

Chapter 18 Exercise Set A

1 70 and 80.

2a 6.5 to 10.5 (Discrete Histogram)

2b 6.5 to 7.5

3a 7

3b 7 (tallest bar in 2nd panel)

3c No, this is just chance variation, panel one is a "low" # of draws.

3d iii) it's an empirical histogram. so it shows actual percentages.

4a 4, 6

4b The bottom panel \rightarrow the probability histogram

4c 3; the bar is taller in the empirical histogram.

4d There is no way to get a product of 14 with 2 dice.

4e The percentage of time that 6 shows up in the chance process. The bottom panel is the probability histogram.

5 A goes with a smaller spread in box so sum is smaller.
B goes with a larger spread in box so larger spread in the sum too.

6 False, it tells you the chance of drawing those numbers not the # of times you draw them.

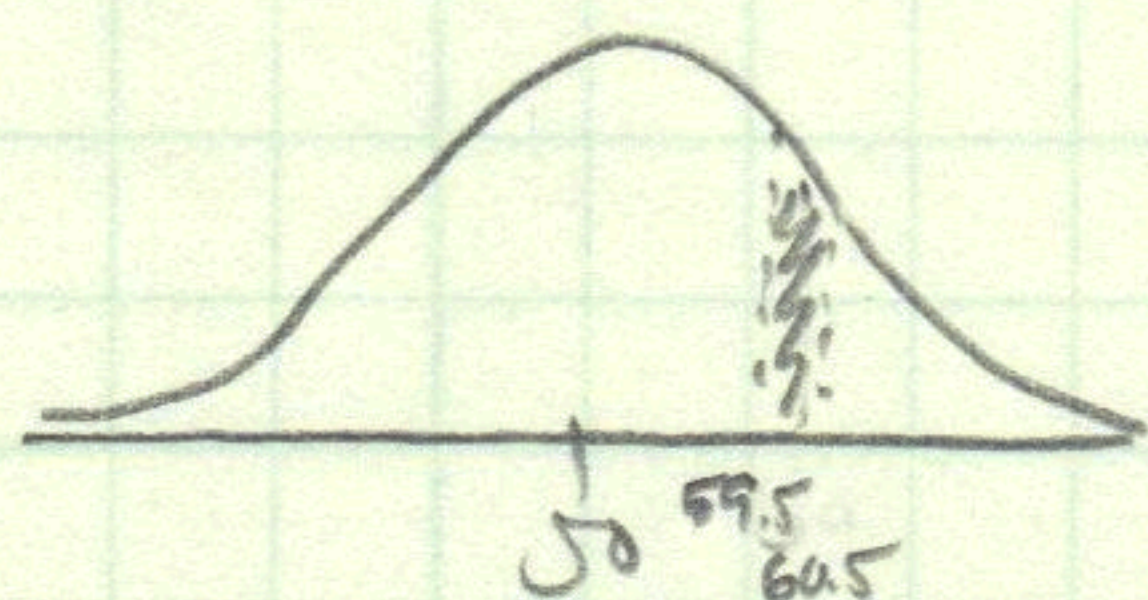
Chapter 18 Exercise Set B

- 1 Fairly obvious why
- i - Exactly 6
 - ii - 3-7 exclusive (not including)
 - iii - 3-7 inclusive (including)

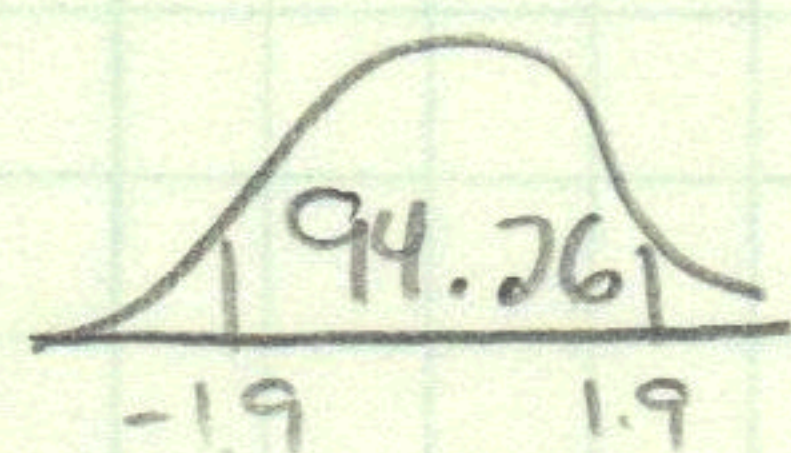
2 51.5 to 52.5 under the probability histogram.

3 box ave = .5
box sd = .5

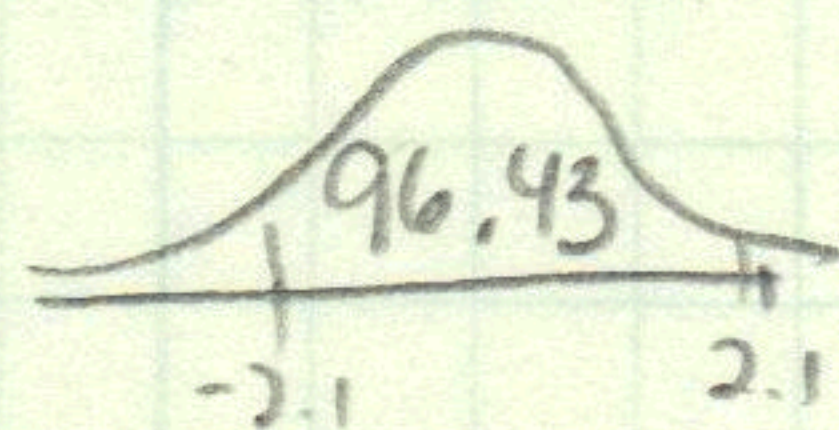
$EV_{sum} = 100 \times .5 = 50$
 $SE_{sum} = .5 \times \sqrt{100} = 5$



$\frac{59.5 - 50}{5} = 1.9$



$\frac{60.5 - 50}{5} = 2.1$



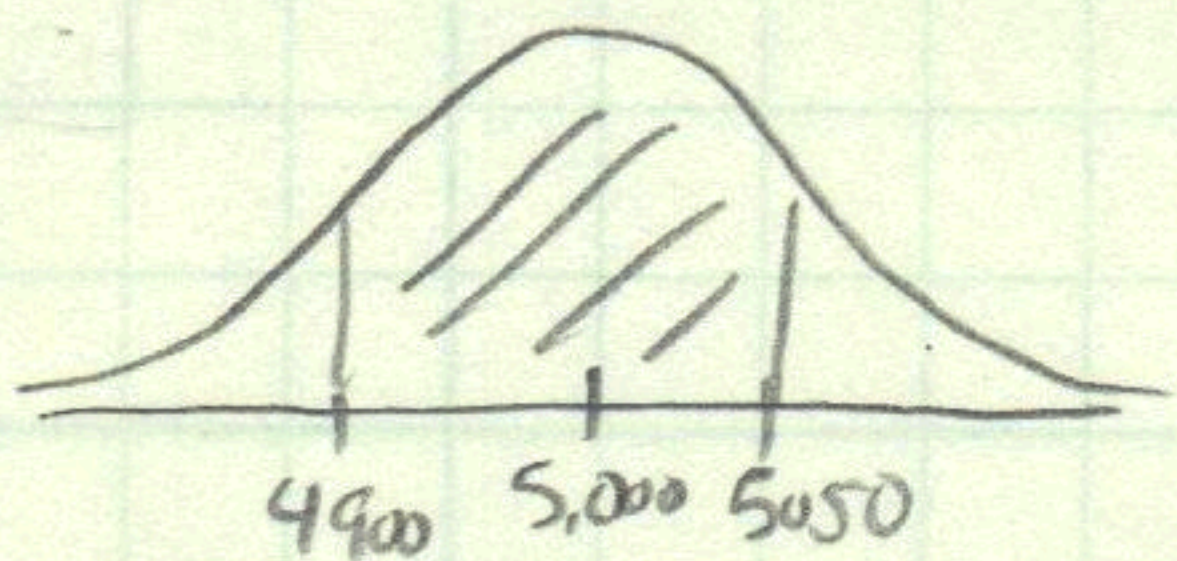
Discrete Value!!

Same Side Subtract! $\frac{96.43}{2} - \frac{94.26}{2} = 48.365 - 47.13 = \underline{1.235\%}$

4 From above about 1 in 100 should have exactly 60
It occurs once!

5 $EV_{sum} = .5 \times 10,000 = 5,000$
 $SE_{sum} = .5 \times \sqrt{10,000} = 500$

from previous problems ☺



$\frac{4900 - 5000}{500} = -2 \approx 95\%$ in middle

$\frac{5050 - 5000}{500} = 1 \approx 68\%$ in middle.

a Opposites Attract! $\frac{95}{2} + \frac{68}{2} = 47.5 + 34 = 81.5\%$

b Lower Tail $\frac{100 - 95}{2} = \underline{2.5\%}$

c Upper Tail $\frac{100 - 68}{2} = \underline{16\%}$

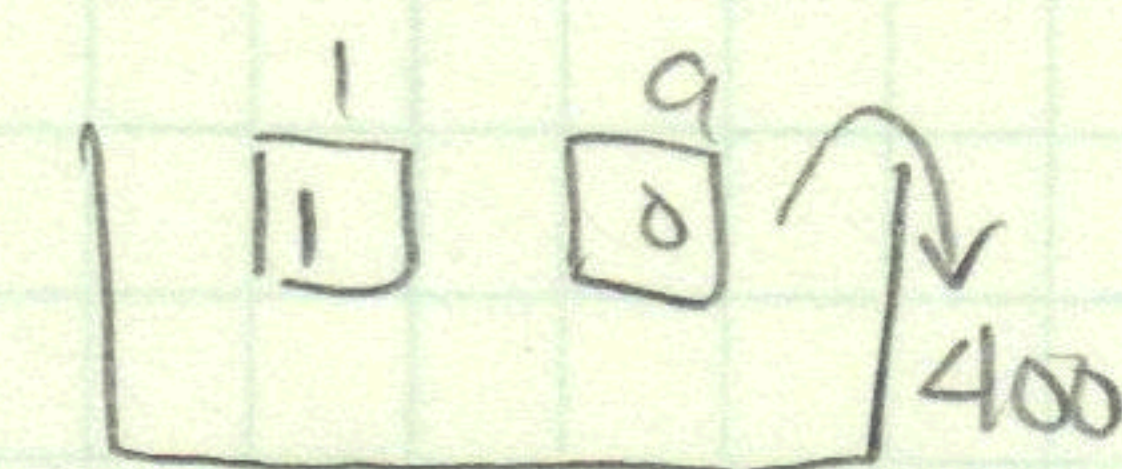
16a ODD PROBLEM.

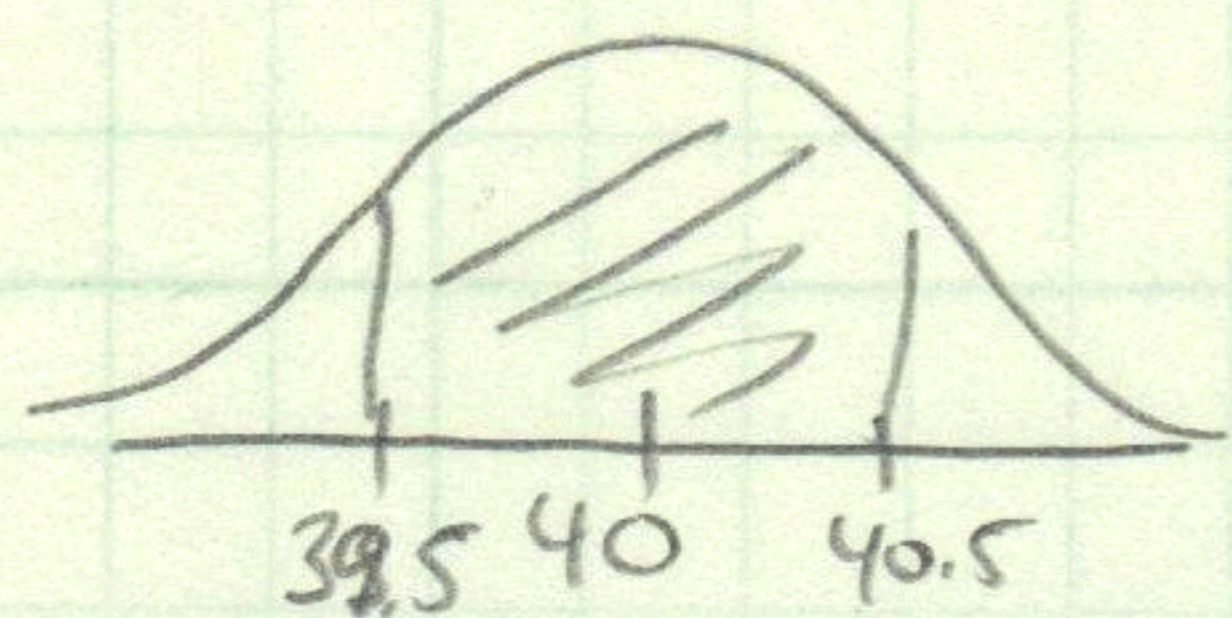
Yes! The rectangles for a low # of draws are significant because they are large.

16b No! The rectangles for a high # of draws are really small, the corners don't matter much ☺

Chapter 18 Exercise Set C

1 a - 4; 7
b - 3, the bar is higher above 3.

2 Discrete! box model 
 $\left. \begin{array}{l} \text{box}_{\text{ave}} = .1 \\ \text{box}_{\text{sd}} = .3 \end{array} \right\} \begin{array}{l} EV_{\text{sum}} = .1 \times 400 = 40 \\ SE_{\text{sum}} = .3 \times \sqrt{400} = 6 \end{array}$
 From 39.5 to 40.5



$$\frac{40.5 - 40}{6} = .083 \approx .10$$

$$\frac{39.5 - 40}{6} = -.083 \approx -.10$$

7.97% in middle

3 low, the bar is above the Normal curve.

4 Yes, the blocks are still a little too big.

5 A) ii
B) i
C) iii

6 $\left. \begin{array}{l} 100 - i \\ 400 - ii \\ 900 - iii \end{array} \right\}$ look at size of rectangles.

7 Probability Histogram because we don't look like the normal curve yet.

8 105, 101, 100. $EV_{\text{sum}} = 25 \times 4 = 100$

9 a) Much smaller than 50%

b) 10,000 (see scale @ bottom of diagram / 100 units)

c) 400,000 - 401,000

Chapter 18 Review Exercises

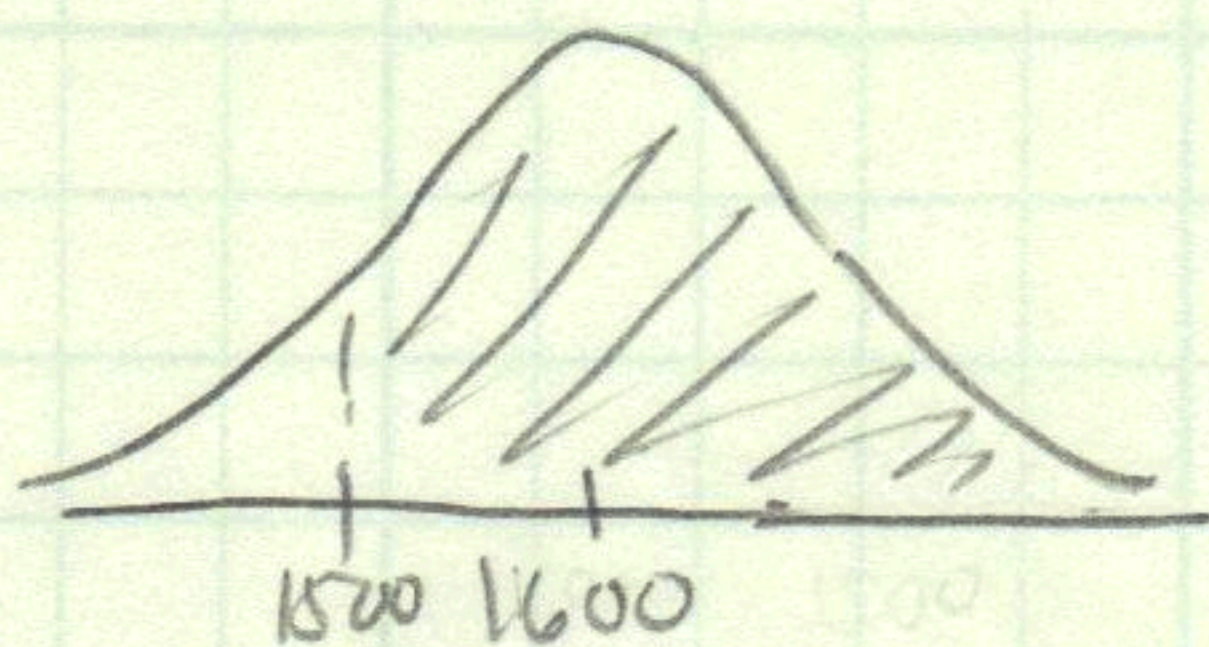
1 20 and 25

2a

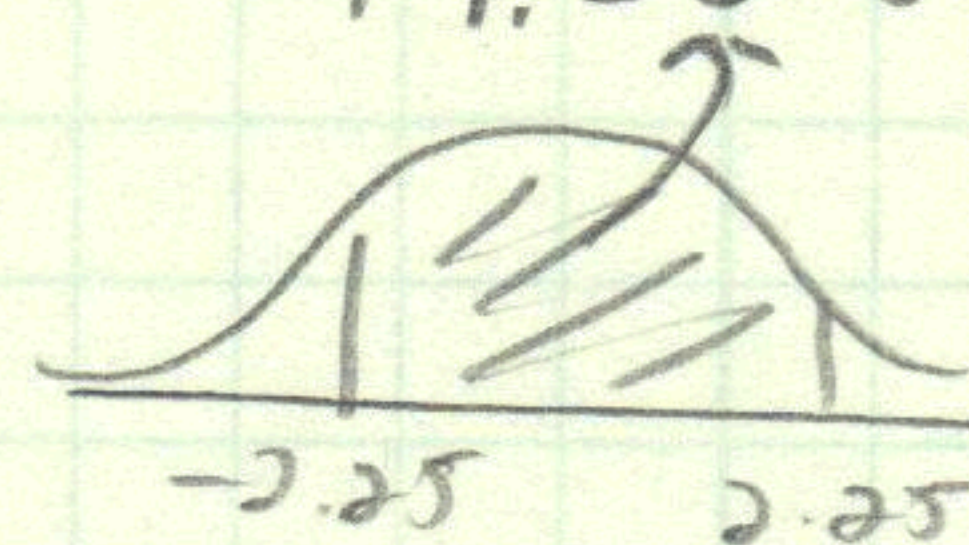


$$\begin{aligned} \text{box ave} &= 4 \\ \text{box sd} &= 2.24 \end{aligned}$$

$$\begin{aligned} EV_{\text{sum}} &= 4 \times 400 = 1600 \\ SE_{\text{sum}} &= 2.24 \times \sqrt{400} = 44.8 \end{aligned}$$



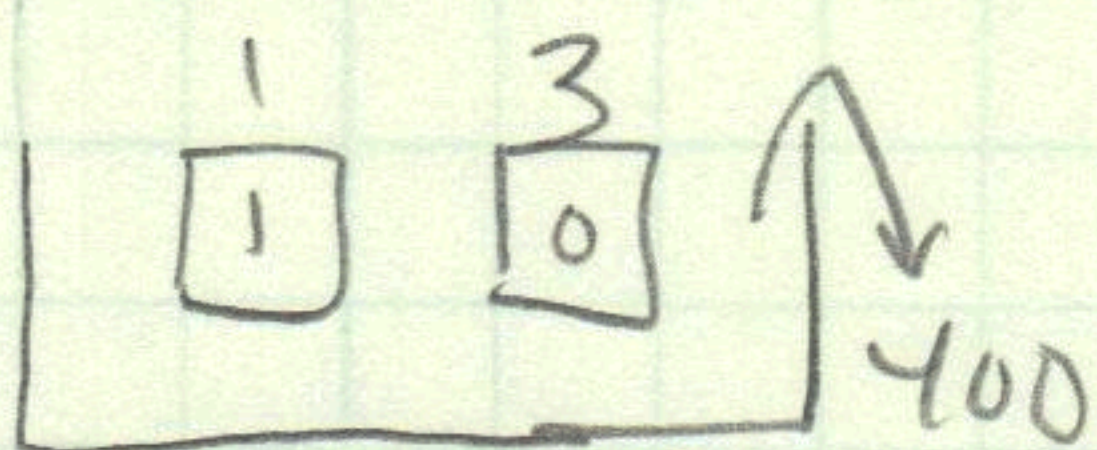
$$\frac{1500 - 1600}{44.8} = -2.23 \approx -2.25 \approx 97.56\%$$



Tail + Middle

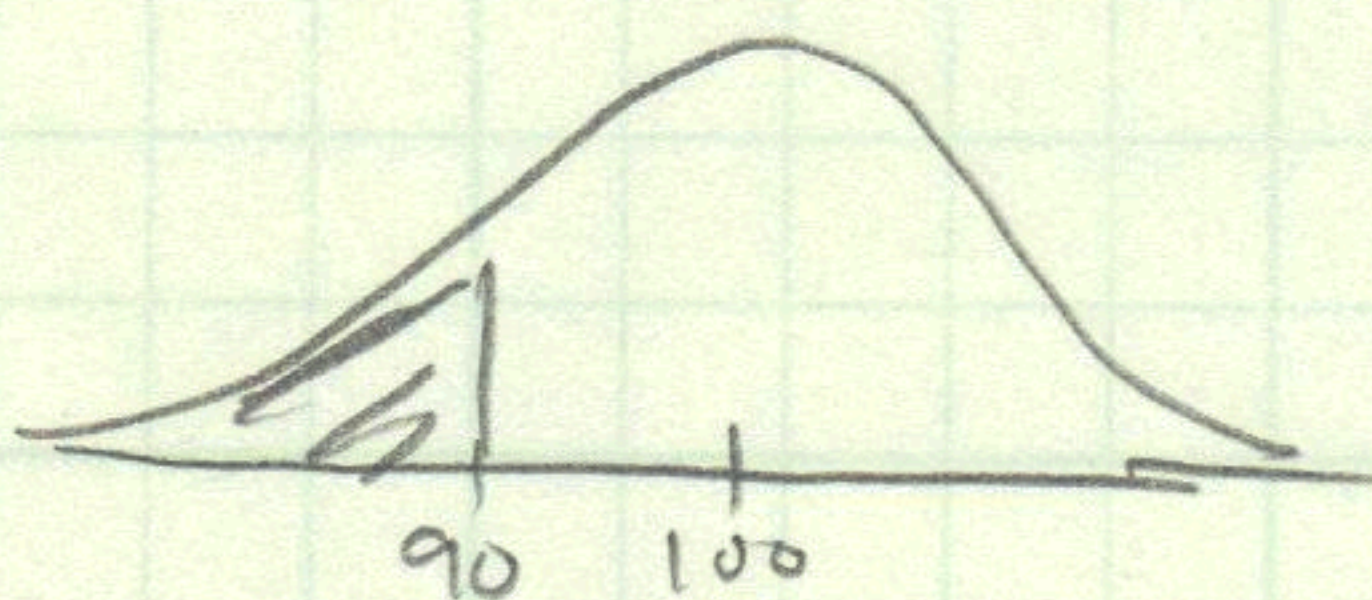
$$97.56 + \left(\frac{100 - 97.56}{2} \right) = \underline{98.78\%}$$

2b



$$\begin{aligned} \text{box ave} &= .25 \\ \text{box sd} &= .43 \end{aligned}$$

$$\begin{aligned} EV_{\text{sum}} &= .25 \times 400 = 100 \\ SE_{\text{sum}} &= .43 \times \sqrt{400} = 8.6 \end{aligned}$$



$$\frac{90 - 100}{8.6} = -1.16 \approx -1.15 \approx 75\%$$

Tail! $\frac{100 - 75}{2} = \underline{12.5\%}$

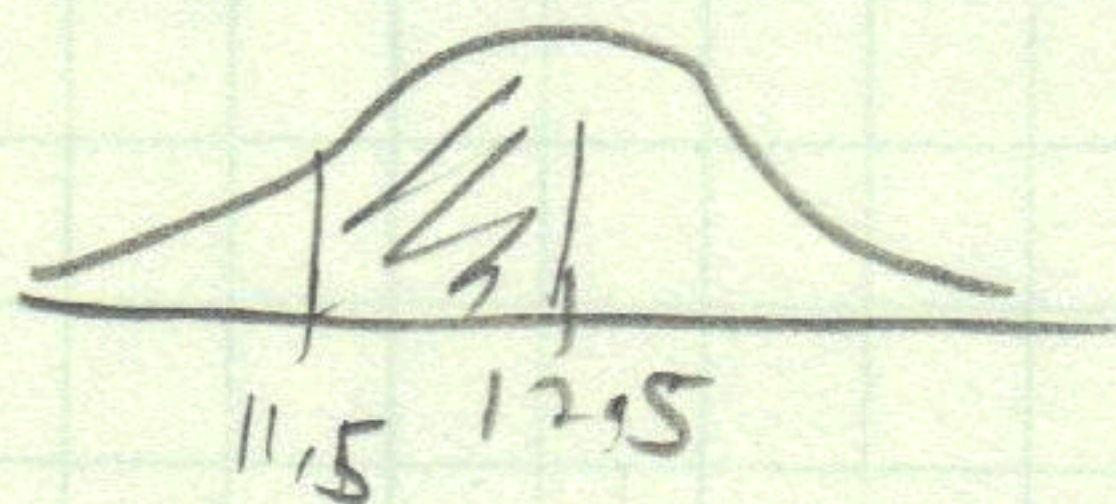
3 The probability histogram between 10 and 20; low draws.

4 $\begin{aligned} \text{box ave} &= .5 \\ \text{box sd} &= .5 \end{aligned}$

$$\begin{aligned} EV_{\text{sum}} &= 25 \times .5 = 12.5 \\ SE_{\text{sum}} &= \sqrt{25} \times .5 = 2.5 \end{aligned}$$

Discrete! Exactly 12 heads = 11.5 - 12.5 heads.

$$\frac{12.5 - 12.5}{2.5} = 0 \approx 0$$



$$\frac{11.5 - 12.5}{2.5} = -.4 \approx 31.08\% = \underline{15\%}$$

only 1 side →

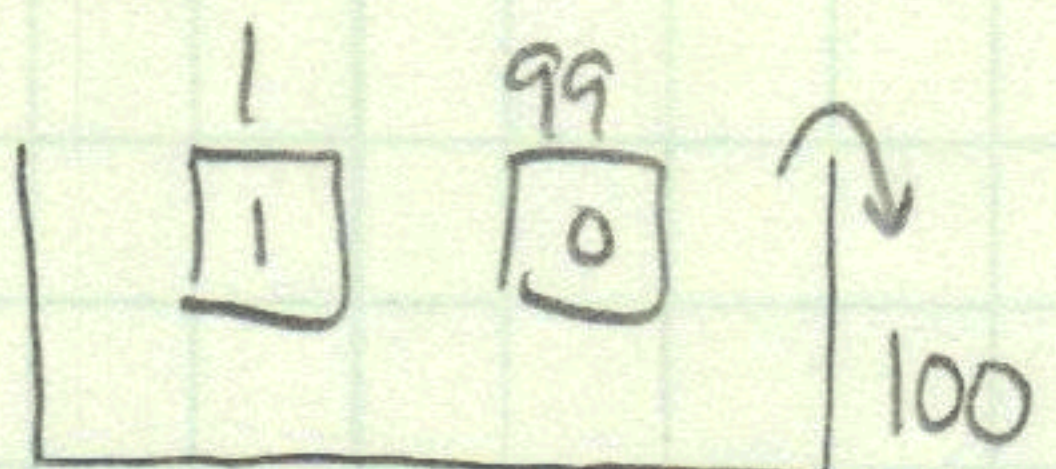
5 histogram of #'s is (iii) proportions right, # of blades right.
Sum is (i) spread is evenly distributed.
Product is (ii) sporadic spread.

6 $EV_{sum} = .5 \times 1,000,000 = 500,000$
 $SE_{sum} = .5 \times \sqrt{1,000,000} = 500$ ← Oops for the programmer.

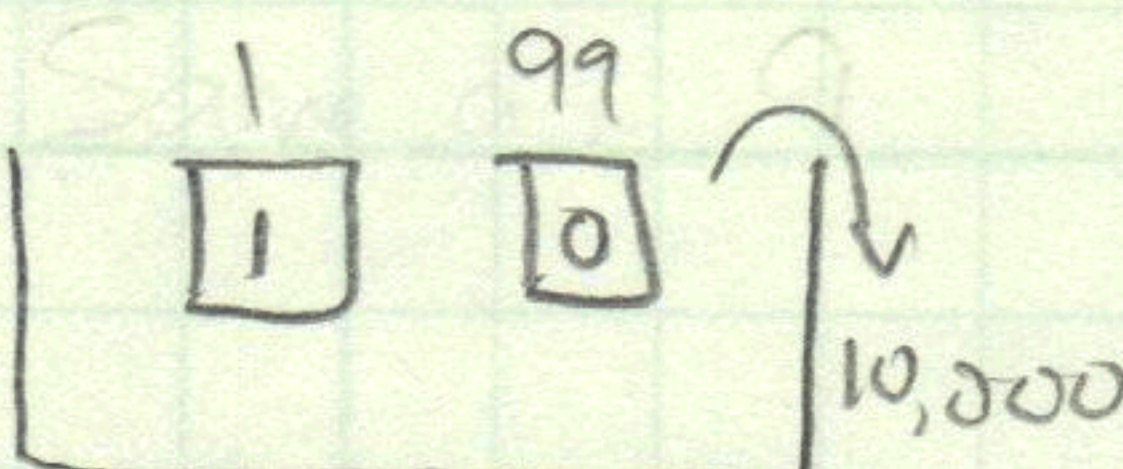
This means 502,015 is more than 4 SE's away from expected, something is probably wrong!

7 ii) the first option does not have the right proportions of tickets.

- 8 a - True
 b - True $EV = 50$ $SE = 5$
 c - False, that's just what we expect but chance is involved.
 d - True.

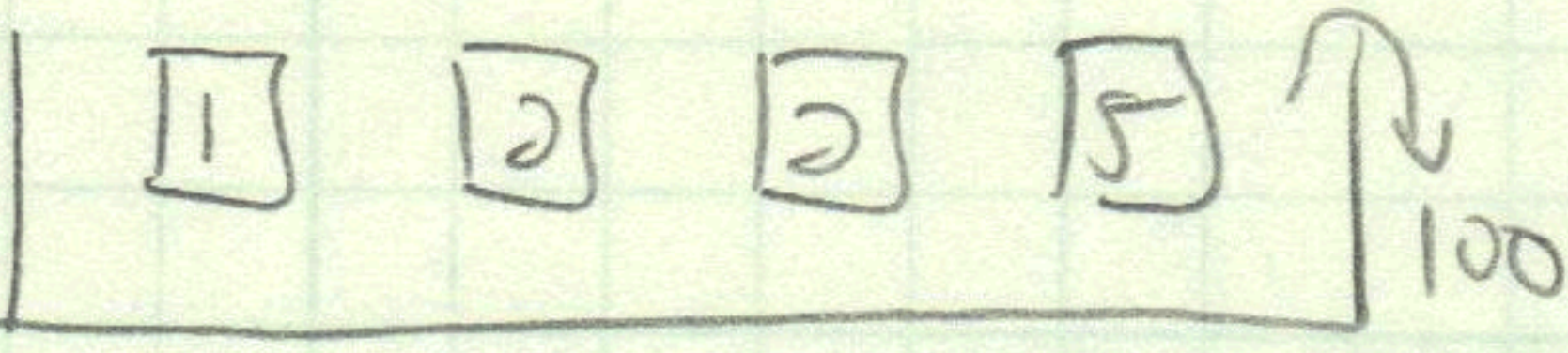
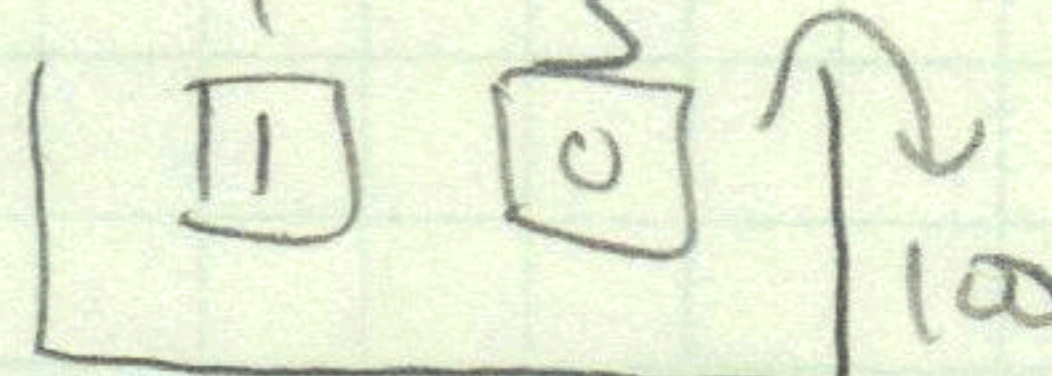
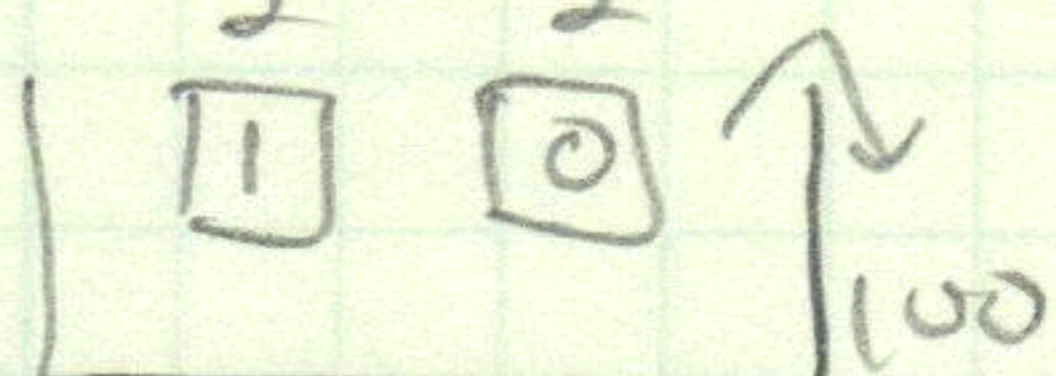
9  $box_{ave} = .01$ $EV_{sum} = .01 \times 100 = 1$
 $box_{sd} = .099$ $SE_{sum} = .099 \times \sqrt{100} = .99 \approx 1$

- a - True.
 b - False, we need more draws because of the proportions being so different.

10  $box_{ave} = .01$ $EV_{sum} = .01 \times 10,000 = 100$
 $box_{sd} = .099$ $SE_{sum} = .099 \times \sqrt{10,000} = 9.94$

- a - True
 b - True we have lots of draws!

11 Sum:

		
$box_{ave} = 2.5$ $box_{sd} = 1.5$	$box_{ave} = .25$ $box_{sd} = .43$	$box_{ave} = .5$ $box_{sd} = .5$
$EV_{sum} = 2.5 \times 100 = 250$ $SE_{sum} = 1.5 \times \sqrt{100} = 15$	$EV_{sum} = .25 \times 100 = 25$ $SE_{sum} = .43 \times \sqrt{100} = 4.3$	$EV_{sum} = .5 \times 100 = 50$ $SE_{sum} = .5 \times \sqrt{100} = 5$
Obs = $17(1) + 54(2) + 29(5)$ = 270	Obs = 17	Obs = 54
$\frac{270 - 250}{15} = 1.33$	$\frac{17 - 25}{4.3} = 1.86$	$\frac{54 - 50}{5} = .8$

- a - number of 2's
 b - sum of the draws.

12 a- No, the spread is going to be important to know

b- Yes, with lot's of draws we can use the normal curve.

13 Can't do it either time because we have to know how many three's there are.

14 Yes for a & b because this is now a counting box and we know the contents based on the prompt.

15 Yes, $600/1500 = 40\%$ so in one hundred draws our $EV_{sum} = 40$ but that never appears in the list nor is it the center!