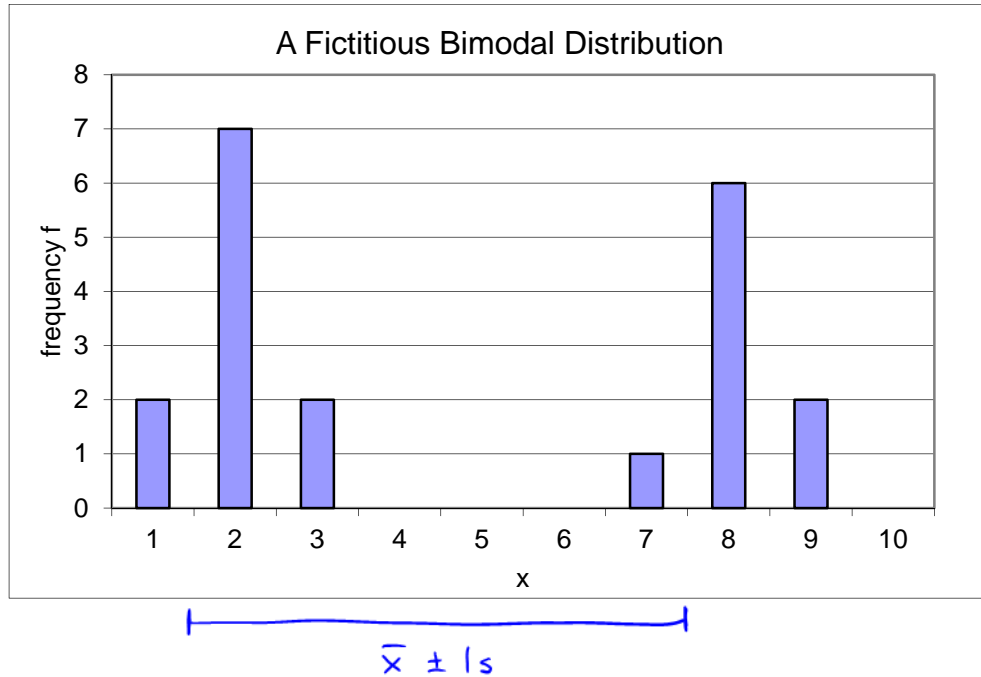


## STAT 157: Tchebysheff & Empirical Rules

Consider the following data set:

1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 3, 3, 7, 8, 8, 8, 8, 8, 8, 9, 9

The mean of this data set is 4.75 with standard deviation of 3.18. It has the following frequency histogram.



Complete the table below by finding the percentage of measurements in the intervals  $\bar{x} \pm s$ ,  $\bar{x} \pm 2s$  and  $\bar{x} \pm 3s$ . Also, state the percentages you'd expect to find in each interval according to the Empirical Rule and Tchebysheff's Theorem.

$\bar{x} = 4.75$   
 $s = 3.18$

	interval	# of points	% of points	Empirical	Tcheby	Empirical works?	Tcheby works?
$\bar{x} \pm s$	1.57 to 7.93	10	50	$\sim 68\%$	$\geq 0$	no	yes
$\bar{x} \pm 2s$	-1.61 to 11.11	all	100	$\sim 95\%$	$\geq 75\%$	sort of	yes
$\bar{x} \pm 3s$	-4.79 to 14.29	all	100	$\sim 99.7\%$	$\geq 89\%$	yes	yes

Should the actual percentages agree with the Empirical Rule? With Tchebysheff?

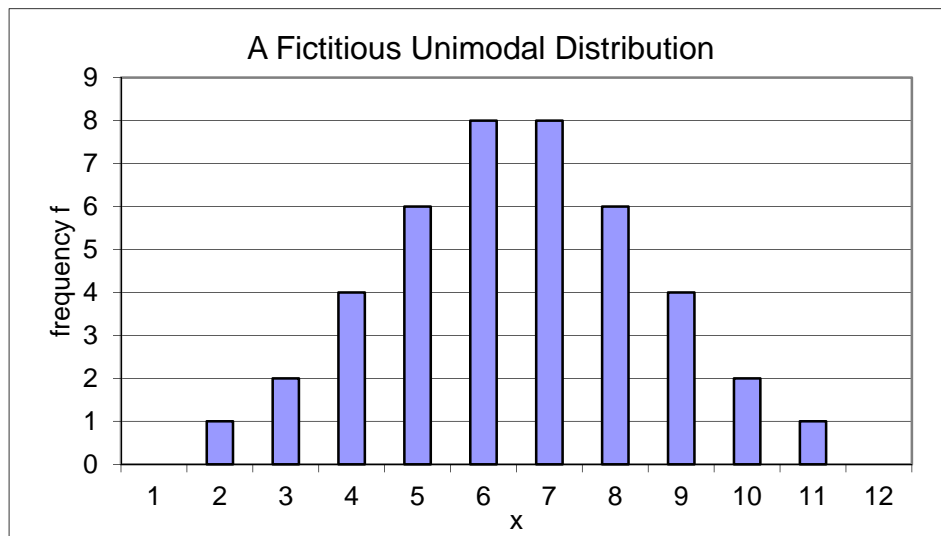
Emp: no, because not mound-shaped (bimodal)  
Tcheby: yes, because Tcheby always valid

Consider another data set in which  $x$  is the value of the data point and  $f$  is the frequency with which that value occurs.

$x$	$f$
1	0
2	1
3	2
4	4
5	6
6	8
7	8
8	6
9	4
10	2
11	1
12	0

$\bar{x} \pm 1s$

The mean of this data set is 6.5 with standard deviation 2.0. It has the following histogram.



Complete the table below.

42 points total

	interval	# of points	% of points	Empirical	Tcheby	Empirical works?	Tcheby works?
$\bar{x} \pm s$	4.5 to 8.5	28	66.7%	~68%	$\geq 0$	yes	yes
$\bar{x} \pm 2s$	2.5 to 10.5	40	95.2%	~95%	$\geq 75\%$	yes	yes
$\bar{x} \pm 3s$	0.5 to 12.5	all	100%	~99.7%	$\geq 89\%$	yes	yes

Should the actual percentages agree with the Empirical Rule? With Tchebysheff?

Emp: yes, because mound-shaped

Tcheby: yes, Tcheby always works

$\bar{x} = 6.5$   
 $s = 2.0$