

\* Speech on all remaining formulas  
Ch 19, 20, 21, 23

\* Requests/discussion Ch 20?

A2, C4 ~~SB~~

Rev 2, 7, 9

cont'd  
next time

All remaining formulas Ch 19, 20, 21, 23

sum of a list  $\leftrightarrow$  average of that list  $\leftrightarrow$  percent 1's in 1st of 0's & 1's  
for 0-1 boxes

$$\text{average of a list} = \frac{\text{sum of that list}}{\# \text{ items in that list}}$$

$$\text{percent of 1's in a list of 0's & 1's} = (\text{ave of same list}) \cdot 100\%$$

ex list  
(7) 1's  
(3) 0's  
percent 1's in list  
is 70%  
 $= \frac{1+1+1+1+1+1+0+0+0}{10} = \frac{7}{10} = 70\%$   
 $= (7) \cdot 100\%$

Ch 17 Sampling

box of tickets  $\rightarrow$  draws (with replacement)  $\rightarrow$  sample  $\rightarrow$  sum of draws  $\leftrightarrow$  something of interest

ave(box)  $\rightarrow$  expected(sum)  $= \text{ave}(\text{box}) \cdot (\# \text{ draws})$   
SD(box)  $\rightarrow$  SE(sum)  $= \text{SD}(\text{box}) \cdot \sqrt{\# \text{ draws}}$

Ch 19, 20, 21, 23

of often draws without replacement

Ch 23 (1) expected(ave)  $= \frac{\text{expected(sum)}}{\# \text{ draws}}$   
(2) SE(ave)  $= \frac{\text{SE(sum)}}{\# \text{ draws}} \cdot \text{corr factor}$

Ch 20 (1) expected(% 1's)  $= \text{expected(ave)} \cdot 100\%$   
(2) SE(% 1's)  $= \text{SE(ave)} \cdot 100\% \cdot \text{corr factor}$

See Summary Notes Descriptive Stats  
Regression  
Probability  
Sampling

Last (but important) detail

$$\text{SE(w/o replacement)} = \text{SE(w/ replacement)} \cdot (\text{correction factor})$$

correction factor  $= \sqrt{\frac{(\# \text{ ticks in box}) - (\# \text{ draws})}{(\# \text{ ticks in box}) - 1}}$  (Ch 20 p. 368)



Ch 20 p. 361

(1) ave(box)  $= \frac{10000}{25000} = \frac{10}{25} = \frac{2}{5} = 0.4 = 40\%$   
SD(box)  $= \sqrt{(1-0) \cdot \frac{2}{5} \cdot \frac{3}{5}} = \sqrt{\frac{10000 \cdot 15000}{25000 \cdot 25000}}$

(a) expected(sum)  $= (0.4) \cdot 400 = 160$   
SE(sum)  $= \sqrt{0.4} \cdot \sqrt{400} = 4\sqrt{4} \approx 9.78$

(b) expected(% 1's)  $= 40\%$  (common sense)  
SE(% 1's)  $= \frac{\text{SE(sum)}}{\# \text{ draws}} \cdot 100\% \cdot \text{corr factor}$   
 $= \frac{9.78}{400} \cdot 100\% \approx 2.4\%$

correction factor  $= \sqrt{\frac{25000 - 400}{25000 - 1}} \approx 0.99 \approx 1$

Fine point: technically, the c.f. is required for any sample w/o replacement, but c.f. may be omitted if sample size is small relative to box size.

400  $\approx 2\%$  of 25000  
Be careful if sample size is 10% or more of box size.

"Simple random Sample"  $\equiv$  random sample draws without replacement  
 $\Rightarrow$  draws are dependent  
 $\Rightarrow$  c.f. required in SE formula

(d) Repeat (b) for sample of 12,500 students simple random

$$\text{SE}(\%) = \frac{\text{SE(sum)}}{\# \text{ draws}} \cdot 100\% \text{ (c.f.)}$$

$$= \frac{\text{SD(box)} \cdot \sqrt{12500}}{12500} \cdot 100\% \cdot \sqrt{\frac{25000 - 12500}{25000 - 1}}$$

$$\approx 0.438\% \quad \text{w/ repl.}$$

$$\approx 0.31\% \quad \text{w/o repl.}$$

$$0.707$$