Statistics

Lecture 10

Feb 19-8:47 AM

SG 10

Intro. to Probabilities:

E → Desired event or outcome

P(E) → Prob. that E happens

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

10 Males, 15 Females, Select 1 person

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

15 ÷ 25 [Math] [1:▶Frac] [Enter]

[math] [2:▶Dec] [Enter]

Mar 25-9:59 AM

A box has 3 white, 7 blue, and 10 Red balls.

Select 1 ball

$P(\text{Red}) = \frac{10}{20} = \frac{1}{2} = .5$ $P(\text{white}) = \frac{3}{20} = .15$

$P(\overbrace{\text{Red or white}}^{13}) = \frac{13}{20} = .65$ $P(\text{Red and white}) = \frac{0}{20} = 0$

Acceptable Answers:

1) Reduced fraction

2) Round to 3-dec. places

3) Scientific Notation

Mar 25-10:05 AM

A standard deck of playing cards has 52 cards, 26 Red, 12 face, and 4 Aces.

Draw 1 Card

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

2) $P(\text{face}) = \frac{12}{52} = \frac{3}{13}$

3) $P(\text{Red and face}) = \frac{6}{52} = \frac{3}{26}$

4) $P(\text{Red or face}) = \frac{26+12-6}{52} = \frac{32}{52} = \frac{8}{13}$

Mar 25-10:12 AM

Let's randomly select one person,

Find the prob. that he/she has a birthday

1) Today $\frac{1}{365}$

2) this week $\frac{1}{52}$

3) This month $\frac{1}{12}$

Mar 25-10:18 AM

Some rules & Terminologies

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

2) Sum of all prob. is always 1.

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

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

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

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

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

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

Complement Rule

Mar 25-10:21 AM

Draw one card from a standard deck of playing cards.

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

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

$\rightarrow \frac{1}{13} + \frac{12}{13} = \frac{13}{13} = 1 \checkmark$

Given $P(A) = .025$

1) Find $P(\overline{A}) = 1 - P(A) = 1 - .025 = \boxed{.975}$

2) Simplify $\frac{P(A)}{P(\overline{A})}$ in reduced fraction

$\frac{.025}{.975} = \frac{1}{39}$

.025 ÷ .975 Math 1:▶Frac Enter

Mar 25-10:28 AM

Do you like rap music?

I surveyed 100 students

	Yes	NO	Total
Females	20	20	40
Males	50	10	60
Total	70	30	100

If we select 1 person,

$P(\text{Female}) = \frac{40}{100} = \boxed{.4}$

$P(\text{Yes}) = \frac{70}{100} = \boxed{.7}$

$P(\text{Female and Yes}) = \frac{20}{100} = \boxed{.2}$

$P(\text{Female or Yes}) = \frac{90}{100} = \boxed{.9}$

SG 10 ✓

Mar 25-10:36 AM

SG 11

Addition Rule

Keyword OR

Single Action event

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

Both

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

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

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$
$$= .4 + .7 - .2 = \boxed{.9}$$

Mar 25-10:45 AM

$P(HB) = .6$

$P(FF) = .3$

$P(HB \text{ and } FF) = .2$

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

$$P(HB \text{ or } FF) = P(HB) + P(FF) - P(HB \text{ and } FF)$$
$$= .6 + .3 - .2 = \boxed{.7}$$

Mar 25-10:50 AM

Mutually Exclusive events
NO overlap
Disjointed events
} P(A and B) = 0

P(A) = .65 P(B) = .25, A and B are M.E.E.

$P(\bar{A}) = 1 - .65 = \boxed{.35}$ $P(\bar{B}) = 1 - .25 = \boxed{.75}$

P(A and B) = 0

P(A or B)
= P(A) + P(B) − P(A and B)
= .65 + .25 − 0
= .9

$P(\overline{A \text{ or } B}) = 1 - P(A \text{ or } B)$
$= 1 - .9 = \boxed{.1}$

Mar 25-10:53 AM

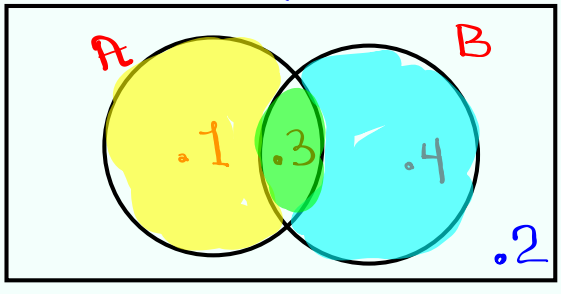
Using Venn Diagram.

P(A) = .4

P(B) = .7

P(A and B) = .3
overlap

Total = 1



.4 − .3 = .1
.7 − .3 = .4

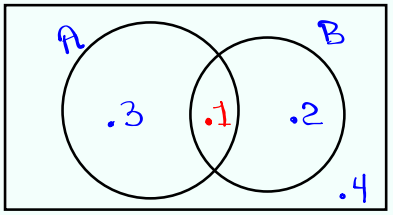
P(A only) = .1

P(B only) = .4

P(A only OR B only) = .1 + .4 = .5

Mar 25-11:00 AM

Complete the Venn Diagram below



Total = 1

$P(A) = .4$

$P(A \text{ only}) = .3$

$P(A \text{ and } B) = .1$ (overlap)

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

$= .4 + .3 - .1 = \boxed{.6}$

$P(\overline{A \text{ and } B}) = 1 - P(A \text{ and } B) = 1 - .1 = \boxed{.9}$

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

Watch De Morgan's Law Video.

Mar 25-11:06 AM