Statistics

Lecture 9

Feb 19-8:47 AM

Review of Probabilities

$E \rightarrow$ Desired Event (outcome)

$P(E) \rightarrow$ Prob. that E happens

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

25 Students, 10 Males, 15 Females

Randomly select one student,

$$P(\text{Female}) = \frac{15 \text{ Females}}{25 \text{ Students}} = \boxed{\frac{3}{5}} = \boxed{.6}$$

$$P(\text{Male}) = \frac{10 \text{ Males}}{25 \text{ Students}} = \boxed{\frac{2}{5}} = \boxed{.4}$$

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A box has 4 nickels, 6 dimes, and 15 quarters. Randomly take one coin.

1) P(Nickel) = $\frac{4}{25}$ = .16

2) P(Dime) = $\frac{6}{25}$ = .24

3) P(Nickel or Dime) = $\frac{10}{25}$ = $\frac{2}{5}$ = .4 (10)

4) P(Nickel and dime) = 0

Impossible event

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I surveyed 200 voters.

Voters	Dem.	Rep.	Ind.	Total
Males	35	45	10	90
Females	65	35	10	110
Total	100	80	20	200

If we randomly select one person from this survey,

P(Female) = $\frac{110}{200}$ = $\frac{11}{20}$

P(Dem.) = $\frac{100}{200}$ = $\frac{1}{2}$

P(Female and Dem.) = $\frac{65}{200}$ = $\frac{13}{40}$

P(Female or Dem.) = $\frac{145}{200}$ = $\frac{29}{40}$

145 ÷ 200 MATH 1: ▸Frac Enter

Acceptable answers
1) Reduced fraction
2) Rounded to 3-decimal places
3) Scientific Notation

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A full-deck of playing cards has 52 cards, 26 Red, 12 face cards, and 4 are aces.

Randomly draw one Card

1) $P(\text{Red}) = \frac{26}{52} = \boxed{\frac{1}{2}} = \boxed{.5}$

2) $P(\text{face}) = \frac{12}{52} = \boxed{.231}$

3) $P(\text{Red Ace}) = \frac{2}{52} = \boxed{.038}$

$P(E) = 0 \longleftrightarrow$ Impossible event

$P(E) = 1 \longleftrightarrow$ Sure event

$0 < P(E) \leq .05 \longleftrightarrow$ Rare event

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Consider numbers $1, 2, 3, 4, \cdots, 28, 29, 30$

Select one number

1) $P(\text{selection} < 5) = \frac{4}{30} = \boxed{\frac{2}{15}}$

2) $P(\text{selection} \geq 25) = \frac{6}{30} = \boxed{\frac{1}{5}}$

3) $P(8 < \text{Selection} \leq 15) = \boxed{\frac{7}{30}}$

4) $P(\text{selection is even}) = \frac{15}{30} = \boxed{\frac{1}{2}}$

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Some rules & terminologies

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

2) Sum of all prob. are always 1

3) $P(E) = 0$ ⟷ Impossible event

4) $P(E) = 1$ ⟷ Sure event

5) $0 < P(E) \le .05$ ⟷ Rare event

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Suppose we randomly select one person, what is the prob. that he/she has a birthday

1) today $\frac{1}{365} \approx .003 \approx .3\%$

2) this week $\frac{1}{52} \approx .019 \approx 1.9\%$

3) this month $\frac{1}{12} = .083 \approx 8.3\%$

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Addition Rule

Keyword OR

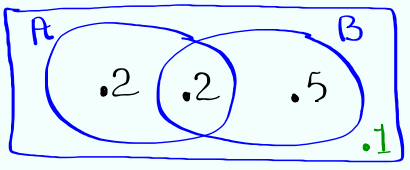
Single Action Event

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

$P(A) = .4$, $P(B) = .7$, $P(A \text{ and } B) = .2$

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

$= .4 + .7 - .2 = \boxed{.9}$



Total = 1

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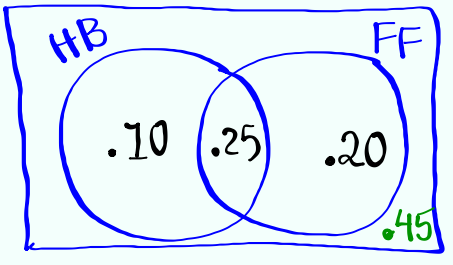
$P(HB) = .35$

$P(FF) = .45$

$P(HB \text{ and } FF) = .25$



Total = 1

$P(HB \text{ or } FF) = P(HB) + P(FF) - P(HB \text{ and } FF)$

$= .35 + .45 - .25 = \boxed{.55}$

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$E \rightarrow$ Desired Event

$\bar{E} \rightarrow$ E-bar, E-Complement, Not E

$P(E) + P(\bar{E}) = 1$ Complement Rule

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

$P(FF) = .45$ $\quad P(\overline{FF}) = 1 - P(FF)$

$= 1 - .45 = \boxed{.55}$

Suppose $P(E) = \frac{3}{17}$

find $P(\bar{E})$. $\quad P(\bar{E}) = 1 - P(E)$

$= 1 - \frac{3}{17} = \frac{14}{17}$

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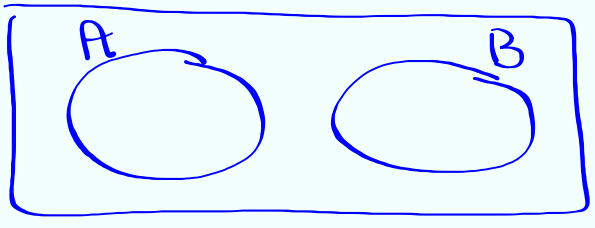
Mutually Exclusive Events

"Disjointed Events"

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

No overlap



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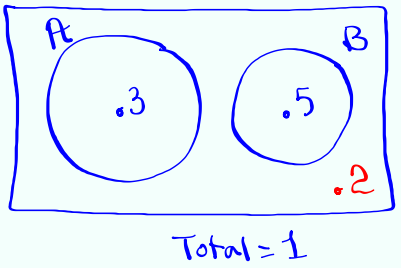
$P(A) = .3$, $P(B) = .5$, A & B are M.E.E.



Total = 1

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

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

3) $P(A \text{ or } B)$
$= P(A) + P(B) - P(A \text{ and } B)$
$= .3 + .5 - 0$
$= \boxed{.8}$

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