Ordered Test Scores			
18	43	54	66
21	44	55	67
21	45	55	69
27	45	56	70
29	46	57	71
31	47	58	73
32	48	61	77
33	49	62	80
34	52	63	81
41	54	64	82

50th → 54

Range 82 − 18 = 64

Percentile

$$\ell = n\left(\frac{P}{100}\right)$$

value # of values

10th → $40\left(\frac{10}{100}\right) = 4$

Ordered Test Scores

18	43	54	66
21	44	55	67
21	45	55	69
27	45	56	70
29	46	57	71
31	47	58	73
32	48	61	77
33	49	62	80
34	52	63	81
41	54	64	82

$$37^{th} \rightarrow 40\left(\frac{37}{100}\right)$$

$$= 14.8 \approx \boxed{15}$$

$$27 = 40\left(\frac{x}{100}\right)$$

$$\frac{27(100)}{40} = 67.5^{th}$$

Ordered Test Scores

18	43	54	66
21	44	55	67
21	45	55	69
27	45	56	70
29	46	57	71
31	47	58	73
32	48	61	77
33	49	62	80
34	52	63	81
41	54	64	82

25th → 42

50th → 54

75th → 65

Quartiles

Quartiles

The 25^{th}, 50^{th}, and 75^{th} percentiles are known as **quartiles** and are denoted as Q_1, Q_2, and Q_3 respectively.

DEFINITION

Interquartile Range

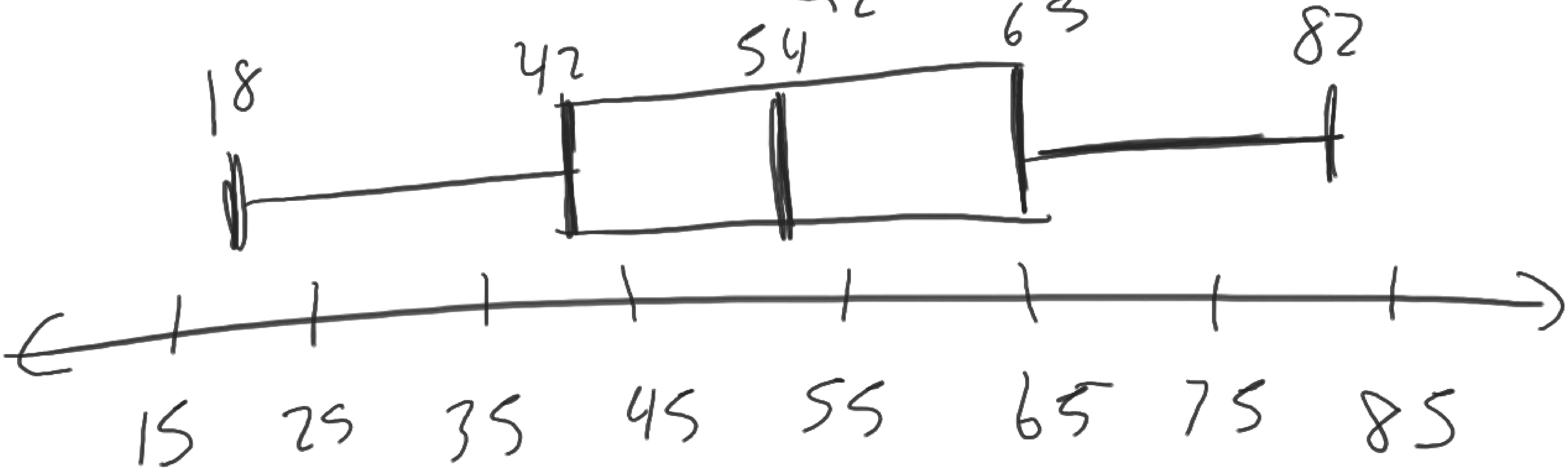
The **interquartile range** is a measure of dispersion which describes the range of the middle fifty percent of the data. It is calculated as follows.

$$\text{IQR} = Q_3 - Q_1$$

FORMULA

$25^{th} = 42$ $50^{th} = 54$ $75^{th} = 65$

Q1 Median Q2 Q3



Procedure for Constructing a Box Plot

1. Determine the 5-number summary for the data set.
2. Draw a scale that includes the minimum and maximum data values.
3. Construct a box extending from Q_1 to Q_3.
4. Draw a line through the box at the value of the median.
5. Draw lines extending from Q_1 to the minimum and from Q_3 to the maximum.

PROCEDURE

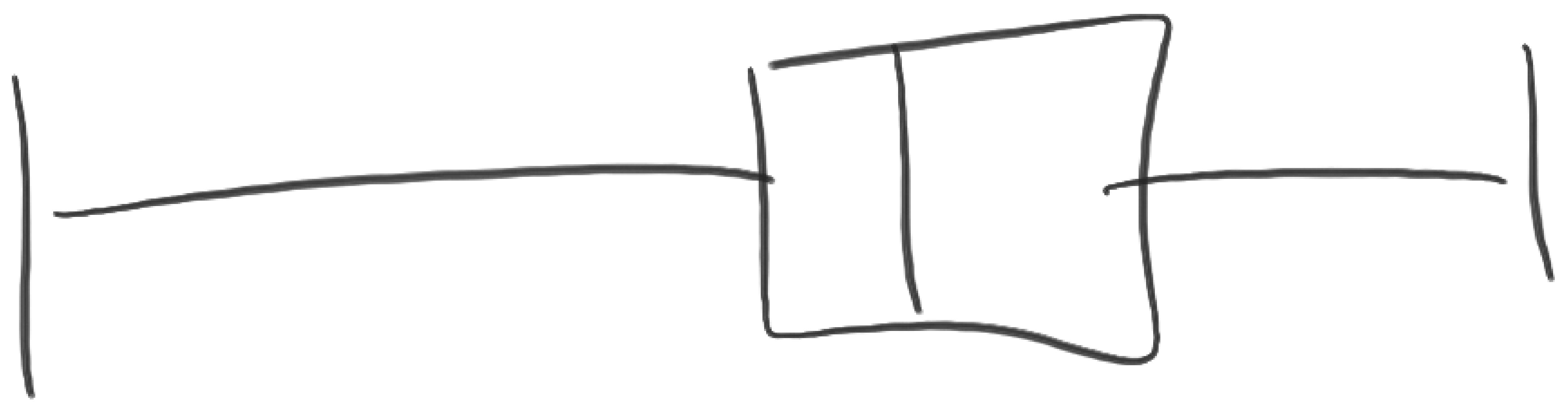
Outlier

A data point is considered an **outlier** if it is 1.5 times the interquartile range above the 75th percentile or 1.5 times the interquartile range below the 25th percentile.

DEFINITION

25th	50th	75th → 99.5
7.5 ← 42	54	65 +34.5
-34.5 Q_1	Q_2	Q_3

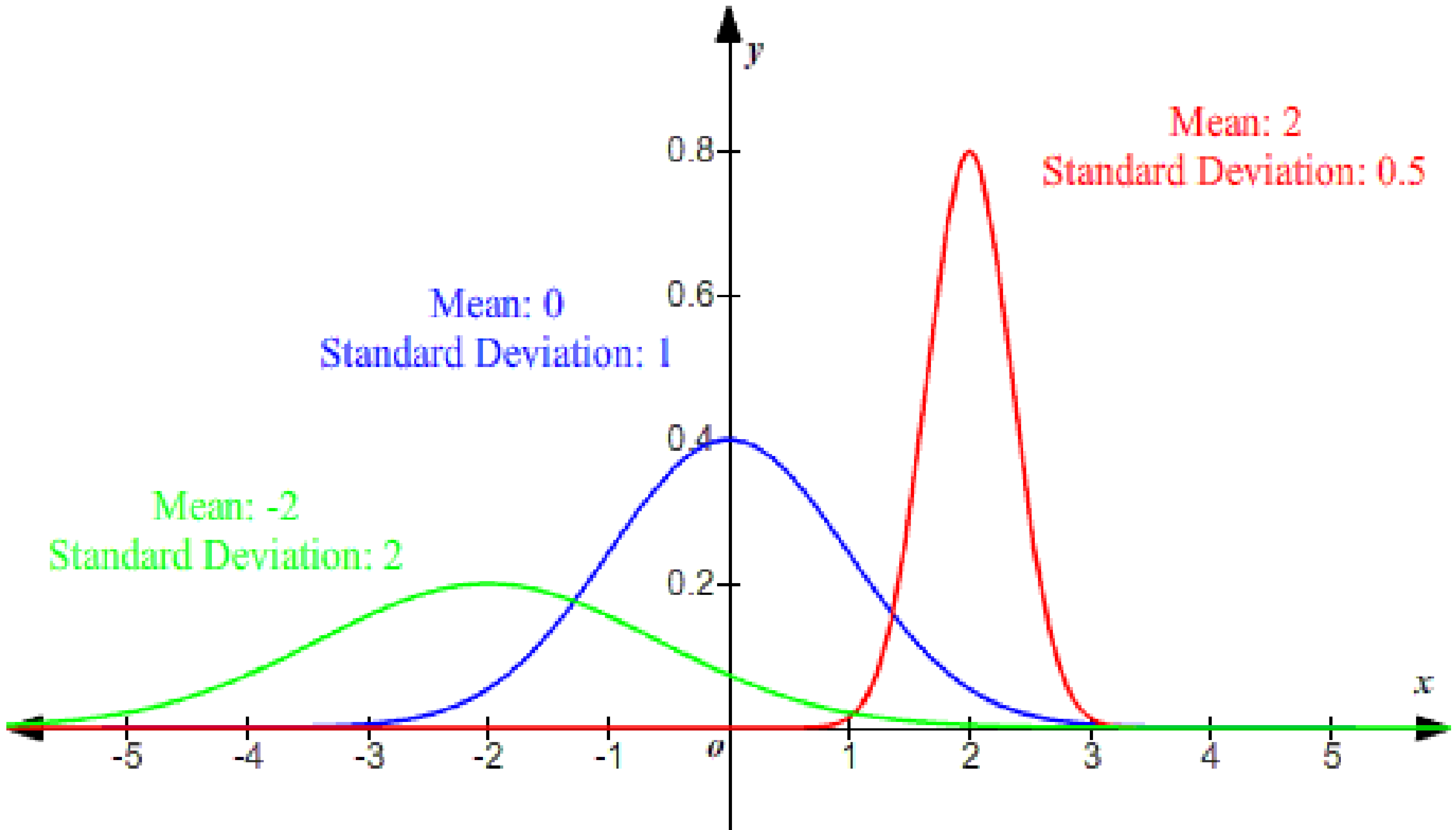
IQR = 23



5, 10, 9, 11, 9, 7   Mean = 8.5

Standard Deviation

5 − 8.5 = −3.5	12.25	find mean
7 − 8.5 = −1.5	2.25	$\frac{23.5}{6} = 3.92$ ↑ variance
9 − 8.5 = .5	.25	
9 − 8.5 = .5	.25	
10 − 8.5 = 1.5	2.25	$\sqrt{3.92} = 1.98$ ↑ Standard Deviation
11 − 8.5 = 2.5	6.25	

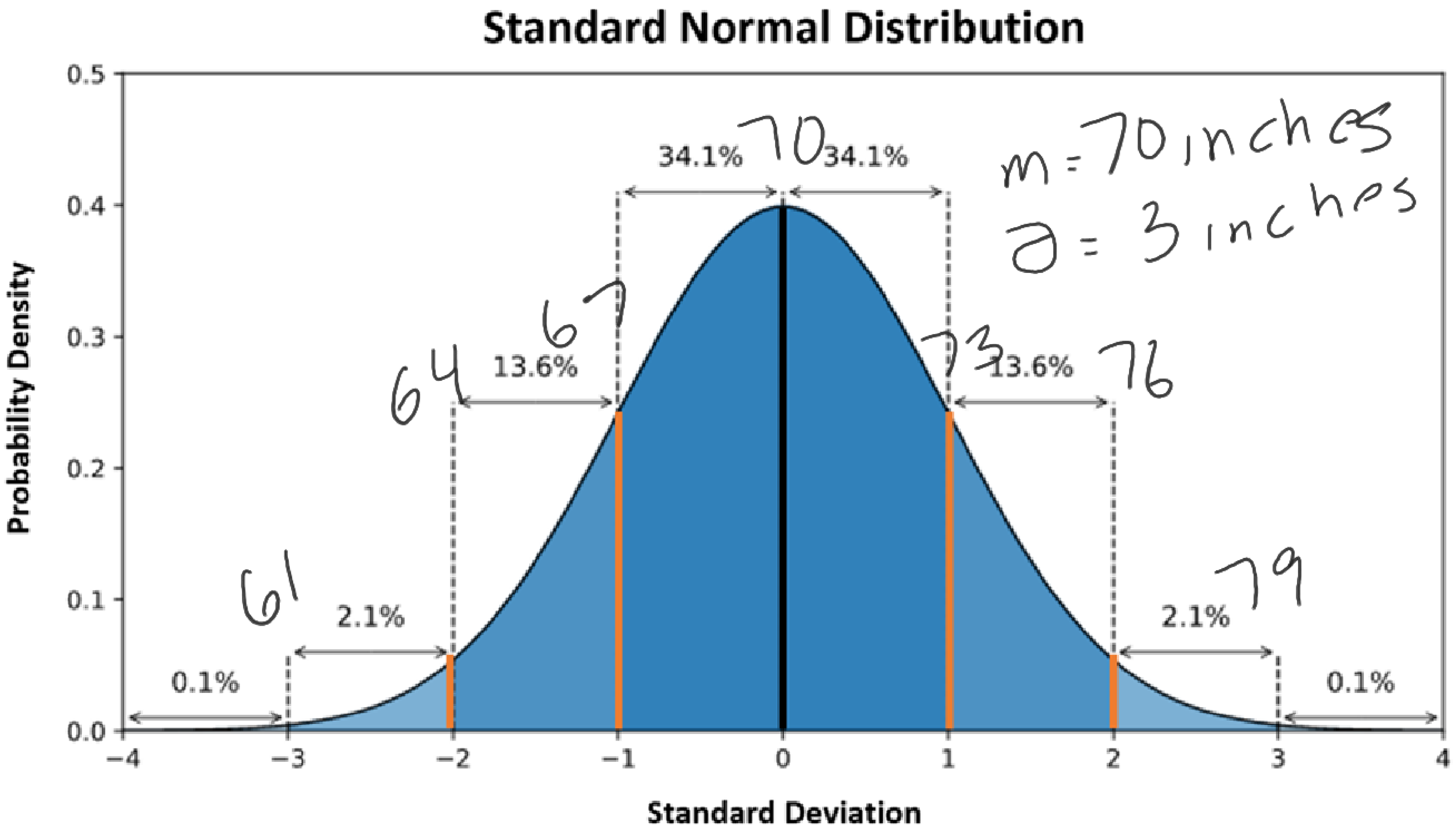

y
x
0.8
0.6
0.4
0.2
-5
-4
-3
-2
-1
o
1
2
3
4
5
Mean: 2
Standard Deviation: 0.5
Mean: 0
Standard Deviation: 1
Mean: -2
Standard Deviation: 2

Empirical Rule

If the distribution of the data is bell-shaped, then

- About 68% of the data should lie within 1 standard deviation of the mean.
- About 95% of the data should lie within 2 standard deviations of the mean.
- About 99.7% of the data should lie within 3 standard deviations of the mean.

PROPERTIES



Standard Normal Distribution
m = 70 inches
σ = 3 inches
Probability Density
0.5
0.4
0.3
0.2
0.1
0.0
34.1%
34.1%
13.6%
13.6%
2.1%
2.1%
0.1%
0.1%
70
67
73
64
76
61
79
−4
−3
−2
−1
0
1
2
3
4
Standard Deviation