

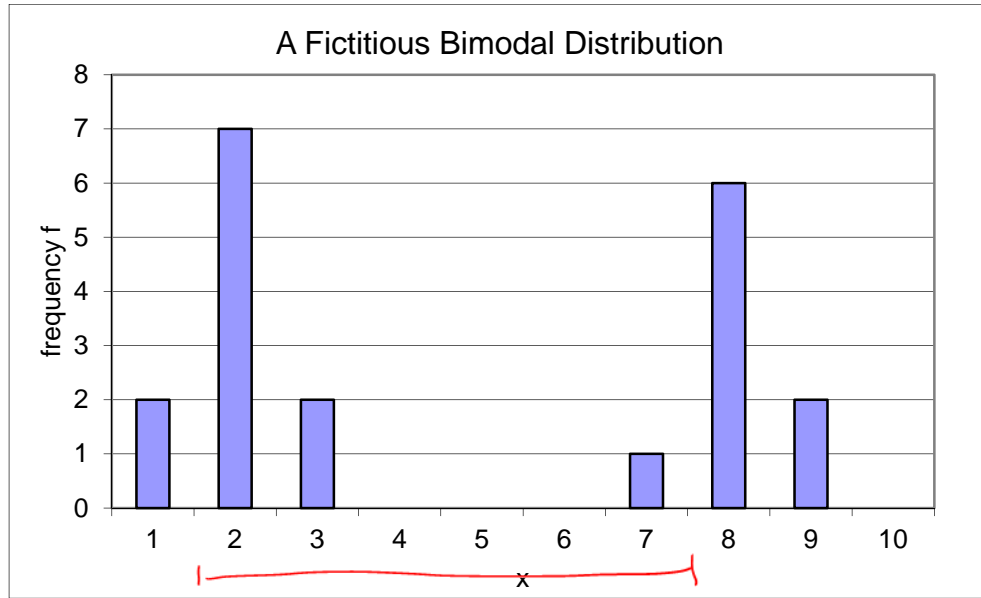
STAT 157: Tchebysheff & Empirical Rules

Consider the following data set:

1.57 to 7.93

1, 1, 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.



1.57 to 7.93

~ means "approximately"

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

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.

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

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

Empirical: NO, the data is not mound-shaped.

Tcheby: Yes, it always works.

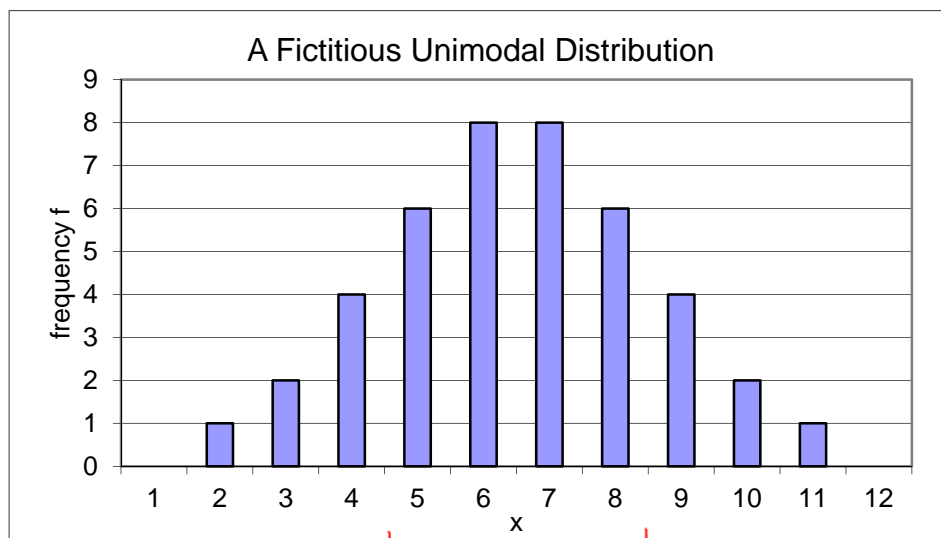
Consider another data set in which x is the value of the data point and f is the frequency with which that value occurs.

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

← number of times the value x appears in the data set

4.5
to 8.5

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



4.5 to 8.5

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

Complete the table below.

	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 Tchebsheff?

Empirical: Yes, because data is unimodal and symmetrical
Tcheby: Yes, it always works.