Chapter 21 Exercise Set A

1
a- observed
b- ii - bootstrap!
c- ii - bootstrap Again!

2 iii - Always draw the box first.

Box: 194 [1], 306 [0]; 500 draws

$box_{ave} = .388$
$box_{SD} = .49$
} bootstrapped!

$EV_{\%} = 38.8\%$
$SE_{\%} = (11/500) \times 100 = 2.2\%$

$SE_{sum} = .49 \times \sqrt{500} = 11$

38.8% give or take 2.2% or so.

3
$EV_{\%} = (48/100) \times 100\% = 48\%$
$SE_{\%} = (5/100) \times 100\% = 5\%$

Box: 48 [1], 52 [0]; 100 draws

$box_{SD} = .5$
$SE_{sum} = .5 \times \sqrt{100} = 5$

48% give or take 5% or so

4
$EV_{\%} = (11/400) \times 100\% = 2.75\%$
$SE_{\%} = (3.27/400) \times 100\% = .8\%$

Box: 11 [1], 389 [0]; 400 draws

$box_{SD} = .16$
$SE_{sum} = .16 \times \sqrt{400} = 3.27$

2.75% give or take .8% or so.

5
$EV_{\%} = (187/400) \times 100\% = 46.75\%$
$SE_{\%} = (9.98/400) \times 100\% = 2.5\%$

Box: 187 [1], 213 [0]; 400 draws

$box_{SD} = .4989$
$SE_{sum} = .4989 \times \sqrt{400} = 9.98$

46.75% give or take 2.5% or so.

6 No the percentages are representing different things.

7
Box: 20 [1], 80 [0]; 400 draws

$box_{SD} = .4$
$SE_{sum} = .4 \times \sqrt{400} = 8$

$SE_{\%} = (8/400) \times 100\% = 2\%$

8

a
$(72/400) \times 100\% = EV_{\%} = 18\%$
$(7.68/400) \times 100\% = SE_{\%} = 1.92\%$

Box: 18 [1], 82 [0]; 400 draws

$box_{SD} = .38$
$SE_{sum} = .38 \times \sqrt{400} = 7.68$

b
$(84/400) \times 100\% = EV_{\%} = 21\%$
$(8.15/400) \times 100\% = SE_{\%} = 2.03\%$

Box: 21 [1], 79 [0]; 400 draws

$box_{SD} = .41$
$SE_{sum} = .41 \times \sqrt{400} = 8.15$

c
$(98/400) \times 100\% = EV_{\%} = 24.5\%$
$(8.6/400) \times 100\% = SE_{\%} = 2.15\%$

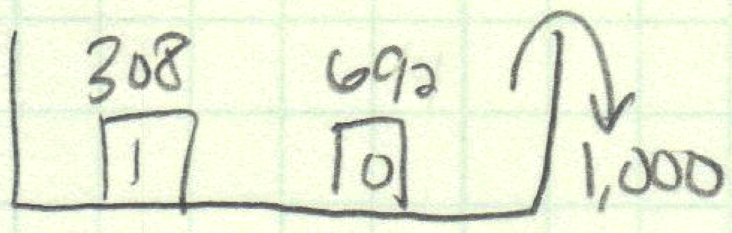
Box: 245 [1], 755 [0]; 400 draws

$box_{SD} = .43$
$SE_{sum} = .43 \times \sqrt{400} = 8.6$

ALL DIFFERENT BECAUSE BOOTSTRAP

9

	Known to be	Estimated
SE	N/A	1.46%
SD of Box	N/A	.46
# draws	1,000	N/A



$box_{SD} = .46$

$SE_{sum} = .46 \times \sqrt{1000} = 14.6$

$SE_{\%} = \frac{14.6}{1000} \times 100 = \underline{1.46\%}$

Chapter 21 Exercise Set B

1
a- Observed
b- ii - bootstrap.
c- ii - bootstrap.

2
a- $EV_{\%} = (194/500)\times 100\% = 38.8\%$ — bootstrap $box_{SD} = .487$

b- $SE_{\%} = (10.9/500)\times 100\% = 2.18\%$

Box: [1] 388, [0] 612 — 500 draws

$SE_{sum} = .487\times\sqrt{500} = 10.9$

$CI = 38.8\% \pm 2(2.18\%)$ ← $z = 95\%$

b- $CI = 38.8\% \pm 3(2.18\%)$ ← $z = 99.7\%$

c- $EV_{\%} = (776/2{,}000)\times 100\% = 38.8\%$ — $box_{SD} = .487$

$SE_{\%} = (21.77/2{,}000)\times 100\% = 1.09\%$

$SE_{sum} = .487\times\sqrt{2{,}000} = 21.77$

$CI = 38.8\% \pm 3(1.09\%)$ ← $z = 99.7$

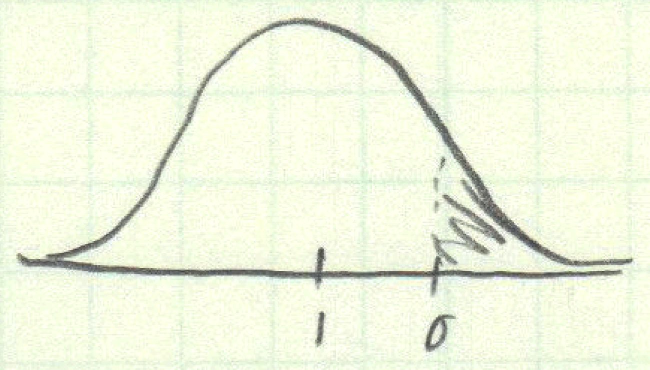
3a
Box: [1] 1, [0] 99 — 100 draws

$box_{av} = .01$
$box_{SD} = .10$

$EV_{sum} = .01\times 100 = 1$
$SE_{sum} = .10\times\sqrt{100} = 1$

3b Impossible! 0%

3c



$\frac{0-1}{1} = 1 \approx 68\%$ Tail $\frac{100-68}{2} = 16\%$

3d No because, b & c are different. We don't have enough draws!

4 False, the normal approximation does not apply because the box model does not have enough draws for such an odd proportion of 0s & 1s.

Chapter 21 Exercise Set C

1 box; draws; draws; box

2 Observed; population

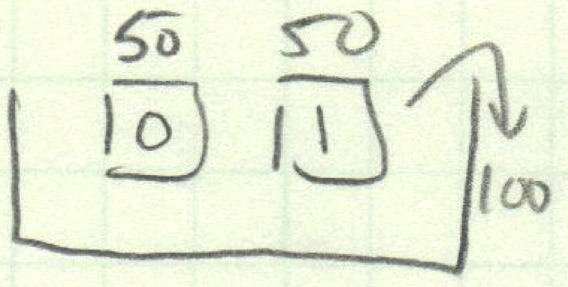
3 a) $EV_{\%} = 18\%$
$SE_{\%} = 1.92\%$ $CI = 18 \pm 2(1.92) = 14.16\% - 21.84\%$

b) $EV_{\%} = 21\%$
$SE_{\%} = 2.03\%$ $CI = 21 \pm 2(2.03) = 16.94\% - 25.06\%$

c) $EV_{\%} = 24.5\%$
$SE_{\%} = 2.15\%$ $CI = 24.5 \pm 2(2.15) = 20.2 - 28.8\%$

From 7 20% are one's so a & b contain this value.

4a True



$box_{ave} = .5$
$box_{SD} = .5$

$EV_{\%} = .50\%$
$SE_{\%} = 5/100 \times 100 = 5\%$

$SE_{sum} = .5 \times \sqrt{100} = 5$

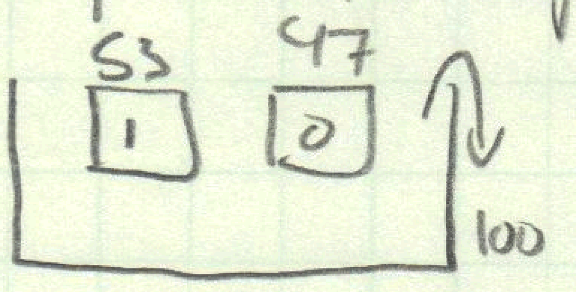
4b False, EV = 50% no error involved in that calculation.

4c True.

4d False, a CI doesn't talk about the sample.

4e True by definition

5a True by bootstrap.



$box_{SD} = .499$
$SE_{sum} = .499 \times \sqrt{100} \approx 5$

$EV_{\%} = 53\%$
$SE_{\%} = (5/100) \times 100 = 5\%$

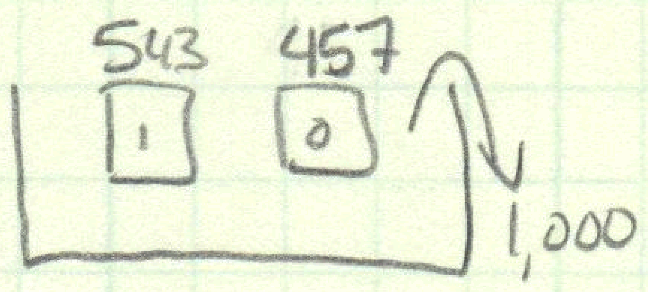
5b True due to the bootstrap!

5c True

5d True

5e False; CI are not for the sample!

6



$box_{SD} = .498$

$SE_{sum} = .498 \times \sqrt{1000} = 15.75$

$EV_{\%} = \underline{54.3\%}$

$SE_{\%} = \frac{15.75}{1000} \times 100 = \underline{1.6\%}$

a - True
b - True
c - False; CI does not apply to sample.
d - True; by definition of CI

7 False; the confidence intervals will be different because the SE's will vary due to the sample %'s.

8 True; We know the contents of the box so this is just a straight probability problem.

Chapter 21 Exercise Set D

1. How was this man's enrollment made? Was it a SRS? If not we can't use the SE formula's.

2. Not a SRS, so the formula's don't apply again.

Chapter 21 Exercise Set E

1) Gallup Polls are not SRS (reading) so no the formula's don't apply.

2) True this is a SRS.

3) a) voter enthusiasm affects the change

b) Simply Chance Variation due to the sampling process

c) quite possible due to chance variation.

Chapter 21 Review Exercises

1 The mayor is like the sum of 1,000 draws from the box:

Box: [1] ? [0] ? → 1,000 draws (32, 68)

The 1's represent the mayor is approved
The 0's represent he is not approved.

bootstrap $box_{SD} = .466$ $SE_{sum} = .466 \times \sqrt{1000} = 14.75$

2a Box: [1] 239 [0] 261 → 500 draws

bootstrap $box_{SD} = .50$
$SE_{sum} = .5 \times \sqrt{500} = 11.17$
$SE_{\%} = \frac{11.17}{500} \times 100 = 2.23\%$
$EV_{\%} = (239/500) = 47.8\%$

47.8% ± 2.23%

2b 47.8% ± 2(2.23%) = 43.34% – 52.26%

3a Box: [1] 7 [0] 493 → 500 draws

$EV_{\%} = 1.4\%$
$SE_{\%} = .5\%$

bootstrap $box_{SD} = .117$
$SE_{sum} = .117 \times \sqrt{500} = 2.63$

3b Hard to do with such an odd proportion of 1's & 0's.

4 Box: [0] 121 [1] 172 [1] 207 → 500 draws (the 1's: have 1 car or more)

$EV_{\%} = ((172+207)/500) \times 100 = 75.8\%$
$SE_{\%} = (9.58/500) \times 100 = 1.92\%$

$box_{SD} = .43$ $SE_{sum} = .43 \times \sqrt{500} = 9.58$

75.8% ± 1.92%

5a bootstrap! Box: [1] 361 [0] 639 → 6,000 draws

$Box_{SD} = .48$
$SE_{sum} = .48 \times \sqrt{6000} = 37.2$

$EV_{\%} = (361/1,000) = 36.1\%$
$SE_{\%} = (37.2/6,000) \times 100 = .62\%$

CI = 36.1% ± 2(.62%)

5b bootstrap Box: [1] 952 [0] 48 → 6,000 draws

$Box_{SD} = .21$
$SE_{sum} = .21 \times \sqrt{6000} = 16.56$

$EV_{\%} = 95.2\%$
$SE_{\%} = (16.56/6,000) \times 100 = .28\%$

CI = 95.2% ± 2(.28%)

[6] False PCE will never be exactly 0. Law of Averages.

[7] No, it's not a SRS so the formula's don't apply.

[8a] Yes it is the $SE_{\%}$ from a SRS.

[8b] Confidence Interval; population parameter.

[9] No! This is the SE for average not %.

[10] SUM:

6: [11], 94: [-1]; 100 draws

$box_{ave} = -.28$
$box_{SD} = 2.85$

$EV_{sum} = -.28 \times 100 = 28$
$SE_{sum} = 2.85 \times \sqrt{100} = 28.5$

-28 ± 28.5 or so.

[11] They are the same event because $7.1 \times 100 = 710$

[12] ii due to the definition of CI.

[13] i is irrelevant
ii is histogram of #'s drawn
iii is probability histogram for sum.

[14] We know the box!

[1] [0]; 1,000 draws

$box_{SD} = .5$ $box_{ave} = .5$

$EV_{sum} = .5 \times 1000 = 500$
$SE_{sum} = .5 \times \sqrt{1000} = 16$

a- 500; 29; 16
b- 500; -16; 16
c- 500; 14; 16

[15] a- estimated from the data - bootstrap
b- estimated from the data - bootstrap :)