Statistics
Spring 2023
Lecture 27

Feb 19-8:47 AM

Class QZ 6

A deck of playing cards has $n = 25$ cards with $n = 3$ Aces.

1) How many ways can you select $r = 2$ cards? No replacement, order does not matter.

$_{25}C_2 = 300$ ✓

2) How many ways can you select $r = 2$ Aces?

$_{3}C_2 = 3$ ✓

3) P(selecting 2 Aces) in reduced fraction.

$$P(2\text{ Aces}) = \frac{{}_{3}C_2}{{}_{25}C_2} = \frac{3}{300} = \boxed{\frac{1}{100}}$$ ✓

Mar 23-7:55 AM

The chart below is for random variable x with Prob. dist. $P(x)$.

x	$P(x)$
1	.08
2	.17
3	.25
4	.35
5	.15

1) Find $P(x=5)$

$P(x=5) = 1 - [.08 + .17 + .25 + .35]$

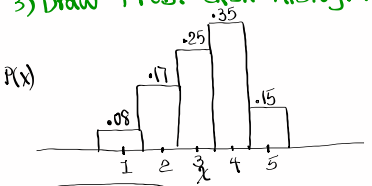
↑ Total prob. $= 1$

$= 1 - .85 = .15$

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

$= .17 + .25 + .35 = .77$

3) Draw Prob. dist. histogram



4) Find μ, σ, and σ^2

Clear all lists

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

STAT CALC 1:1-Var Stats

List: L1

FreqList: L2

Calculate

$\mu = \bar{x} = 3.32$

$\sigma = \sigma_x = 1.157$

$n = 1$

$\sigma^2 = \frac{836}{625}$

For σ^2

VARS 5: Statistics

$4: \sigma_x$ x^2

MATH 1: ▶Frac Enter

No Menu

L1, L2

Enter

Mar 27-7:19 AM

There are 2 dimes and 3 nickels.

Take 2 coins, No replacement

NN ND DN DD ← Sample Space

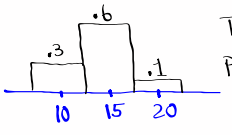
10¢ 15¢ 20¢ ← Total value in ¢.

$P(10¢) = P(NN) = \frac{{}_3C_2 \cdot {}_2C_0}{{}_5C_2} = \frac{3}{10} = .3$

$P(15¢) = P(ND \text{ or } DN) = \frac{{}_3C_1 \cdot {}_2C_1}{{}_5C_2} = \frac{6}{10} = .6$

$P(20¢) = P(DD) = \frac{{}_3C_0 \cdot {}_2C_2}{{}_5C_2} = \frac{1}{10} = .1$

Total	P(Total)
10¢	.3
15¢	.6
20¢	.1



Total → x → L1

P(Total) → P(x) → L2

Use 1-Var Stats with L1 & L2 to find

$\mu = \bar{x} = 14$

$\sigma = \sigma_x = 3$

$n = 1$

So $\sigma^2 = 3^2 = 9$

Usual Range

$\mu \pm 2\sigma = 14 \pm 2(3)$

$\to$ 8 To 20

Mar 27-7:31 AM

Suppose a deck of cards has 20 cards and 5 face cards.

Randomly take 2 cards, No replacement.

FF ← 2 face cards

FF̄, F̄F ← exactly 1 face card

F̄F̄ ← No face cards ← Sample Space

Let x be # face cards

No face cards → $x=0$

$$P(x=0) = \frac{{}_5C_0 \cdot {}_{15}C_2}{{}_{20}C_2} = \frac{105}{190} = \frac{21}{38}$$

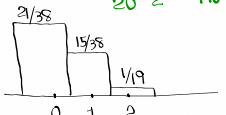
exactly 1 face card → $x=1$

$$P(x=1) = \frac{{}_5C_1 \cdot {}_{15}C_1}{{}_{20}C_2} = \frac{75}{190} = \frac{15}{38}$$

2 face cards → $x=2$

$$P(x=2) = \frac{{}_5C_2 \cdot {}_{15}C_0}{{}_{20}C_2} = \frac{10}{190} = \frac{1}{19}$$

# face	P(# face)
0	21/38
1	15/38
2	1/19 = 2/38



face → x → L1

P(# face) → P(x) → L2

Use 1-Var Stats with L1 & L2 to find $\mu = \bar{x} = .5$ ($n=1$)

$\sigma = \sigma_{\bar{x}} = .596$

σ^2(exact) $= \frac{21}{76}$

VARS 5: Statistics ▸ 4: $\sigma_{\bar{x}}$ x^2

MATH 1: ▸Frac Enter

Mar 27-7:43 AM

Application: Expected Value → μ → $\bar{x}$

Suppose 10 tickets are sold for $20 each.

One ticket is randomly drawn.

The owner of the winning ticket gets a calculator worth $120.

Net	P(Net)	
$20 − $120	1/10	winning TKT
$20 − 0	9/10	Losing TKTs

Expected Value per tkt is μ

Net → L1

P(Net) → L2

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

$8/TKT for Fundraisers.

Mar 27-7:57 AM

You buy insurance policy for your luggage before your flight.

Policy is sold for $100 and any damages, the airline pays you $1000.

Prop. of any damages to the luggage is .5%

Find expected value per policy sold by the airline.

$P(\text{Damage}) = .5\% = .005$

$P(\overline{\text{Damage}}) = 99.5\% = .995$

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

Net → L1

P(Net) → L2

E.V. $= \mu = \bar{x} =$ \$95

Mar 27-8:06 AM

Pay $10, and draw one card from a standard deck of playing cards.

If you draw an ace → I give you $50

If " " a face → " " " $20

If you draw any other card → I give you nothing.

Net	P(Net)	
10 − 50	4/52	Ace
10 − 20	12/52	face
10 − 0	36/52	any other card

Net → L1

P(Net) → L2

Expected value per bet $= \mu = \bar{x} = 1.538$

Money → Round to 2 decimal places

E.V. ≈ \$1.54

Find σ^2 in reduced fraction

VARS | 5: Statistics | 4: σx | x^2 | MATH | 1: ▶Frac

Enter

$\sigma^2 = \frac{36000}{169}$

SG 14 & 15 ✓

Mar 27-8:13 AM

30 pockets

18 Red

10 Black

2 Green

Spin twice → Independent outcomes

$P(RR) = \frac{18}{30} \cdot \frac{18}{30} = \square$

$P(BB) = \frac{10}{30} \cdot \frac{10}{30} = \square$

$P(GG) = \frac{2}{30} \cdot \frac{2}{30} = \square$

P(Same Color) = + +

P(Different color) = 1 − P(Same color)

Mar 27-8:25 AM

P(Shirt) = .5

P(Tie) = .4

P(Shirt | Tie) = .6

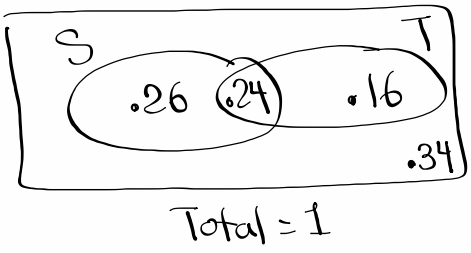
$P(\text{Shirt} \mid \text{Tie}) = \frac{P(\text{Shirt and Tie})}{P(\text{Tie})}$

$.6 = \frac{P(\text{Shirt and Tie})}{.4}$

Cross-Multiply

P(S and T) = .24

P(Shirt and Tie)



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