\cancel{4}}}{7} \cdot \dfrac{\overset{1}{\cancel{3}}}{\cancel{6}_2} = \boxed{\dfrac{5}{28}}$

3) P(Schedule at least 1 female for grave yard shift)

$= 1 - P(M\,M)$

↑ Total Prob.

$= 1 - \dfrac{5}{8} \cdot \dfrac{4}{7} = 1 - \dfrac{5}{14} = \boxed{\dfrac{9}{14}}$

M M

M F

F M

F F

Mar 16-7:06 PM

$P(A) = .6$

$P(B) = .5$

$P(A|B) = .8$

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

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

Cross-Multiply

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

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

$= .6 + .5 - .4 = .7$

Find $P(B|A) = \frac{P(A \text{ and } B)}{P(A)} = \frac{.4}{.6} = \frac{2}{3}$

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A box has 5 Red, 3 white, and 2 blue balls.

Draw 3 balls

P(All Red)

a) with replacement

$$\frac{5}{10} \cdot \frac{5}{10} \cdot \frac{5}{10} = \frac{1}{8}$$

b) No replacement

$$\frac{\overset{1}{\cancel{5}}}{\underset{2}{\cancel{10}}} \cdot \frac{\overset{1}{\cancel{4}}}{\underset{3}{\cancel{9}}} \cdot \frac{\overset{1}{\cancel{3}}}{\underset{2}{\cancel{8}}}$$

$$= \frac{1}{12}$$

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A circular plate is divided into 20 equal parts. 10 Red, 8 White, and 2 blue.
Spin it twice.

1) P(Stops on Red twice) $= \frac{10}{20} \cdot \frac{10}{20} = \boxed{\frac{1}{4}}$

2) P(Stops on white twice) $= \frac{8}{20} \cdot \frac{8}{20} = \boxed{\frac{4}{25}}$

3) P(Stops on blue twice) $= \frac{2}{20} \cdot \frac{2}{20} = \boxed{\frac{1}{100}}$

4) P(Stops on Same Color) $= \frac{1}{4} + \frac{4}{25} + \frac{1}{100}$
RR WW BB
$= \frac{42}{100} = \frac{21}{50}$

5) P(Stops on different Color) $= 1 - P(\text{Same Color})$
$= 1 - \frac{21}{50} = \frac{29}{50}$

6) P(Stops on Same part) $= \frac{20}{20} \cdot \frac{1}{20} = \boxed{\frac{1}{20}}$

SG 12 & 13

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Data
- 1) Qualitative
  - Non-Numerical
- 2) Quantitative
  - Numerical
    - 1) Discrete
      - Countable
    - 2) Continuous
      - Measureable

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

Some rules

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

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

3) $P(x) = 1$ ⟷ Sure event

4) $P(x) = 0$ ⟷ Impossible event

5) $0 < P(x) \le .05$ ⟷ Rare event

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What is prob. dist.?

It is a way to give prob. of all possible outcomes.

1) Form of a table/chart

2) Form of a graph

3) Form of a formula

4) find all possible probabilities.

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Consider the chart below

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

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

$.4 + .5 + .1 = 1$

2) Find $P(x \geq 2)$

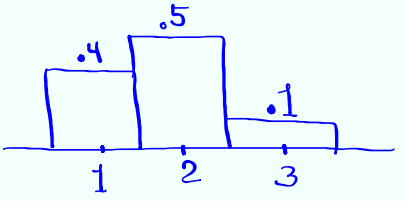
$= .5 + .1 = \boxed{.6}$

3) Find $P(x \leq 2) = .5 + .4 = \boxed{.9}$

4) Draw Prob. dist. Histogram

$x \rightarrow$ Midpt

$P(x) \rightarrow$ Rel. F



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Consider the chart below for discrete random variable x with prob. dist. $P(x)$.

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

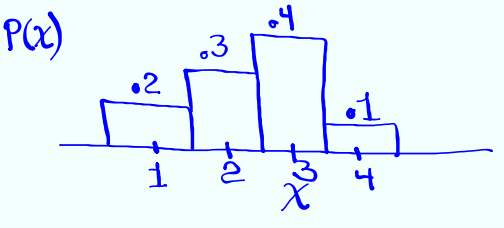
1) $P(x = 4)$

$= 1 - (.2 + .3 + .4) = \boxed{.1}$

2) $P(x = 2 \text{ or } x = 3) =$

$.3 + .4 = \boxed{.7}$

3) Draw Prob. dist. hist.



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Complete the chart below

x	$P(x)$	$x\,P(x)$	$x^2P(x)$
2	.3	.6	1.2
3	.5	1.5	4.5
4	.2	.8	3.2

Find

1) $\sum P(x) = \boxed{1}$

2) $\sum xp(x) = \boxed{2.9}$

3) $\sum x^2p(x) = \boxed{8.9}$

4) Compute $\sum x^2p(x) - \left(\sum xp(x)\right)^2 =$

$8.9 - 2.9^2 = \boxed{.49}$

5) Find $\sqrt{\text{Last Answer}} = \sqrt{.49} = \boxed{.7}$

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x	$P(x)$	$xP(x)$	$x^2P(x)$
1	.1	.1	.1
2	.2	.4	.8
3	.3	.9	2.7
4	.4	1.6	6.4

Find

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

2) $\sum xp(x) = 3$

3) $\sum x^2p(x) = 10$

4) Compute $\sum x^2p(x) - \left(\sum xp(x)\right)^2$

$= 10 - 3^2 = \boxed{1}$

5) Find $\sqrt{\text{Last Ans.}} = \sqrt{1} = \boxed{1}$

Mar 16-8:03 PM

Clear all lists

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

L1	L2
1	.1
2	.2
3	.3
4	.4

STAT ⟶ CALC

1: 1-Var Stats

List: L1

FreqList: L2

Calculate

No Menu

L1 , L2

enter

$\bar{x} = 3$

S = blank

$n = 1$ ⟵ Total Prob.

Mar 16-8:08 PM

A box has 3 nickels & 2 dimes.

Take 2 coins with replacement

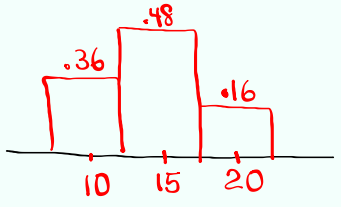
NN → 10¢ $P(10¢) = \frac{3}{5} \cdot \frac{3}{5} = \frac{9}{25} = .36$

N D

D N → 15¢ $P(15¢) =$ .48

D D → 20¢ $P(20¢) = \frac{2}{5} \cdot \frac{2}{5} = \frac{4}{25} = .16$

Total	P(Total)
10	.36
15	.48
20	.16



Total → x → L1

P(Total) → P(x) → L2

use 1-Var Stats with L1 & L2

$\bar{x} = 14$

S = Blank

$n = 1$

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Mean μ (mu) $\quad \mu = \sum x p(x)$

Variance σ^2 (Sigma^2) $\quad \sigma^2 = \sum x^2 p(x) - \mu^2$

Standard deviation σ (Sigma) $\quad \sigma = \sqrt{\sigma^2}$

$x \rightarrow L1$ $\quad$ $P(x) \rightarrow L2$ $\quad$ 1-Var Stats with L1 & L2 $\quad$ $\mu = \bar{x}$ $\quad$ $\sigma = \sigma_x$

because we are working with Prob. dist. $\rightarrow S = S_x$ blank.

Mar 16-8:22 PM

use the chart below

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

Find μ & σ.

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

use 1-Var Stats with L1 & L2

$\mu = \bar{x} = 2.9$

$\sigma = \sigma_x = .7$

$n = 1$

Find σ^2

VARS | 5: Statistics

4: σ_x | x^2 | Enter

.49

Mar 16-8:27 PM

4 Females 6 Males

Select 2 people

F F → 2 Females $P(2F) = \frac{4}{10} \cdot \frac{3}{9} = \boxed{\frac{2}{15}}$

F M
M F → 1 Female $P(1F) = \boxed{\frac{8}{15}}$

M M → 0 Female $P(\text{No F}) = \frac{6}{10} \cdot \frac{5}{9} = \boxed{\frac{1}{3}}$

$1 - \left(\frac{2}{15} + \frac{1}{3}\right) = \frac{8}{15}$

#F	P(#F)
2	2/15
1	8/15
0	1/3

#F → x → L1

P(#F) → P(x) → L2

Use 1-Var Stats

with L1 & L2

$\mu = \bar{x} = .8$

$\sigma = \sigma_x = .653$

$n = 1$

$\sigma^2 = \frac{32}{75}$

Find σ^2 in reduced fraction

VARS 5: Statistics

4: σ_x x^2 Math 1: ▶Frac Enter

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Application

Expected Value → μ → $\bar{x}$

Ex: 25 tickets Sold

$10 per Ticket

1 tkt randomly taken

Winner gets a Calc. worth $100.

Net	P(Net)
10 - 100	1/25
10 - 0	24/25

Net → L1

P(Net) → L2

E.V. / TKT → μ → $\bar{x}$

$6 Per TKT Sold.

$6(25 TKTS) = $150

SG 14 & 15

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