GOALS:

- 1. Long term: want to predict from data with an associated confidence, or reliability, computed from probability of occurrence.
- 2. Find probability of equally likely outcomes.
- 3. Determine basics properties of probabilities.

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page





4.1 Probability Basics

Sampling: all individuals equally likely to be selected

Need to understand probability of occurrence

Equally Likely Outcomes

Probability of event =
$$\frac{f}{N}$$

Where f = number of ways the event can occur and N= total number of possible outcomes

Since
$$f \le N$$
, $0 \le f \le 1$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page





Basic Properties of Probability

- 1. $0 \le p \le 1$
- 2. If event can NOT happen, p = 0
- 3. If event MUST happen, p = 1

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page

Class Notes

Homework

Given:
Governor (G)
Lt. Governor (L)
Secretary of State (S)
Attorney General (A)
Treasurer (T)

Find:
a) List samples of size 3 w/o replacement.
b) Prob G, A, and T obtained
c) Prob G and T included in sample
d) Prob G included.

Class Notes: Prof. G. Battaly, Westchester Community College, NY
Statistics Home Page

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Class Notes: Prof. G. Battaly, Westchester Community College, NY

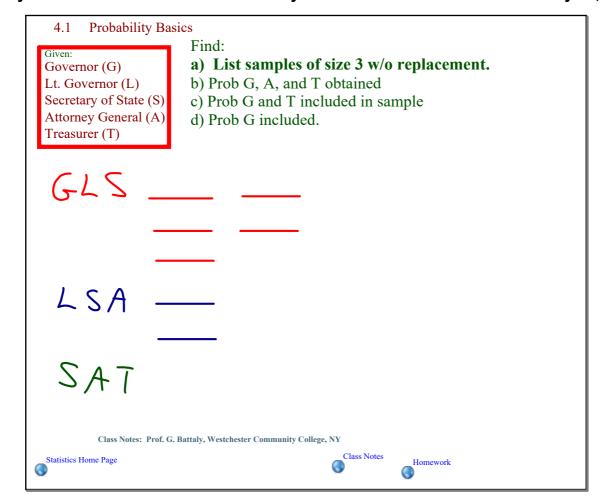
Class Notes: Prof. G. Battaly, Westchester Community College, NY

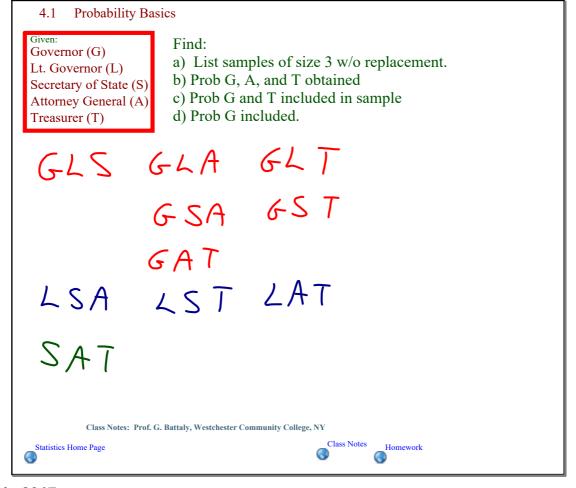
Class Notes: Prof. G. Battaly, Westchester Community College, NY

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Class Notes: Prof. G. Battaly, Westchester Community College, NY





© G. Battaly 2017 3

Given: Governor (G) Lt. Governor (L) Secretary of State (S) Attorney General (A) Treasurer (T)

Find:

- a) List samples of size 3 w/o replacement.
- b) Prob G, A, and T obtained
- c) Prob G and T included in sample
- d) Prob G included.

To Find Number of Possibilities, find

On Calculator:

- 1. Enter the total number of items available, in this case 5
- 2. Select the calculator button MATH/ PRB

#3: _nC_r

- $C_{r} = C_{s} = \frac{5!}{3! \ 2!}$ $= \frac{5.4.3!}{3! \ a}$
- 3. Enter the number of items you are selecting, in this case 3
- 4. Hit Enter

Class Notes: Prof. G. Battaly, Westchester Community College, NY







Probability Basics 4.1

Given: Governor (G) Lt. Governor (L) Secretary of State (S) Attorney General (A) Treasurer (T)

Find:

- a) List samples of size 3 w/o replacement.
- b) Prob G, A, and T obtained
- c) Prob G and T included in sample
- d) Prob G included.

Probability of event = $\frac{\mathbf{f}}{\mathbf{N}}$

- b) P(G&A&T) = f = N
- GLS GLA GLT GSA GST

c) $P(G\&T) = \frac{f}{N} = \frac{1}{N}$

GAT LSA LST LAT

d) $P(G) = \frac{f}{N} = \frac{1}{N}$

Class Notes: Prof. G. Battaly, Westchester Community College, NY





SAT

 $C_r = C_s = \frac{5!}{3! 2!}$

4.1 Probability Basics

Given:
Governor (G)
Lt. Governor (L)
Secretary of State (S)
Attorney General (A)
Treasurer (T)

Find:

- a) List samples of size 3 w/o replacement.
- b) Prob G, A, and T obtained
- c) Prob G and T included in sample
- d) Prob G included.

Probability of event =
$$\frac{f}{N}$$

b)
$$P(G&A&T) = \frac{f}{N} = \frac{1}{10}$$

c)
$$P(G\&T) = \frac{f}{N} = \frac{3}{10}$$

d)
$$P(G) = \frac{f}{N} = \frac{6}{10}$$

c)
$$\frac{3^{\frac{1}{5}}}{5^{\frac{2}{3}}}$$
 choose 1 from remaining 3

d)
$$\frac{\sqrt{C_2}}{5C_3}$$
 choose 2 from remaining 2

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page





4.1 Probability Basics

Given,	Given, in thousands:				
Size	Frequency				
2	34,454				
3	17,525				
4	15,075				
5	6,863				
6	2,307				
7+	1,179				

US family selected at random. Find:

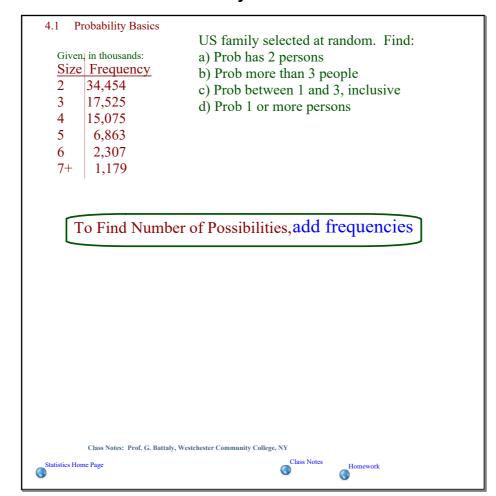
- a) Prob has 2 persons
- b) Prob more than 3 people
- c) Prob between 1 and 3, inclusive
- d) Prob 1 or more persons

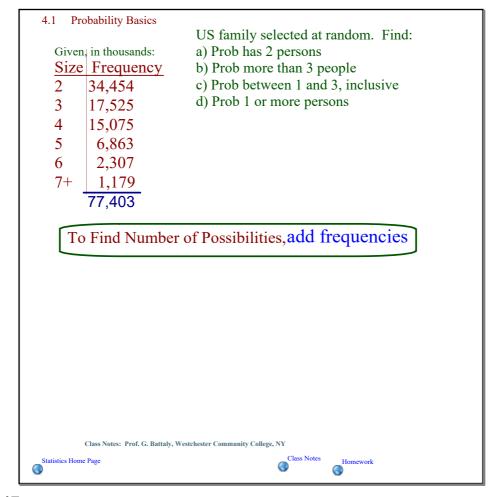
Class Notes: Prof. G. Battaly, Westchester Community College, NY











© G. Battaly 2017 6

Given, in thousands:

<u>Size</u>	Frequency		
2	34,454		
_	l		

- 17,525 15,075
- 6,863
- 6 2,307 7+ 1,179 77,403

US family selected at random. Find:

- a) Prob has 2 persons
- b) Prob more than 3 people
- c) Prob between 1 and 3, inclusive
- d) Prob 1 or more persons

a)
$$P(2) = \frac{f}{N} = \frac{77403}{}$$

b)
$$P(>3) = \frac{f}{N} = \frac{}{77403}$$

c)
$$P(1,2,0r3) = \frac{f}{N} = \frac{77403}{}$$

d)
$$P(1 \text{ or more}) = \frac{f}{N} = \frac{77403}{}$$







4.1 Probability Basics

Given, in thousands:

Size	Freq	uer
2	34,454	

- 3 | 17,525

- 4 | 15,075 5 | 6,863 6 | 2,307 7+ | 1,179 77,403

US family selected at random. Find:

- a) Prob has 2 persons
- b) Prob more than 3 people
- c) Prob between 1 and 3, inclusive
- d) Prob 1 or more persons

a)
$$P(2) = \frac{f}{N} = \frac{34454}{77403} = 0.445$$

b)
$$P(>3) = \frac{f}{N} = \frac{15075 + 6863 + 2307 + 1179}{77403} = \frac{25424}{77403} = 0.328$$

c)
$$P(1,2,or3) = \frac{f}{N} = \frac{34454+17525}{77403} = \frac{51979}{77403} = 0.672$$

d) P(1 or more) =
$$\frac{f}{N}$$
 = $\frac{77403}{77403}$ = 1







$$C = \frac{n!}{r!(n-r)!}$$

$$5C_{4} = \frac{5!}{4! \; 1!}$$

$$= \frac{5 \cdot 4!}{4!} = 5$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Pag



