Elementary Statistics Lecture 6

Class QZ 2

Use the chart below

x	y
3	11
4	13
5	18
5	20
8	20

Find

1) $a = 7.5$

2) $b = 1.8$

3) $r^2 = 65\%$

4) $r = .803$

} Round to 1-decimal

whole %

3-decimal

x → L1

y → L2

LinReg(a+bx) L1, L2

Introduction to Probabilities: SG 10-13

E → Event, outcome

P(E) → Prob. that E happens

$P(E) = \frac{\text{Total \# of all desired outcomes}}{\text{Total \# of all outcomes}}$

25 Students Randomly Select 1 Student

15 Females

10 Males

P(Select a Female) $= \frac{15}{25} = \frac{3}{5} = .6$

A full deck of playing cards

52 Cards Randomly Select 1 Card,

12 face

4 Aces

26 Red

P(Select a red Card) $= \frac{26}{52} = \frac{1}{2} = .5$

P(Select an Ace) $= \frac{4}{52} = \frac{1}{13} = .077$

4 ÷ 52 [Math] [1:▶Frac] [Enter]

[Math] [2:▶Dec] [Enter]

Acceptable answers for Probabilities:

1) Reduced Fraction

2) Round to 3-decimal places

3) Scientific Notation.

Consider numbers from 1 to 30.

1, 2, 3, 4, 5, - - - , 27, 28, 29, 30

Select 1 number,

1) P(Select below 6) $= \frac{5}{30} = \frac{1}{6} = .167$ (1, 2, 3, 4, 5)

2) P(Select at least 27) $= \frac{4}{30} = \frac{2}{15} = .133$ (27, 28, 29, 30)

3) P(Select below 6 and at least 27) $= \frac{0}{30} = 0$

4) P(Select below 6 or at least 27) $= \frac{9}{30} = \frac{3}{10} = .3$ (1, 2, 3, 4, 5 or 27, 28, 29, 30)

I conducted a Survey:
"Do You have an iPhone?"

	Yes	NO	Total
Females	100	40	140
Males	18	42	60
Total	118	82	200

1) Survey Size $n=200$

If we randomly Select one of these people,

2) $P(\text{Male}) = \frac{60}{200} = \frac{3}{10} = .3$

3) $P(\text{Yes}) = \frac{118}{200} = \frac{59}{100} = .59$

4) $P(\text{Male and Yes}) = \frac{18}{200} = \frac{9}{100} = .09$

5) $P(\text{Male or Yes}) = \frac{160}{200} = \frac{4}{5} = .8$

Some Prob. rules & Terminologies

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

2) $P(E) = 1 \iff$ Sure event

3) $P(E) = 0 \iff$ Impossible event

4) $0 < P(E) \le .05 \iff$ Rare event

5) Sum of all prob. is always 1.

6) $E \to$ Desired event
$\bar{E} \to E$-bar, not E, E-Complement

7) $P(E) + P(\bar{E}) = 1$ Complement rule
$P(\bar{E}) = 1 - P(E)$, $P(E) = 1 - P(\bar{E})$

Ex: $P(\text{Rains}) = .1$
$P(\overline{\text{Rain}}) = 1 - P(\text{Rains}) = 1 - .1 = .9$

Ex: $P(E) = .075$

Find $P(\bar{E})$

$P(\bar{E}) = 1 - P(E) = 1 - .075 = .925$

$P(\bar{E})$ in % $\Rightarrow 92.5\%$

$P(\bar{E})$ in reduced fraction $\frac{37}{40}$

.925 MATH 1: ▶Frac Enter

Given $P(A) = \frac{5}{8}$

1) Find $P(\bar{A})$ in reduced fraction

$= 1 - 5 \div 8$ math 1: ▶ Enter $\frac{3}{8}$

2) Find $P(\bar{A})$ in decimal.

Math 2: ▶Dec. Enter 0.375

3) Find $P(\bar{A})$ in %. 37.5%

SG 10 ✓

Addition Rule

Keyword: "OR"

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

overlap

Given: $P(A) = .3$, $P(B) = .8$, $P(A \text{ and } B) = .25$

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

$= 1 - .3 = .7$

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

$= 1 - .8 = .2$

3) $P(\overline{A \text{ and } B}) = 1 - P(A \text{ and } B) = 1 - .25 = .75$

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

$= .3 + .8 - .25 = .85$

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

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

$P(\text{Eggs and Coffee}) = .2$

$E \rightarrow$ Eggs

$C \rightarrow$ Coffee

1) $P(\bar{E}) = 1 - P(E)$
$= 1 - .4 = \boxed{.6}$

2) $P(\bar{C}) = 1 - P(C)$
$= 1 - .7 = \boxed{.3}$

3) $P(E \text{ or } C) = P(E) + P(C) - P(E \text{ and } C)$
$= .4 + .7 - .2 = \boxed{.9}$

4) $P(\overline{E \text{ or } C}) = 1 - P(E \text{ or } C) = 1 - .9 = \boxed{.1}$

Mutually Exclusive Events (Disjoint Events)

No overlap

$P(A \text{ and } B) = 0 \Leftrightarrow A \& B$ are M.E.E.

$P(A) = .4$, $P(B) = .5$, A & B are disjointed events.

1) $P(\bar{A}) = 1 - P(A)$
$= \boxed{.6}$

2) $P(\bar{B}) = 1 - P(B)$
$= \boxed{.5}$

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

4) $P(A \text{ or } B)$
$= P(A) + P(B) - P(A \text{ and } B)$
$= .4 + .5 - 0$
$= \boxed{.9}$

P(grade is A) = .3

P(grade is B) = .4

A & B are M.E.E.

P(A) = .3 , P(B) = .4 , A & B are M.E.E.

$P(\overline{A}) = 1 - .3$

$= .7$

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

$= .6$

P(A and B) = 0

P(A or B)

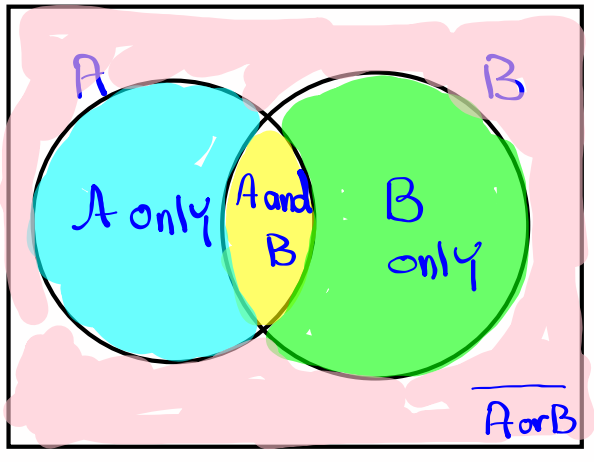
= P(A) + P(B) − P(A and B)

= .3 + .4 − 0

= .7

Now using Venn Diagram

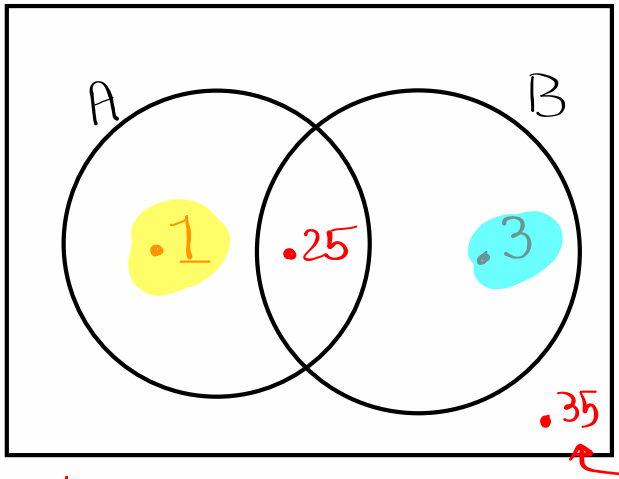
- Rectangle
- Circles for each event
- Total prob. = 1



$P(A) = .35$

$P(B) = .55$

$P(A \text{ and } B) = .25$ over lap



$P(A \text{ only}) = .35 - .25 = .1$

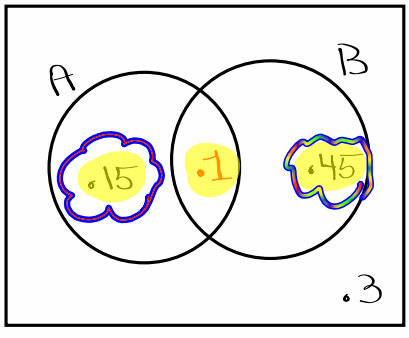
$P(B \text{ only}) = .55 - .25 = .3$

$1 - [.1 + .25 + .3]$

$= 1 - .65 = .35$

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

Complete the Venn Diagram below:



Total = 1 .9

$1 - [.15 + .45 + .3]$

$= .1$

$P(A) = .15 + .1 = .25$

$P(B) = .1 + .45 = .55$

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

$= .25 + .55 - .1 = .7$

$P(A \text{ only} \text{ OR } B \text{ only}) = .15 + .45 = .6$

SG 11 but watch video De Morgan's Law

Introduction to odds:

I flipped a coin 100 times.

It landed tails 65 times.

$P(\text{Tails}) = \frac{65}{100} = .65$

$P(\overline{\text{Tails}}) = \frac{35}{100} = .35$

Now odds

odds in favor of event E

E happens : # E happens

odds in favor of landing tails

65 Tails : 35 Tails Num. & Denom.

65 ÷ 35 Math 1:▶Frac Enter 13:7

A full deck of playing cards

52 cards, 26 Red, 12 face, 4 Aces

odds in favor of drawing a red card.

26 Red : 26 $\overline{\text{Red}}$ ⇒ 1:1

odds in favor of drawing a face card

12 face : 40 $\overline{\text{face}}$ ⇒ 3:10

odds against drawing an Ace

48 $\overline{\text{Aces}}$: 4 Aces ⇒ 12:1

odds in favor of event E are

$$a : b$$

$$P(E) = \frac{a}{a+b} \qquad P(\bar{E}) = \frac{b}{a+b}$$

Odds for Warriors to win the championship next Year are 1 : 4

$$P(\text{Win}) = \frac{1}{1+4} = \frac{1}{5} \qquad P(\overline{\text{Win}}) = \frac{4}{1+4} = \frac{4}{5}$$

How to find odds when $P(E)$ is given:

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

Given $P(E) = .24$

1) $P(\bar{E}) = 1 - .24 = .76$

2) odds in favor of event E

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

$$.24 : .76 \Rightarrow 6 : 19$$

.24 [:] .76 [Math] [1:▶] [Enter]

3) odds against Event E $\Rightarrow$ [19:6]

SG 12 (First Two Pages)

Class QZ Wednesday at 6:30 PM.