Statistics
Spring 2023
Lecture 18

Feb 19-8:47 AM

Class QZ 3:

Given $P(A)=.7$, $P(B)=.6$, $P(A \text{ and } B)=.5$

1) $P(\bar{A})=1-.7=\boxed{.3}$ ✓

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

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

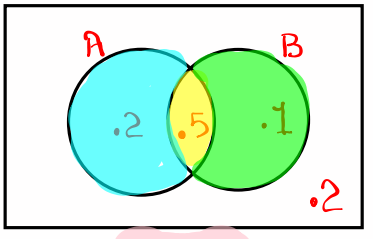
$.7+.6-.5=\boxed{.8}$ ✓

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

3) Construct Venn Diagram.

$P(A \text{ only})=.7-.5=.2$

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



Total = 1

4) $P(A \text{ only} \text{ OR } B \text{ only})=.2+.1=\boxed{.3}$

5) $P(\bar{A} \text{ and } \bar{B})=P(\overline{A \text{ or } B})=1-P(A \text{ or } B)=1-.8=\boxed{.2}$

De Morgan's Law

6) $P(\bar{A} \text{ or } \bar{B})=P(\overline{A \text{ and } B})=1-P(A \text{ and } B)=1-.5=\boxed{.5}$

Mar 7-8:11 AM

Given $P(E) = .08$

1) Write $P(E)$ in %.

$P(E) = .08 = .08(100)\% = 8\%$

2) Write $P(E)$ in reduced fraction.

.08 [Math] [1:▶Frac] [Enter] $\frac{2}{25}$

3) Find $P(\bar{E})$ in decimal.

$P(\bar{E}) = 1 - P(E) = 1 - .08 = .92$

Complement rule

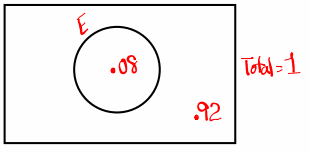
4) Find $\frac{P(E)}{P(\bar{E})}$ in reduced fraction.

.08 [÷] .92 [Math] [1:▶Frac] [Enter] $\frac{2}{23}$

5) Find $\frac{P(\bar{E})}{P(E)}$ in reduced fraction.

[x^{-1}] [Enter] $\frac{23}{2}$

6) Construct Venn Diagram for event E.



Mar 8-7:24 AM

Given $P(A) = .55$, $P(B) = .25$, A & B are disjointed events

1) $P(\bar{A}) = 1 - P(A) =$ .45

2) $P(\bar{B}) = 1 - P(B) =$ .75

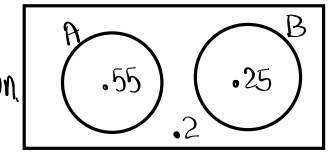
3) $P(A \text{ and } B) =$ 0

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

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

$.55 + .25 - 0 =$ .8

5) Construct Venn Diagram



6) Find $\frac{P(B)}{P(\bar{B})}$ in reduced fraction. $\frac{1}{3}$

.25 [÷] .75 [MATH] [1:▶Frac] [Enter]

7) Find $\frac{P(\bar{B})}{P(B)}$ in reduced fraction.

$\frac{3}{1}$

Mar 8-7:33 AM

Given $P(A) = .125$

1) Find $P(\bar{A}) = 1 - P(A) = 1 - .125 = .875$

Complement Rule

2) Find $\frac{P(A)}{P(\bar{A})}$ in reduced fraction.

.125 ÷ .875 MATH 1:▶Frac Enter $\frac{1}{7}$

3) Find $\frac{P(\bar{A})}{P(A)}$ in reduced fraction. $\frac{7}{1}$

Mar 8-7:46 AM

Introduction to odds:

odds in favor of event E are

$a : b$

a: # E happens

b: # E does not happen

odds against event E are $b : a$.

Always Simplify

Mar 8-7:51 AM

I flip a coin 40 times, and it landed tails 24 times.

$P(\text{Tail}) = \frac{24}{40} = \frac{3}{5}$

24 Tails
16 Tails
40 flips

odds in favor of landing tails:

tails : # tails

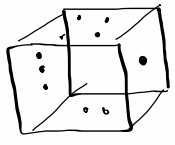
24 : 16 $\Rightarrow$ 3 : 2

Divide by 8

odds against landing tails: 2 : 3

Mar 8-7:53 AM

Roll a fair die



{1,2,3,4,5,6}

$P(\text{get } 6) = \frac{1}{6}$

odds in favor of getting 6:

6 : # $\overline{6}$

1 : 5

odds against getting 6: 5 : 1

Mar 8-7:58 AM

A standard deck of playing cards has 52 cards and 4 Aces.

$P(\text{Select Ace}) = \frac{4}{52} = \frac{1}{13}$

$P(\text{Select } \overline{\text{Ace}}) = \frac{48}{52} = \frac{12}{13}$

odds in favor of getting Ace:

Aces : # $\overline{\text{Aces}}$

4 : 48 $\Rightarrow$ 1 : 12

Divide by 4

Colon

odds against getting Ace:

12 : 1

Mar 8-8:02 AM

odds in favor of event E are a : b

$P(E) = \frac{a}{a+b}$, $P(\overline{E}) = \frac{b}{a+b}$

ex: Suppose odds in favor of event E are 3 : 17

out of 20 attempts

E happens 3 times

$\overline{E}$ = 17 times

$P(E) = \frac{3}{3+17} = \boxed{\frac{3}{20}}$ $P(\overline{E}) = \frac{17}{3+17} = \boxed{\frac{17}{20}}$

odds for Lakers to win the championship this year are 1 : 49.

$P(\text{Win}) = \frac{1}{1+49} = \frac{1}{50}$ $P(\overline{W}) = \frac{49}{1+49} = \frac{49}{50}$

Mar 8-8:06 AM

If we have $P(E)$, then

odds in favor of event E are

$$P(E) : P(\overline{E})$$

odds against event E are

$$P(\overline{E}) : P(E)$$

ex: Given $P(E) = .08$

1) $P(\overline{E}) = .92$

2) odds in favor of event E are

$$P(E) : P(\overline{E})$$

$$.08 : .92 \rightarrow 2:23$$

.08 [a/b] .92 [Math] [1:▶Frac] [Enter]

$$\frac{2}{23}$$

3) odds against event E $\rightarrow$ 23 : 2

Use : for odds.

Use —— for Prob.

Mar 8-8:11 AM

Prob. of winning a certain game is .125.

1) $P(W) = .125$

2) $P(\overline{W}) = .875$

3) odds in favor of winning.

$$P(W) : P(\overline{W})$$

$$.125 : .875 \rightarrow 1:7$$

$ bet

$ Net Profit.

4) odds against winning 7 : 1

Mar 8-8:16 AM

Prob. of event E is .25.

1) $P(E) = .25$

2) $P(\bar{E}) = .75$

3) odds in favor of event E.

$P(E) : P(\bar{E})$

$.25 : .75$

$\rightarrow 1 : 3$

4) odds against event E.

$\rightarrow 3 : 1$

You can do Pages 1 & 2 of SG 12.

Mar 8-8:21 AM