Statistics

Lecture 14

Feb 19-8:47 AM

A deck of Cards with 40 Cards has 20 red, 20 Black, 10 faces, and 3 aces.

We randomly take $\boxed{\text{3 Cards}}$ $\boxed{\text{without replacement}}$

1) $P(\text{All Red}) = \frac{20}{40} \cdot \frac{19}{39} \cdot \frac{18}{38} = \boxed{\frac{3}{26}}$

2) $P(\text{All Black}) = \frac{20}{40} \cdot \frac{19}{39} \cdot \frac{18}{38} = \boxed{\frac{3}{26}}$

3) $P(\text{All Same Color}) = P(\text{RRR or BBB}) = \frac{3}{26} + \frac{3}{26} = \boxed{\frac{3}{13}}$

4) $P(\text{Not Same Color}) = 1 - P(\text{Same Color}) = 1 - \frac{3}{13} = \boxed{\frac{10}{13}}$

RR R

Some R & Some B

B B B

5) $P(\text{at least 1 Red})$

$= 1 - P(\text{No Red}) = 1 - P(BBB)$

$= 1 - \frac{3}{26} = \boxed{\frac{23}{26}}$

Nov 14-7:22 AM

A Three-Sided fair die is colored.
Two sides are Red, one Side is black.

$P(\text{Red}) = \frac{2}{3}$, $P(\text{Black}) = \frac{1}{3}$

Roll this four times,

1) $P(\text{All Red}) = \frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3} = \boxed{\frac{16}{81}}$

2) $P(\text{All Black}) = \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} = \boxed{\frac{1}{81}}$

3) $P(\text{All Same Color}) = P(\text{RRRR OR BBBB}) = \frac{16}{81} + \frac{1}{81} = \boxed{\frac{17}{81}}$

4) $P(\text{Not all Same Color}) = 1 - P(\text{Same Color}) = 1 - \frac{17}{81} = \boxed{\frac{64}{81}}$

RRRR
Some R & Some B
BBBB

5) $P(\text{at least } 1 \text{ R}) = 1 - P(\text{All Black}) = 1 - \frac{1}{81} = \boxed{\frac{80}{81}}$

6) $P(\text{at least } 1 \text{ B}) = 1 - P(\text{All Red}) = 1 - \frac{16}{81} = \boxed{\frac{65}{81}}$

Nov 14-7:32 AM

4 Females, 8 males, Select 4 people.
No replacement, order does not matter.

1) How many ways can this be done?

$_{12}C_4 = \boxed{495}$

2) How many ways can we select 4 males?

$\underset{\text{Females}}{_4C_0} \cdot \underset{\text{Males}}{_8C_4} = \boxed{70}$

3) $P(4 \text{ males}) = \frac{_4C_0 \cdot {_8C_4}}{_{12}C_4} = \frac{70}{495} = \boxed{\frac{14}{99}}$

4) $P(4 \text{ Females}) = \frac{_4C_4 \cdot {_8C_0}}{_{12}C_4} = \boxed{\frac{1}{495}}$

M M M M
Some M & Some F
F F F F

5) $P(\text{at least } 1 \text{ male}) = 1 - P(\text{All Females})$
$= 1 - \frac{1}{495} = \boxed{\frac{494}{495}}$

6) $P(\text{at least } 1 \text{ Female}) = 1 - P(\text{All Males})$
$= 1 - \frac{14}{99} = \boxed{\frac{85}{99}}$

Nov 14-7:43 AM

$P(4m \; \& \; 0F) = \dfrac{{}_4C_0 \cdot {}_8C_4}{{}_{12}C_4} = \boxed{\dfrac{14}{99}}$

$P(3m \; \& \; 1F) = \dfrac{{}_4C_1 \cdot {}_8C_3}{{}_{12}C_4} = \boxed{\dfrac{224}{495}}$

$P(2m \; \& \; 2F) = \dfrac{{}_4C_2 \cdot {}_8C_2}{{}_{12}C_4} = \dfrac{168}{495} = \boxed{\dfrac{56}{165}}$

$P(1m \; \& \; 3F) = \dfrac{{}_4C_3 \cdot {}_8C_1}{{}_{12}C_4} = \boxed{\dfrac{32}{495}}$

$P(0m \; \& \; 4F) = \dfrac{{}_4C_4 \cdot {}_8C_0}{{}_{12}C_4} = \boxed{\dfrac{1}{495}}$

Nov 14-7:54 AM

# Males	P(# Males)
4	14/99
3	224/495
2	56/165
1	32/495
0	1/495

1) Verify that the sum of all prob. is 1. ✓

14 [÷] 99 [+] 224 [÷] 495 [+] 56 [÷] 165 [+] 32 [÷] 495 [+] 1 [÷] 495 [enter]

\# Males → L1

P(# Males) → L2

[STAT] [→] CALC [1: 1-Var Stats]

List: L1
FreqList: L2
[Calculate]

No Menu: L1, L2 [Enter]

$\bar{x} = 2.\overline{6}$ S_x = Blank $n = 1$

2.667

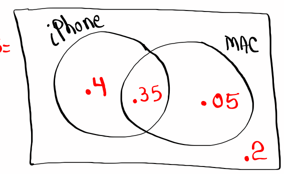
Nov 14-8:02 AM

$.4 - .35 = .05$

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

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

$.75 - .35 = .4$



$P(\text{iPhone and MAC}) = .35$

$$P(\text{MAC} \mid \text{iPhone}) = \frac{P(\text{iPhone and MAC})}{P(\text{iPhone})} = \frac{.35}{.75} = \boxed{.467} = \frac{7}{15}$$

$$P(\text{iPhone} \mid \text{MAC}) = \frac{P(\text{iPhone and MAC})}{P(\text{MAC})} = \frac{.35}{.4} = \boxed{.875} = \frac{7}{8}$$

Nov 14-8:11 AM

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

$P(\text{physics}) = .7$

$P(\text{physics} \mid \text{MATH}) = .85$

$$P(\text{physics} \mid \text{Math}) = \frac{P(\text{Math and Phys})}{P(\text{Math})}$$

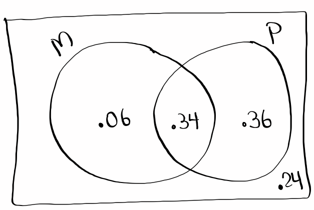
$$.85 = \frac{P(M \,\&\, P)}{.4}$$

Cross-Multiply

$P(M \,\&\, P) = .85(.4)$

$= \boxed{.34}$

$P(\text{math and physics}) = ?$



$P(\text{Math only}) = .4 - .34 = \boxed{.06}$

$P(\text{Physics only}) = .7 - .34 = \boxed{.36}$

$$P(\text{Math} \mid \text{Physics}) = \frac{P(M \,\&\, P)}{P(\text{physics})} = \frac{.34}{.7} = \boxed{.486} = \frac{17}{35}$$

SG 13 ✓

Nov 14-8:18 AM

SG 14 & SG 15

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

Nov 14-8:58 AM

Let x be a discrete random variable with Prob. distribution $P(x)$.

What is Prob. dist.?

It is a method to give prob. of every Possible outcome in the Sample Space.

Prob. dist. can be in the form of
- a chart or table
- Graph
- a formula
- using basic Prob. Concept.

Nov 14-9:00 AM

Some rules for Prob. dist. P(x):

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

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

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

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

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

Nov 14-9:04 AM

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

1) $\sum P(x) = 1$ ✓

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

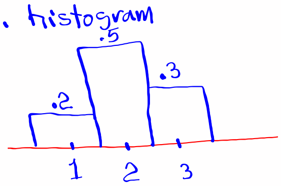
2) $P(x \ge 2) = .5 + .3 = \boxed{.8}$

3) $P(x \le 2) = .5 + .2 = \boxed{.7}$

4) Draw Prob. dist. histogram

$x \to$ midpoint

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



Nov 14-9:08 AM

Consider the chart below

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

1) $P(x=4)$

$= 1 - [.2 + .3 + .4] = 1 - .9 = \boxed{.1}$

$\uparrow$ Total Prob.

2) $P(x>1) = 1 - .2 = \boxed{.8}$

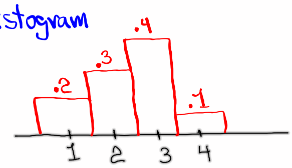
3) $P(x<4) = 1 - .1 = \boxed{.9}$

4) $P(2 \le x \le 3) = .3 + .4 = \boxed{.7}$

5) Draw Prob. dist. histogram

$x \rightarrow$ Midpoint

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



Nov 14-9:12 AM

Complete the chart below

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

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

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

2) $\sum xp(x) = 1.9$

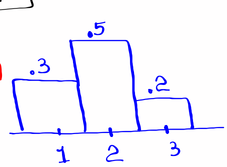
3) $\sum x^2p(x) = 4.1$

4) Compute $\sum x^2p(x) - \left(\sum xp(x)\right)^2 = 4.1 - 1.9^2$

$= \boxed{.49}$

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

6) Draw Prob. dist. histogram



Nov 14-9:19 AM

Consider the chart below

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

1) $P(x=4)$
$= 1 - [.1 + .2 + .3] = \boxed{.4}$

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

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

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

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

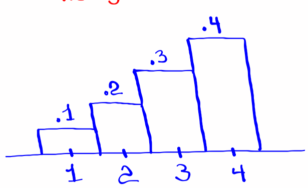
5) $\sqrt{\text{Last Answer}} = \sqrt{1} = \boxed{1}$

6) Draw Prob. dist. histogram

7) $P(x=1 \text{ or } x=3)$

$= .1 + .3$

$= \boxed{.4}$



Nov 14-9:25 AM

Consider the chart below

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

$x \rightarrow L1$

$P(x) \rightarrow L2$

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

with L1 & L2, find

$\bar{x} = 3$

$S_x =$ blank

$n = 1 \leftarrow$ Total Prob.

Nov 14-9:36 AM

Consider the chart below

x	$P(x)$
10 − 100	1/200
10 − 0	199/200

$x \to L1$

$P(x) \to L2$

use $\boxed{\text{1-Var Stats}}$ with L1 & L2 to find

$\bar{x} = \boxed{9.5}$ S_x = blank $n = 1$

Total Prob.

1) Finish SG 13, and Submit.

2) Have SG 14 & 15 with You for next meeting.

3) Be Ready to work on SG 14 & 15 in class tomorrow.

Nov 14-9:39 AM