

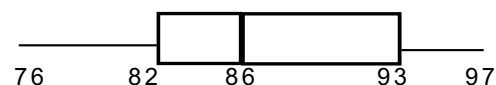
1. Given the data: 5.7 3.2 4.6 5.5 6.3 4.6 5.9 6.6 6.2 6.4
 - a. Find the mean.
 - b. Find the median.
 - c. Find the mode.
 - d. Find the range.
 - e. Estimate the standard deviation.
2. For this data (*lifespans, in years, of eighteen tortoises of species "G"*):

138	142	144	138	99	114	162	134	94
110	148	138	148	149	145	169	140	136

 - a. Draw a stem-and-leaf diagram for the data, using classes as indicated in part b.
 - b. Classify the data, using intervals of width 10, in such a way that 99.5 will be one of the boundaries.
 - c. Draw the histogram for the classified data.
 - d. Find the median using the raw data. Optional: Use the histogram to estimate the median.
 - e. Find the mean of the raw data
 - f. Find the interquartile range.
 - g. Draw a *box plot* of the data.
3. Give an example of two sets of data with the same mean but different standard deviations.
 Given the data: 25 27 28 32 has mean 28 and standard deviation ≈ 8.67 , find data with a mean of 13 and the same standard deviation.
4.
 - a. If every value in a set of data is tripled, how are the mean and standard deviation affected?
 - b. If ten is added to every value in a set of data, how are the mean and standard deviation affected?
 - c. If every value in a set of data is doubled, then decreased by five, how are the mean and standard deviation affected?
 - d. If the mean and the standard deviation of a set of "x" data are 42 and 10 respectively, what are the mean and standard deviation of the new "y" data obtained by letting each y be $(x - 42)/10$ for each x value?
5. State whether each of the following situations is possible, and, if so, give an example.
 Can a standard deviation of a set of data be: a. zero? b. negative? c. larger than the mean of the data?
6.
 - a. Give an example of data where the median is better than the mean to represent "typical value" of a population.
 - b. Give an example of a situation where we might be more interested in the mode than in the median or mean.
7. On a test, Mr Jones' class of 30 averaged 70, & Ms. Smith's 20 students averaged 75. Find the combined mean.
8. Two hundred kindergartners were asked their favorite color. Eighty responded "red"; fifty "green"; forty "blue"; six "yellow"; and twenty-four named other colors. Display these results in a pie chart.
9. In the following pictograph, each \triangle stands for 1000 housing units. According to the graph, how many housing units are: a. included in the data? b. under ten years old? c. Estimate the median age of the housing units.

Age (yrs)	Number of houses
0 - 9	$\triangle\triangle\triangle\triangle\triangle\triangle\triangle\triangle\triangle\triangle\triangle\triangle\triangle\triangle$
10-19	$\triangle\triangle\triangle\triangle\triangle\triangle\triangle\triangle\triangle\triangle\triangle\triangle$
20-49	$\triangle\triangle\triangle\triangle\triangle\triangle\triangle$
50+	$\triangle\triangle\triangle$

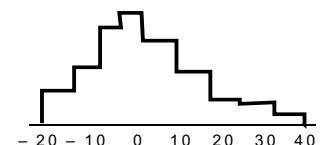
Scores of 250 students in BMGUSD on the NMSAT



10. Using the box plot above right, find the range, *and* the interquartile range.
 How many of the BMGUSD students scored between 82 and 93 on the NMSAT?
11. Jonathon earned 85 points on the first two tests, and 68 on the third. What score does he need on the upcoming fourth test so that his average on the tests will be at least a B (80 and above)? Should he study his head off, in an effort to earn an A?

Susan has an average of 86 for her first three tests. With a score of 100 on the fourth test, what will her average be?

12. The distribution at right appears as though it could have a standard deviation closest to: a. -20 b. 0 c. 20 d. 40 e. 60



1. a. 5.5 b. 5.8 c. 4.6 d. 3.4 e. $\sigma \approx 1.05$, $s = \{(2.3^2 + .9^2 + \dots + 1.1^2)/9\}^{1/2} \approx 1.11$

2a. Lifespans of 18 species G tortoises

16	29
15	
14	0245889
13	46888
12	
11	04
10	9
9	49

Legend:
9 | 49 represents
94 yrs & 99 yrs.

2b. 18 tortoises of species G

Lifespan (yrs.)	f
89.5 - 99.5	2
99.5 - 109.5	0
109.5 - 119.5	2
119.5 - 129.5	0
129.5 - 139.5	5
139.5 - 149.5	7
149.5 - 159.5	0
159.5 - 169.5	2

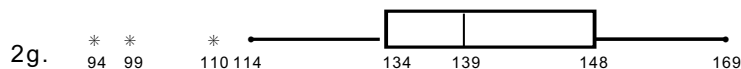
2d. Median from the raw data: 139 (average 138 & 140)

2e. raw: $(94 + 99 + 110 + 114 + \dots + 169)/18 = 2448/18 = 136$
(Estimated from histogram would be...
 $(94.5 \times 2 + 104.5 \times 0 + 114.5 \times 2 + \dots + 164.5 \times 2)/18 \approx 135.1$
The small difference is due to the inaccuracies introduced by classifying the data (essentially replacing actual values by the mid-values for each class.)

2f. $IQR = Q_3 - Q_1 = 148 - 134 = 14$

$1\frac{1}{2} IQRs = 21 \quad 134 - 21 = 113 \quad \dots$ making 94, 99 & 110 all outliers.

Lifespans of 18 G tortoises, in years:



3. Data set: 10, 20, 30 has mean 20, $\sigma \approx 2.6$ ($s \approx 3.1$). Data set: 19, 20, 21 has mean 20, $\sigma \approx .8$ ($s = 1$).
Data set: 10, 12, 13, 17 will have mean 13 (15 less than 28) and standard deviation unchanged!

4. a. Values & distances are tripled—so mean and s are both tripled.

b. Values increase, distances do not. Std Dev is unchanged, mean increases by ten.

c. Mean is doubled, less five; s doubles. d. 0 & 1.

5. a. Yes. {4, 4, 4, 4, 4} b. No. ($\sqrt{\geq 0}$) c. Yes, they are independent {-20, 0, 20}

6a. The median is a better indicator of a "typical" value when some extremely high or extremely low values are involved; for instance, in a class of twenty students, most receive an allowance between \$1 and \$5 per week, but one child receives \$150/week—that one high value would raise the mean from somewhere between \$1 and \$5 to between \$8 and \$12, yet only one child receives over \$5. (More discussion: see bottom of page S4.)

6b. I am going to manufacture hats in one size only. I want to choose the size that will fit the greatest number of women. Suppose, for example, 45% of women wear size "S", 30% "M", 20% "L", and 5% "XL". By manufacturing size "S", my hats will fit 45% of women. If S is 18", M is 19", L is 21" and XL is 23", the median is 19" (M) and the mean is 19.15" (M)—size M hats would fit only 30%. (In reality, I'd make 19" hats, labeled "S"!)

7. 72. (How: $(30 \times 70 + 20 \times 75)/50$. Note the result is 2/5 of the way between 70 and 75.)

8. See right.

(e.g. Red: $80/200 = 40\%$ 40% of $360^\circ = 144^\circ$)

9. a. $(17 + 13 + 8 + 3) \times 1000$ housing units
= 41000 housing units.

b. 17000 units are under 10 years old.

c. The median age is about $(4/13)$ of the way from 10 to 19... which is about 13 years old.

10. Range = $97 - 76 = 21$ IQR = $93 - 82 = 11$
Percentage within middle two quartiles = 50%

11. Jonathon needs $4 \times 80 = 320$ pts total.
He already has 238, so he needs 82 (or better).
For an A, he needs $4 \times 90 = 360$ pts total.

$360 - 238 = 122$ pts. Not possible.

Susan's new average will be $(100 + (3 \times 86))/4 = 89.5$
(Susan needs extra bonus pts. to get an A.)

12. 20 is the best answer. 40 is a little too high. a, b, e are impossible!

2c. Lifespans of 18 tortoises of species G

