Statistics

Lecture 10

Feb 19-8:47 AM

Intro. to Probabilities

(SG 10)

E → Event or outcome

P(E) → Prob. that E happens

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

Ex: 15 Students, 9 Females, 6 Males

Randomly Select One Student,

$$P(\text{Select a female}) = \frac{\text{\# females}}{\text{\# of people}} = \frac{9}{15} = \boxed{\frac{3}{5}} = \boxed{.6}$$

$$P(\text{Select a male}) = \frac{\text{\# males}}{\text{\# of all Students}} = \frac{6}{15} = \boxed{\frac{2}{5}} = \boxed{.4}$$

Nov 7-7:22 AM

A box has 2 quarters, 8 dimes, and 10 nickels.

We shake it to drop one coin,

P(get a quarter) = $\frac{\text{2 Quartes}}{\text{20 Coins}} = \frac{2}{20} = \boxed{\frac{1}{10}} = \boxed{.1}$

P(get a dime) = $\frac{\text{8 Dimes}}{\text{20 Coins}} = \frac{8}{20} = \boxed{\frac{2}{5}} = \boxed{.4}$

P(get a nickel) = $\frac{\text{10 Nickels}}{\text{20 Coins}} = \frac{10}{20} = \boxed{\frac{1}{2}} = \boxed{.5}$

Acceptable Answers:

1) Reduced Fraction
2) Round to 3-decimal Places
3) Scientific Notation.

Nov 7-7:28 AM

A Standard deck of playing Cards has 52 Cards,

26 red, 12 face cards, and 4 aces.

Draw one Card,

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

2) P(get a face Card) = $\frac{12}{52} = \boxed{\frac{3}{13}} = \boxed{.231}$

12 [÷] 52 [enter]

[MATH] [1:▶Frac] [Enter]

3) P(get $\underbrace{\text{a face}}_{12}$ $\boxed{\text{or}}$ $\underbrace{\text{ace Card}}_{4}$) = $\frac{16}{52} = \boxed{.308} = \boxed{\frac{4}{13}}$

Pay attention

4) P(get $\underbrace{\text{a face } \boxed{\text{and}} \text{ ace Card}}_{\text{Not Possible}}$) = $\frac{0}{52} = \boxed{0}$

Do not use Ø for 0.

Nov 7-7:35 AM

Consider integers from 1 to 30.

$\underbrace{1, 2, 3, 4, \ldots, 26, 27, 28, 29, 30.}_{\text{Sample Space}}$

A collection of all possible outcomes

Let's select one number,

1) P(Select 4) = $\boxed{\frac{1}{30}}$ = $\boxed{.033}$

2) P(less than 4) = $\frac{3}{30}$ = $\boxed{\frac{1}{10}}$ = $\boxed{.1}$

1, 2, 3

3) P(at least 25) = $\frac{6}{30}$ = $\boxed{\frac{1}{5}}$ = $\boxed{.2}$

25, 26, 27, 28, 29, 30

4) P($\boxed{\text{less than } 4}$ or $\boxed{\text{at least } 25}$) = $\frac{9}{30}$ = $\boxed{\frac{3}{10}}$ = $\boxed{.3}$

3 choices — 6 choices

5) P(less than 4 and at least 25) = $\frac{0}{30}$ = $\boxed{0}$

Impossible event

6) P(multiples of 4) = $\boxed{\frac{7}{30}}$ = $\boxed{.233}$

4, 8, 12, 16, 20, 24, 28

Nov 7-7:46 AM

I surveyed 80 people, I asked them if they support abortion. Here is the summary of answers.

	Yes	NO	Total
Males	25	10	35
Females	15	30	45
Total	40	40	80

If we randomly select one person from this group,

P(Female) = $\frac{45}{80}$ = $\boxed{.563}$ = $\boxed{\frac{9}{16}}$

P(Yes) = $\frac{40}{80}$ = $\boxed{\frac{1}{2}}$ = $\boxed{.5}$

P(Female or Yes) = $\frac{70}{80}$ = $\boxed{\frac{7}{8}}$ = $\boxed{.875}$

P(Female $\boxed{\text{and}}$ Yes) = $\frac{15}{80}$ = $\boxed{.188}$ = $\boxed{\frac{3}{16}}$

Nov 7-7:57 AM

If we randomly Select one person, find the Prob. that he/she has a

1) birthday today $\frac{1}{365} = \boxed{.003}$

2) birthweek this week $\frac{1}{52} = \boxed{.019}$

3) birth month this month $\frac{1}{12} = \boxed{.083}$

Nov 7-8:12 AM

Some Prob. Rules & Terminologies:

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

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

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

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

5) $0 < P(E) \le .05 \iff$ Rare event

Nov 7-8:17 AM

Complement Rule:

E → Desired event

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

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

$P(\text{Rains}) + P(\overline{\text{Rain}}) = 1$

$P(\text{Ace}) + P(\overline{\text{Ace}}) = 1$

$$\boxed{\begin{array}{l} P(\bar{E}) = 1 - P(E) \\ P(E) = 1 - P(\bar{E}) \end{array}}$$ Complement Rule

Nov 7-8:21 AM

Suppose $P(E) = .04$

1) P(E) in reduced fraction.

.04 $\boxed{\text{MATH}}$ $\boxed{\text{1:▶Frac}}$ $\boxed{\text{Enter}}$ $\frac{1}{25}$

2) P(E) in %

.04 $\boxed{\times}$ 100 $\boxed{\text{Enter}}$ $\boxed{4\%}$

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

$P(\bar{E}) = 1 - P(E) = 1 - .04 = \boxed{.96}$

Nov 7-8:25 AM

Suppose $P(\overline{A}) = \frac{6}{25}$

1) $P(\overline{A})$ in decimal

6 $\boxed{\div}$ 25 $\boxed{\text{Enter}}$ $\boxed{.24}$

2) $P(\overline{A})$ in %

$\frac{6}{25} \cdot 100$

6 $\boxed{\div}$ 25 $\boxed{\times}$ 100 $\boxed{\text{Enter}}$ $\boxed{24\%}$

3) $P(A)$ in reduced fraction.

$P(A) = 1 - P(\overline{A}) = 1 - \frac{6}{25} = \boxed{\frac{19}{25}}$

1 $\boxed{-}$ 6 $\boxed{\div}$ 25 $\boxed{\text{MATH}}$ $\boxed{1{:}\blacktriangleright\text{Frac}}$ $\boxed{\text{Enter}}$

SG 10 ✓

Nov 7-8:28 AM

$\boxed{\text{Addition Rule}}$:

SG 11

Keyword OR

Single Action event

overlap

Both

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

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

$P(\overline{A}) = 1 - P(A) = 1 - .6 = \boxed{.4}$

$P(\overline{B}) = 1 - P(B) = 1 - .7 = \boxed{.3}$

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

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

Addition Rule

$= .6 + .7 - .5 = \boxed{.8}$

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

Nov 7-9:09 AM

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

$P(\text{Donut}) = .35$

$P(\text{Coffee and Donut}) = .15$

$P(\overline{\text{Coffee}}) = 1 - P(\text{Coffee}) = 1 - .75 = \boxed{.25}$

$P(\overline{\text{Donut}}) = 1 - P(\text{Donut}) = 1 - .35 = \boxed{.65}$

$P(\text{Coffee or Donut}) = P(\text{Coffee}) + P(\text{Donut}) - P(\text{Coffee and Donut})$

Addition Rule $= .75 + .35 - .15 = \boxed{.95}$

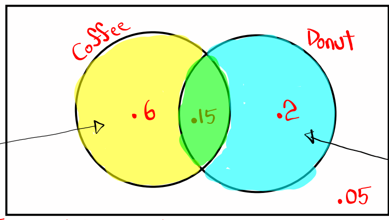
Venn Diagram

$.75 - .15 = .6$

Coffee only

$.35 - .15 = .2$

Donut only



$1 - .95 = .05$

Total Prob = 1

$P(\text{Coffee only OR Donut only}) = .6 + .2 = \boxed{.8}$

Addition

Nov 7-9:16 AM

$P(\text{Math}) = .6$

$P(\text{English}) = .8$

overlap

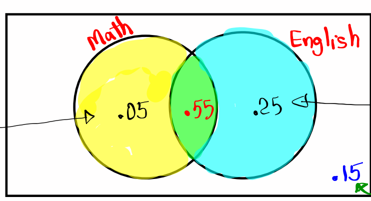
$P(\text{Math and English}) = .55$

$.6 - .55 = .05$

Math only

$.8 - .55 = .25$

English only



Total = 1

$1 - [.05 + .55 + .25]$

$P(\text{Math or English}) = P(M) + P(E) - P(M \text{ and } E)$

$= .6 + .8 - .55$

$= \boxed{.85}$

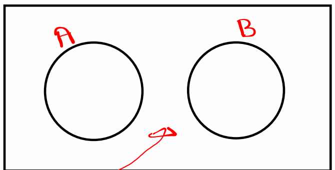
$P(\text{Math only OR English only}) =$

$.05 + .25 = \boxed{.3}$

Nov 7-9:26 AM

Mutually Exclusive Events (MEE)

Disjointed Events



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

No Overlap

Nov 7-9:35 AM

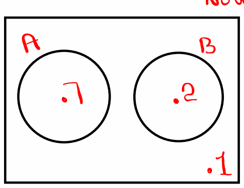
$P(A) = .7$, $P(B) = .2$, A and B are M.E.E.

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

2) $P(\bar{B}) = 1 - P(B) = \boxed{.8}$

3) Venn Diagram

No overlap



Total = 1 ✓

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

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

$.7 + .2 - 0 = \boxed{.9}$

Nov 7-9:37 AM

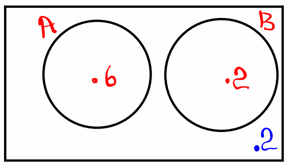
$P(A) = .6$, $P(B) = .2$, A and B are disjoint events

1) $P(\bar{A}) = \boxed{.4}$

2) $P(\bar{B}) = \boxed{.8}$

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

4) Draw Venn Diagram



Total = 1

5) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
$= .6 + .2 - 0 = \boxed{.8}$

On the right-hand side of SG 10-13, watch the video called De Morgan's Law.

Nov 7-9:42 AM