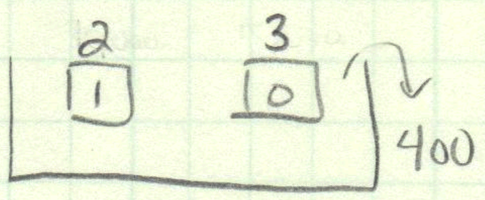
# Chapter 20 Exercise Set A

1 population = box
population percentage = 12,000/30,000 = 40%
sample = draws
sample size = 1,000
sample number = number of 1's among the draws
sample percentage = %age " " " " "
denominator = 1,000

2a




$EV_{SUM} = .4 \times 400 = 160$
$SE_{SUM} = .49 \times \sqrt{400} = 10$

$box_{ave} = .4$ $box_{SD} = .49$

2b $EV_{\%} = 40\%$
$SE_{\%} = \frac{10}{400} \times 100\% = 2.5\%$

2c 40% give or take 2.5% or so.

3 percentage → $(50/10{,}000) \times 100\%$.
number of → $\sqrt{10{,}000} \times .5 = 50$

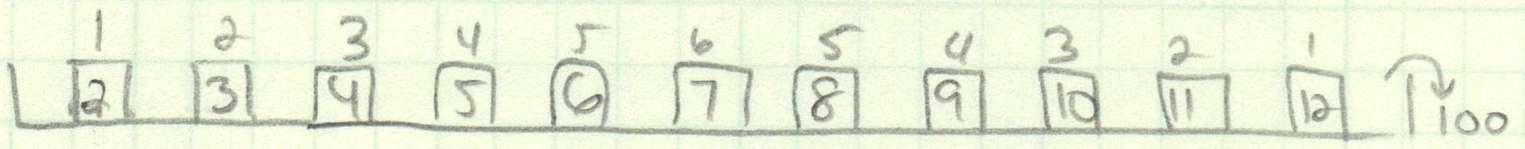
4a True box models are the same.

4b True there is a 1/4 chance of getting a 1.

5 False, they didn't change the box to 1/0.

6 10% + 1% → if you talk % stay in %.

7




$box_{ave} = 7$
$box_{SD} = 2.42$

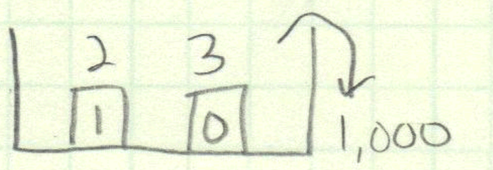
$EV_{sum} = 7 \times 100 = 700$
$SE_{sum} = 2.42 \times \sqrt{100} = 24.2$

8 There always exists chance error! (HARD)

# Chapter 20 Exercise Set B

1a sample; population

1b number; percentage.

2a 

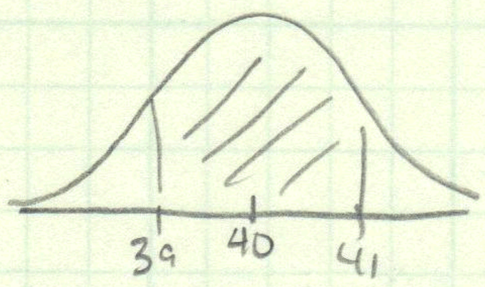

$box_{ave} = .4$ $box_{SD} = .49$

$EV_{\%} = 40\%$

$SE_{\%} = (15.5/1{,}000) \times 100\% = 1.55\%$

$SE_{sum} = .49 \times \sqrt{1000} = 15.5$

2b 40% give or take 1.5% or so.

2c 

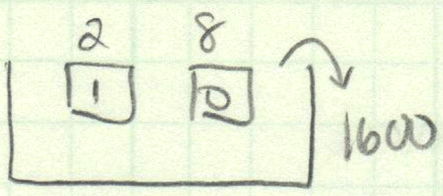

$\frac{39-40}{1.5} = -.67$

$\frac{41-40}{1.5} = .67$

> 48.43% in middle

3a 100,000; one for every person in the population.

3b No; 1 if their income is $>75{,}000$, 0 if their income is $<75{,}000$.

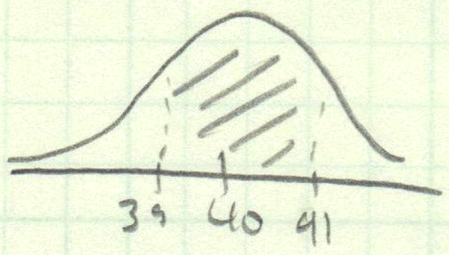
3c 


$box_{ave} = .2$ $box_{SD} = .4$

$EV_{\%} = 20\%$

$SE_{\%} = \frac{16}{1600} \times 100 = 1\%$

$SE_{sum} = .4 \times \sqrt{1600} = 16$




$\frac{39-40}{1} = -1$

$\frac{41-40}{1} = 1$

> 68% in middle

4 The chance that we draw 22% or more persons with income over $50,000.

5a The chance that 88 persons will have income over $50,000

5b The chance the sample will have 22% earning $>\$50{,}000$

5c No because % and sums are related.

$\frac{88}{400} = 22\%$

# Chapter 20 Exercise Set C

1 ii) They are both SRS so they are equally accurate.

2a $box_{ave} = .5$, $box_{SD} = .5$ $\quad SE_{sum} = .5\times\sqrt{2500} = 25$ $\quad SE_{\%} = \frac{25}{2500}\times 100 = \underline{1\%}$

2b $.5\sqrt{25000} = 79 = SE_{sum}$ $\quad SE_{\%} = (79/25000)\times 100\% = .31\%$

2c $.5\sqrt{100000} = 158 = SE_{sum}$ $\quad SE_{\%} = (158/100{,}000)\times 100\% = .16\%$

3 if 20% 1's in box → $SD_{box} = .4$
if 40% 1's in box → $SD_{box} = .49$

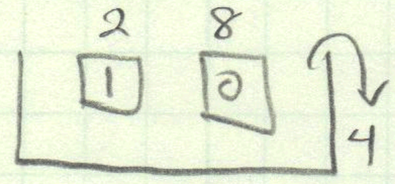
if 20% → $SE_{sum} = .4\times\sqrt{100} = 4$ $\quad SE_{\%} = \frac{4}{100}\times 100 = 4\%$
if 40% → $SE_{sum} = .49\times\sqrt{100} = 5$ $\quad SE_{\%} \frac{5}{100}\times 100 = 5\%$

if 20% → $SE_{sum} = .4\times\sqrt{2500} = 20$ $\quad SE_{\%} = \frac{1000}{2500}\times 100\% = .8\%$
if 40% → $SE_{sum} = .49\times\sqrt{2500} = 24.5$ $\quad SE_{\%} = \frac{24.5}{2500}\times 100\% = .98\%$

Choose 2500 draws!

4 Same, the proportions are all the same.

5 With:




$box_{SD} = .4$
$SE_{sum} = .4\times\sqrt{4} = .8$ $\quad SE_{\%} = \frac{.8}{4}\times 100\% = 20\%$

Without: In book.

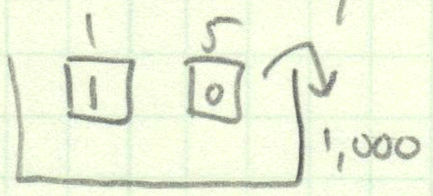
$$\sqrt{\frac{10-9}{10-1}} = \sqrt{\frac{1}{9}} = .82\times 20\% = \underline{16\%}$$

# Chapter 20 Review Exercises

**1**

| # tosses | $EV_{sum}$ | $SE_{sum}$ | $EV_{\%}$ | $SE_{\%}$ |
|---|---|---|---|---|
| 100 | 50 | 5 | 50% | 5% |
| 2,500 | 1250 | 25 | 50% | 1% |
| 10,000 | 5,000 | 50 | 50% | .5% |
| 1,000,000 | 500,000 | 500 | 50% | .05% |

**2** iii - Always set the box model first.




$box_{ave} = .167$
$box_{SD} = .37$

$EV_{\%} = 16.67\%$
$SE_{\%} = \frac{11.79}{1,000} \times 100 = 1.179\%$

$SE_{sum} = .37 \times \sqrt{1000} = 11.79$

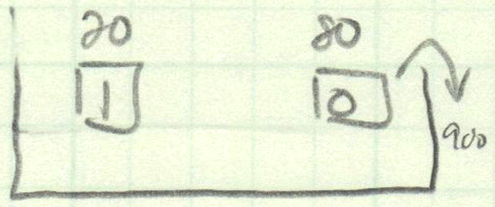
**3** a- 50,000 one for each population member.

b- a zero or a one

c- False, it's a one/zero box.

d- True.

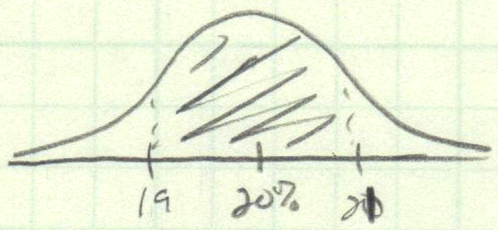
e-




$box_{SD} = .4$

$SE_{\%} = .4 \times \sqrt{900} = 12$

$EV_{\%} = 20\%$
$SE_{\%} = (12/900) \times 100 = 1.33$



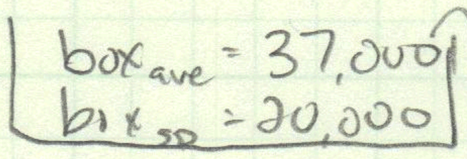

$\frac{19-20}{1.33} = -.75$

$\frac{21-20}{1.33} = .75$

$\Big\rangle$ 54.67% in the middle

f- No, we don't have the percentages of incomes > 75,000.

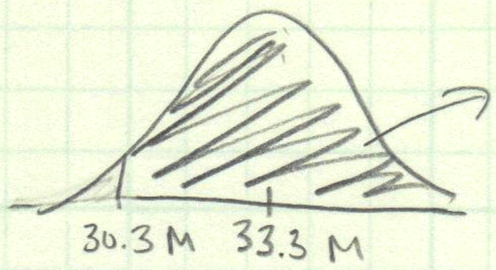
**4** TOTAL:



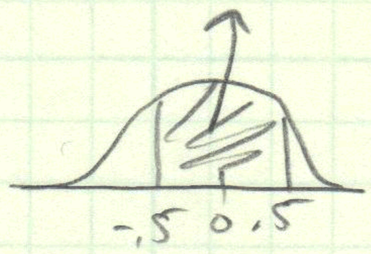

$EV_{sum} = 37,000 \times 900 = 33\,300,000$
$SE_{sum} = 20,000 \times \sqrt{900} = 600,000$

a - 50,000
b - a gross income
c - True
d - True

4e



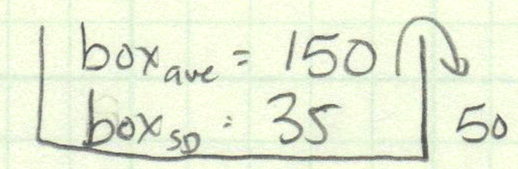

$$\frac{33,000,000 - 33,300,000}{600,000} = -.5 \approx 38.29$$




Middle + Tail

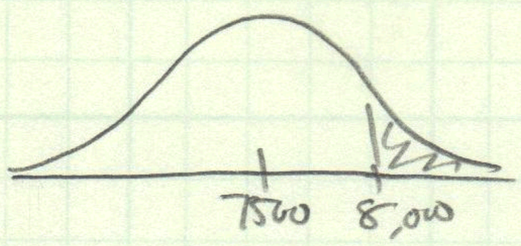
$38.29 + \left(\frac{100 - 38.29}{2}\right) = \underline{69\%}$

5 Total:




$EV_{sum} = 150 \times 50 = 7500$
$SE_{sum} = 35 \times \sqrt{50} = 247.5$

4 tons = 8,000 lbs




$\frac{8,000 - 7500}{247.5} \approx 2 \approx 95\%$ Tail $\frac{100-95}{2} = \underline{2.5\%}$

6 (ii) is right because .10% of 35,000,000 is bigger than .10% of 2,000,000.

7 a- True
b- False, the give or take is not appropriate when just talking about EV
c- True
d- False, chance error still exists.
e- True
f- False we know the box contents.

8 40% the $EV_{\%}$. Look at the Normal Curve.

9 Number of!

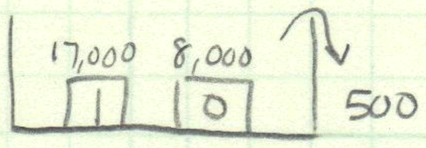
$box_{ave} = .33$
$box_{SD} = .47$

$EV_{sum} = .33 \times 600 = 200$
$SE_{sum} = .47 \times \sqrt{600} = 11.5$

200 give or take 11.5 or so.

10 Yes. Keyword "Number of" find SEsum

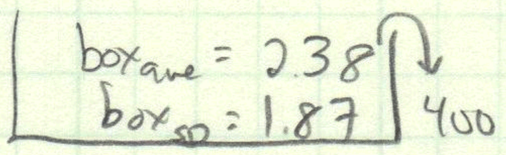
11a 357 = Obs.
340 = Exp.




$box_{ave}$ = .68

11b 357/500 = 71.4% = Obs
68% = Exp.

12 Total




EVsum = 2.38 × 400 = 952
SEsum = 1.87 × $\sqrt{400}$ = 37.4

952 interviews, give or take 37.4 or so.