PRIVATE TUTORING SAT MATH
SAMPLE TUTORING SLIDE SESSION

Crash Course on SAT Mathematics Statistics

-> These slides are an example of what I write on Google Jamboard during a session.

-> Jamboard slides are screenshared during virtual session on Microsoft Teams or Google Meet.

-> Slides will then be emailed to the student as a PDF after the end of a session.

-> Purpose is to promote active learning and organization to high school students.

Statistics Calculator Shortcut

STAT EDIT CALC

Questions 37 and 38 refer to the following information.

Score Frequencies

Score	GroupA	GroupB
2	1	0
3	1	0
4	2	0
5	1	4
6	3	2
7	0	0
8	0	2
9	1	1
10	0	2
total	9	11

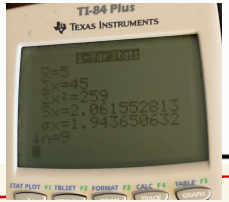
For a certain computer game, individuals receive an integer score that ranges from 2 through 10. The table below shows the frequency distribution of the scores of the 9 players in group A and the 11 players in group B.

37

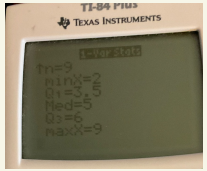
The median of the scores for group B is how much greater than the median of the scores for group A?

38

The mean of the scores for group A is 5, and the mean of the scores for group B is 7. What is the mean of the scores for the 20 players in groups A and B combined?



1



7

You get this as your result

$\bar{X}$ = mean Sx = Sample Standard Deviation

σx = population Standard Deviation

minX = minimum Med = Median maxX = Max number

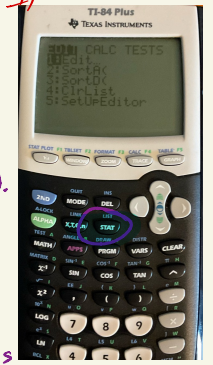
Median of Score A is 5. Do the same thing again to find Score B, except replace all L_2 scores for Score B scores. To empty L_2 column, go up to L_2 and click clear button. Then type B score values. Do same steps again.

Score B median is 6.

6 − 5 = 1.

For question 37, rather arranging the numbers from least to greatest to find the median, let's do a Calculator shortcut.

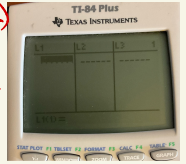
1)



- On Calculator, click the STAT key (circled in picture 1). You should get a screen like in picture 1.
- Next, make sure you are on Choice 1 Edit. Click enter.

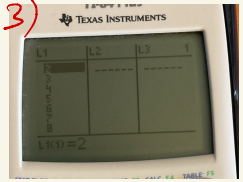
You should now have picture 2 on your screen →

2)



Enter Score data values from question #37 into L1 column. To enter more values, type a number, click enter, and then it takes you to another row.

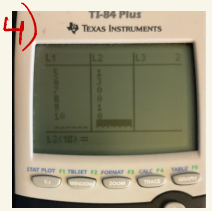
3)



After putting the score data values, scroll all the way up, and then move to L_2 column.

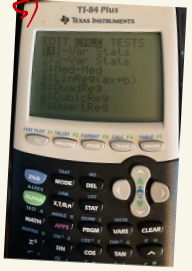
Put data values for Group A into L_2. DO NOT INCLUDE TOTAL Value

4)



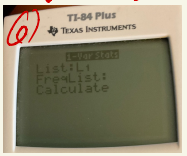
Next click the Stat key again to get picture 1 screen again. Using the right arrow key on Calculator, move to the CALC Section on the screen.

5)



You get this screen. Click Enter for 1: 1-Var STATS

6)



You now get picture 6. Scroll to Freqlist. Click 2nd key and then the number 2 key. You then get L_2 on the Freqlist. Scroll to Calculate and Click enter!

Questions 37 and 38 refer to the following information.

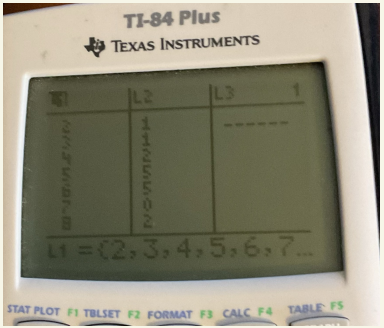
Score Frequencies

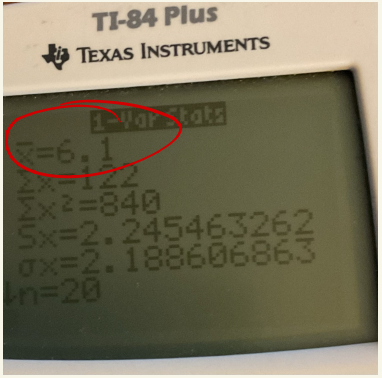
Score	GroupA	GroupB
2	1	0
3	1	0
4	2	0
5	1	4
6	3	2
7	0	0
8	0	2
9	1	1
10	0	2
total	9	11

For a certain computer game, individuals receive an integer score that ranges from 2 through 10. The table below shows the frequency distribution of the scores of the 9 players in group A and the 11 players in group B.

38

The mean of the scores for group A is 5, and the mean of the scores for group B is 7. What is the mean of the scores for the 20 players in groups A and B combined?





For Question 38, Let's use STAT Edit Calculator Strategy again!

This time we want combine A & B scores to find combine score median. On the paper let's make a combine total column.

Score Frequencies

Score	GroupA	GroupB	Combine Total
2	1	0	1
3	1	0	1
4	2	0	2
5	1	4	5
6	3	2	5
7	0	0	6
8	0	2	2
9	1	1	2
10	0	2	2
total	9	11	20

Using Same Steps as #37, do Stat Edit, L_1 should be score value, L_2 should be combine total values. DO NOT INCLUDE the values circled in blue.

Do same steps to find the mean.

$\bar{X} = 6.1$

Mean for combine Scores is 6.1

Intro to Stats

1) Terminology
2) Box Plots

3) Correlation vs Causation → has no math

4) Calculator.

Mean → average

Mean = $\frac{\text{Sum of data set}}{\text{total numbers in set}}$

33

17.1

	Weights (pounds)					
Arun	1.6	1.5	4.3	3.5	1.5	1.4
Carolina	x	3.5	1.4	1.9	4.0	1.6

Arun and Carolina each collected six bags of recyclables, and the weights of the bags are shown in the table above. The mean weight of the bags Carolina collected is 0.3 pounds more than the mean of the weights of the bags Arun collected. What is the value of x?

$x = 3.2$

5, 6, 7, 8, 24

mean

$\frac{5+6+7+8+24}{5} = 10$

mean = 2.3

mean = 2.6

+0.3

add up

$2.6 = \frac{x+3.5+1.4+1.9+4+1.6}{6}$

$2.6 = \frac{x+12.4}{6}$

multiply both sides by 6.

$15.6 = x + 12.4$

mode → the number that appears most frequently on a data set.

mode "think of most"

ex: 2, 3, 3, 5, 7 mode: 3

ex: 2, 3, 3, 4, 4, 5, 7 mode(s): 3 & 4

ex: 2, 3, 3, 4, 4, 4, 5, 7 mode: 4

median – it is the middle # in an organized set (from least to greatest).

ex: 5, 9, 7

↓

5, 7, 9

Small set

Arrange numbers from least to greatest

Odd set (odd amount of numbers)

5, 6, 7, 8, 9, 11, 13 median 8

even set of numbers

5, 6, 7, 8, 9, 10, 11, 13

take average of 2 numbers

$\frac{8+9}{2} = 8.5$

median: 8.5

ex: Let's say we have 49 numbers in set

Odd set of numbers

$$\frac{\text{total numbers in set} + 1}{2} = \text{median position of list}$$

$$\frac{49+1}{2} = 25 \rightarrow \text{25th number in a set is the median}$$

Odd set (odd amount of numbers)

~~5, 6, 7,~~ 8 ~~9, 11, 13~~

$\frac{7+1}{2} = 4$th number of set

50 numbers in set

50 numbers in set even set

$\frac{50+1}{2} = 25.5$ → median is in between 24th & 25th number.

take average of 24th & 25th number → median.

2

1, 15, 7, 6, G, 3, 8

In the data set shown, G is an integer. If the median of the data set is 6 and $G > 3$, what is a possible value of G?

↑ cannot put 3

1) Organize list

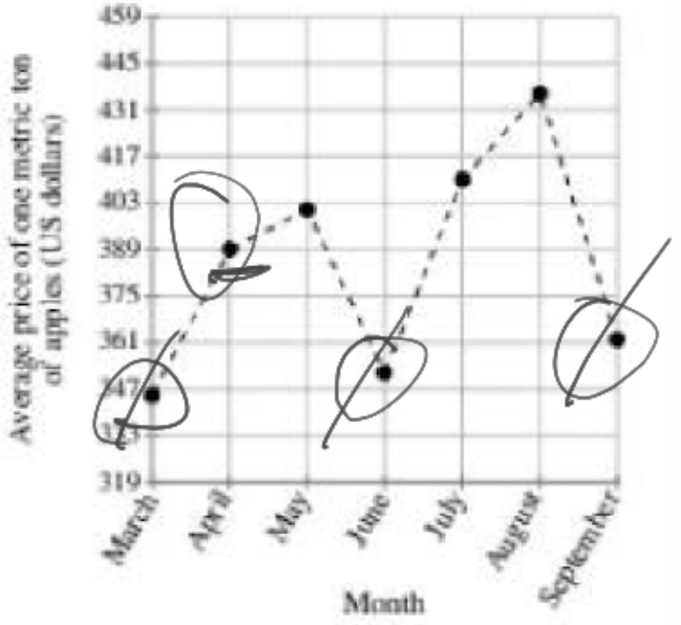
1, 3, G, 6, 7, 8, 15

=

4, 5, 6

4

12 17.1



The line graph above shows the average price of one metric ton of apples, in dollars, for each of seven months in 1989.

Which of the following is closest to the median price, in dollars, of the seven recorded prices of one metric ton of apples?

A) 352

B) 362

C) 389

D) 401

347, 389, 403, 350, 411, 437, 361

Organize it

347, 350, 361, 389, 403, 411, 437.

$\frac{7+1}{2}$ = 4th number in set is median

data is organized

Range = max # in set − min # in set

ex: 2, 3, 5, 6, 7 (2 ↑ min, 7 ↑ max) range: $7 - 2 = 5$

ex: 9, 5, 6, 4, 3, 11 (3 ↑ min, 11 ↑ max) range: $11 - 3 = 8$

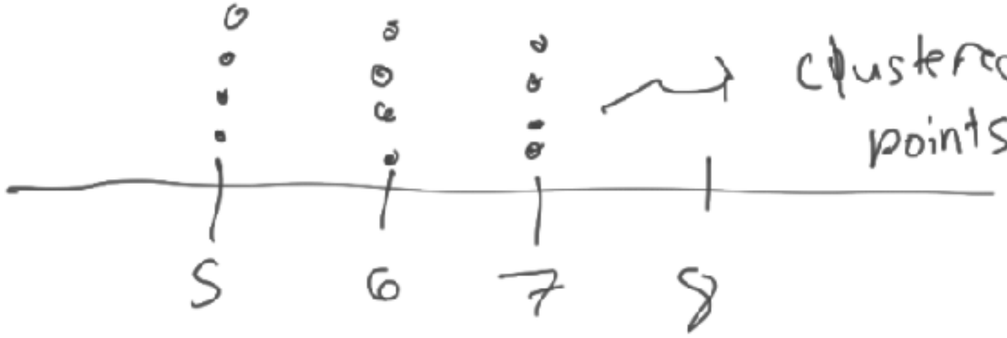
Standard deviation

- a measure of how closely clustered the values in data set are (how close to the mean of the data most of the values are).

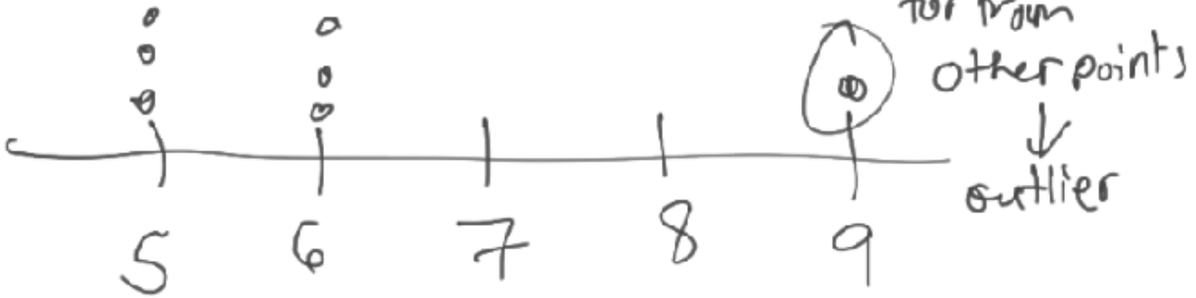
Tightly clustered points ⟶ low standard dev

Points very spread out → large standard dev

dev = deviation



clustered points → low standard deviation



points are spread

high standard deviation

Variance = Standard deviation

9

17.2

Data set A	12,550	35,790	124,360	250,280	420,510	520,300
Data set B	12,360	24,540	25,220	51,000	78,650	92,330

Which of the following is true about the standard deviations of the two data sets in the table above?

A) The standard deviation of data set A is equal to the standard deviation of data set B.

B) The standard deviation of data set A is larger than the standard deviation of data set B.

C) The standard deviation of data set B is larger than the standard deviation of data set A.

D) There is not enough information available to compare the standard deviations of the two data sets.

26

17.2

Two independent surveys asked random samples of 200 bowlers about the time they spend bowling each day. The results of the surveys are detailed in the table below.

Daily Bowling Time

Survey	Mean (hours)	Standard deviation (hours)
A	3.6	0.5
B	3.2	0.5

Which statement is true based on the results of these surveys?

A) There is greater variation in the distribution of the times people bowl in Survey A.

B) There is greater variation in the distribution of the times people bowl in Survey B.

C) The variation in the distribution of the times people bowl is the same in both surveys.

D) It is impossible to determine the variations in the distribution of the times people bowl because the means are different.

List A	List B
20	30
30	40
40	40
50	50
60	50
70	60

The table above shows two lists of numbers. Which of the following is a true statement comparing list A and list B?

A) The means are the same, and the standard deviations are different.

B) The means are the same, and the standard deviations are the same.

C) The means are different, and the standard deviations are different.

D) The means are different, and the standard deviations are the same.

list A mean: 45

↓

average.

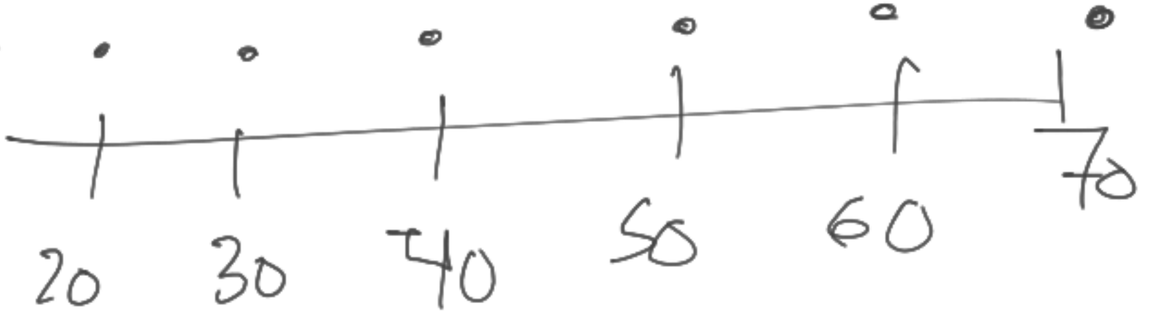
list B mean: 45

repeated numbers

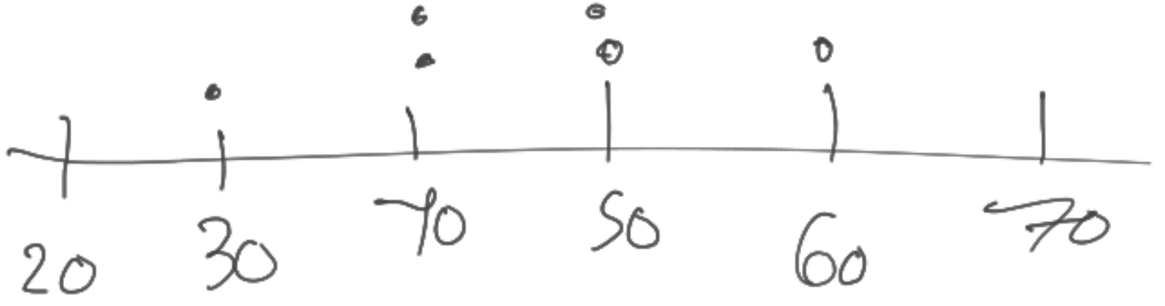
↓

low standard dev

List A:



List B:



6 1600.3o 17.1

Heights of Cacti (in meters)				
4	4	5	5	5
6	6	7	7	7
7	8	8	9	15

The table above lists the heights, to the nearest meter, of a random sample of saguaro cacti. The outlier measurement of 15 meters is an error. Of the mean, median, and range of the values listed, which will change the most if the 15-meter measurement is removed from the data?

a) median

b) mean 6.9 & 5.9

c) range 11 & 5

d) They will all change by the same amount

$$5x+3y-z=15$$
$$-x+2y+3z=10$$
$$3x-4y+3z=8$$

two of three equations have $3z$.

$$[5x+3y-z=15]\,3$$
$$-x+2y+3z=10$$

$$5x+9y-3z=45$$

$$5x+3y-z=15$$
$$3x-4y+3z=8$$

Margin of Error

large sample size $\rightleftharpoons$ small margin of error

small sample size $\rightleftharpoons$ large margin of error

39 1600.Jo ? 17.4

Sample	Percent in favor	Margin of Error
A	68%	3.5%
B	61%	1.2%

The results of two random samples of votes for a new shirt design are shown above. The samples were selected from the same population, and the margins of error were calculated using the same method. Which of the following is the most appropriate reason that the margin of error for sample A is greater than the margin of error for sample B?

A) Sample A had a larger sample size.

B) Sample A had a smaller sample size.

C) Sample A had a higher percentage of favorable responses.

D) Sample A has a smaller number of votes that could not be recorded.

large margin error ↓ Small Sample size

13% of a survey like rock music, there is 3% margin of error.

13% + 3% = 16%

13% − 3% = 10%

answer in interval between 10% to 16%

adding & subtracting margin of error to original percentage.

Doubtful answers

Key words

- likely
- maybe
- Plausible

35

A researcher surveyed a random sample of retirees from a large retirement home about how often they see their grandchildren. Using the sample data, the researcher estimated that 14% of the retirees in the population saw their grandchildren at least once per year. The margin of error for this estimation is 3%. Which of the following is the most appropriate conclusion about all retirees at the retirement home, based on the given estimate and margin of error?

14+3

14−3

11% to 17%.

A) At least 14% but no more than 17% of the retirees see their grandchildren at least once per year.

B) The researcher is between 11% and 17% sure that most retirees see their grandchildren at least once per year.

C) It is unlikely that less than 14% of the retirees see their grandchildren at least once per year.

D) It is plausible that the percentage of retirees who see their grandchildren at least once per year is between 11% and 17%.

Sample	Percent in favor	Margin of error
A	52%	4.2%
B	48%	1.6%

The results of two random samples of votes for a proposition are shown above. The samples were selected from the same population, and the margins of error were calculated using the same method. Which of the following is the most appropriate reason that the margin of error for sample A is greater than the margin of error for sample B?

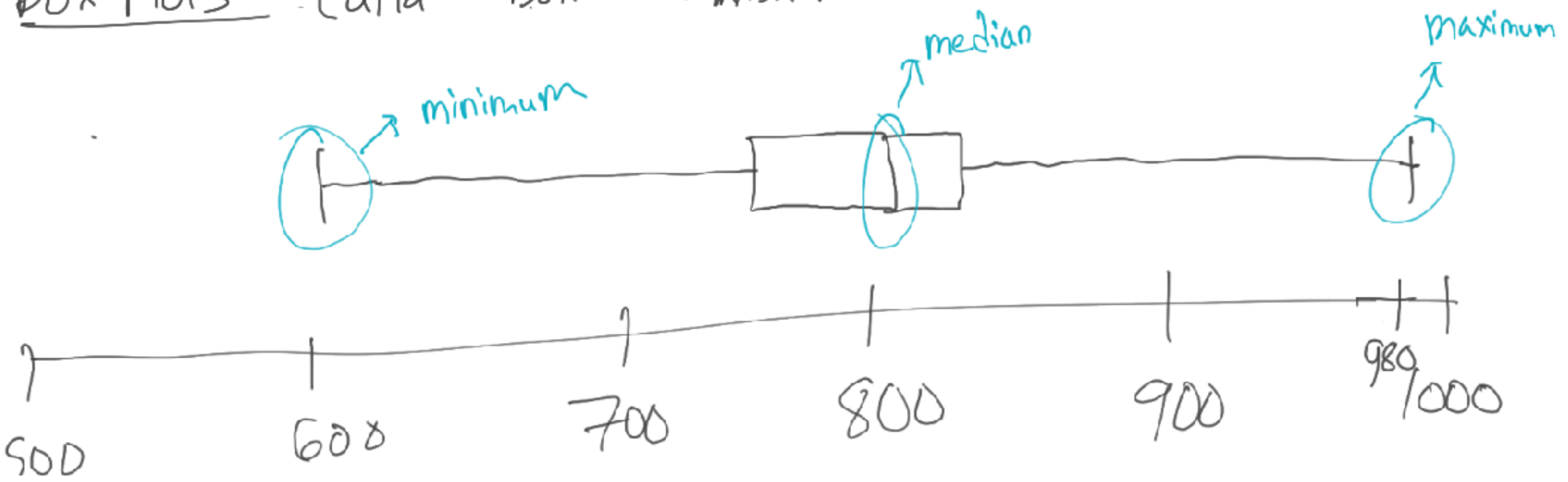
A) Sample A had a smaller number of votes that could not be recorded.

B) Sample A had a higher percent of favorable responses.

C) Sample A had a larger sample size.

D) Sample A had a smaller sample size

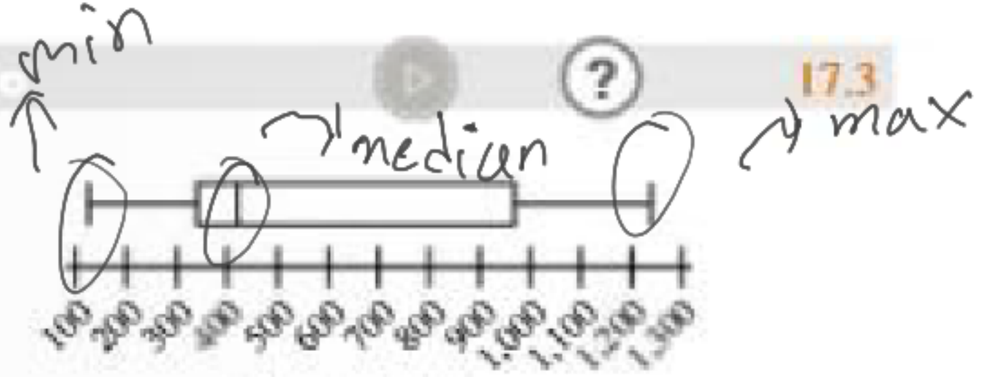
Box Plots (aka Box & Whisker Plots)



What is min? ~600 What is max: ~ 980

What is median ~ 800 What is range: 380

38



Bowling Alleys

The number of bowling alleys in 20 states in America is summarized in the box plot above. Which of the following is closest to the median number of bowling alleys?

A) 341

B) 420

C) 968

D) 1,239

Population & Correlation ≠ Causation

→ doubful answers → Never choose direct statements

→ never choose answer choices that say the word "cause"

Key words

plausible

likely / unlikely

bias

random

Causation ≠ Correlation

5 1600.lo 17.4

In order to determine if treatment A is successful in improving hearing, a research study was conducted. From a large population of people with poor hearing, 500 participants were selected at random. Half of the participants were randomly assigned to receive treatment A, and the other half did not receive treatment A. The resulting data showed that participants who received treatment A had significantly improved hearing as compared to those who did not receive treatment A. Based on the design and results of the study, which of the following is an appropriate conclusion?

A) Treatment A is likely to improve the hearing of people who have poor hearing.

B) Treatment A improves hearing better than all other available treatments.

C) Treatment A will improve the hearing of anyone who takes it.

D) Treatment A will cause a substantial improvement in hearing.

too confident

8 1600.lo 17.4

The members of a state senate wanted to assess the opinions of all state residents about renovating the truck stops on the state highways. The senate surveyed a sample of 2,800 state residents who drive trucks. The survey showed that the majority of those sampled were in favor of the renovations. Which of the following is true about the state senate's survey?

A) The survey sample should have included more residents who drive trucks.

B) The survey sample should have consisted entirely of residents who do not drive trucks.

C) The survey sample is biased because it is not representative of all state residents.

D) It shows the majority of state residents are in favor of the truck stop renovations.

42 17.4

A pollster recently surveyed 3,000 people who were selected at random from a large country and asked each of the adults, "Are you satisfied with the quality of health care in the country?" Of those surveyed, 56 percent responded that they were satisfied with the quality of health care in the country. Based on the results of the survey, which of the following statements must be true?

I. Of all adults in the country, 56 percent are satisfied with the quality of health care in the country.

II. If 3,000 adults selected at random from a different country were surveyed, 56 percent of them would report they are satisfied with the quality of health care in the country.

III. If another 3,000 adults selected at random from the country were surveyed, 56 percent of them would report they are satisfied with the quality of health care in the country.

A) None
B) II only
C) I and II only
D) I and III only

not representing whole country.

one stat result does not mean same stat result from another source.

15 17.4

A sample of 50 accountants was selected at random from a certain company. The 50 accountants completed a survey about the break room, and 13 thought the break room had good snacks. Which of the following is the largest population to which the results of the survey can be applied?

A) The 50 employees who were surveyed
B) All accountants at the company
C) All employees at the company
D) All accountants in the country in which the company is located

what is the pt of sure?

17 1600.io 17.4

Near the end of a livestreamed makeup tutorial, the influencer invited viewers to respond to a poll on social media that asked,"Do you think I should review more lipstick on my channel?" At the end of the livestream, the influencer reported that 34% responded "Yes," and 60% responded "No." Which of the following best explains why the results are unlikely to represent the sentiments of the population of the United States?

A) The influencer did not allow viewers enough time to respond to the poll.

B) The percentages do not add up to 100%, so any possible conclusions from the poll are invalid.

C) There were not 50% "Yes" responses and 50% "No" responses.

D) Those who responded to the poll were not a random sample of the population of the United States.

31 1600.io 17.4

Two hundred 1600.io members will be selected to participate in a survey about selecting a new item for the online store. Which of the following methods of choosing the 200 members would result in a random sample of members of the site?

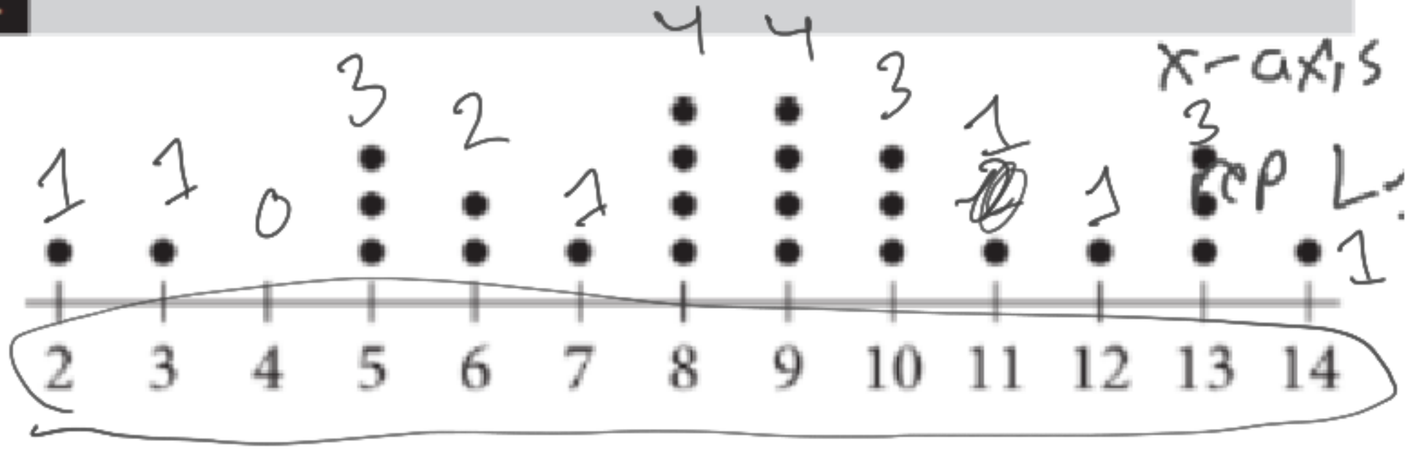
A) Obtain a numbered list of all 1600.io members. Use a random number generator to select 200 members from the list. Give the survey to those 200 members.

B) Obtain a list of all 1600.io members sorted alphabetically. Give the survey to the last 200 members on the list.

C) Tell all 1600.io members that volunteers are needed to take the survey. Give the survey to the first 200 members who volunteer.

D) Obtain a list of all 1600.io members who are attending a live event online. Give the survey to the first 200 members on the list.

31



What is the median of the 25 data values represented in the dot plot above?

median 9

x-axis

STAT

Edit

L_1	L_2	L_3
2	1	
3	1	
4	0	
↓	3	
14		

1: 1-Var Stats

List: L_1 ⟶ 2nd 1

Freqlist: L_2 2ND 2

Calculator Terminology

$\overline{x}$ = mean or average

Sx = standard deviation

n = total numbers in set

$\min X$ = minimum

med = median

$\max X$ = maximum.

Class size	Frequency
21	10
22	13
23	30
24	36
25	20

The table shows the distribution of class sizes for the 109 classes of a high school. What is the median class size at the high school?

24

L_1 $2L_2$

Frequency

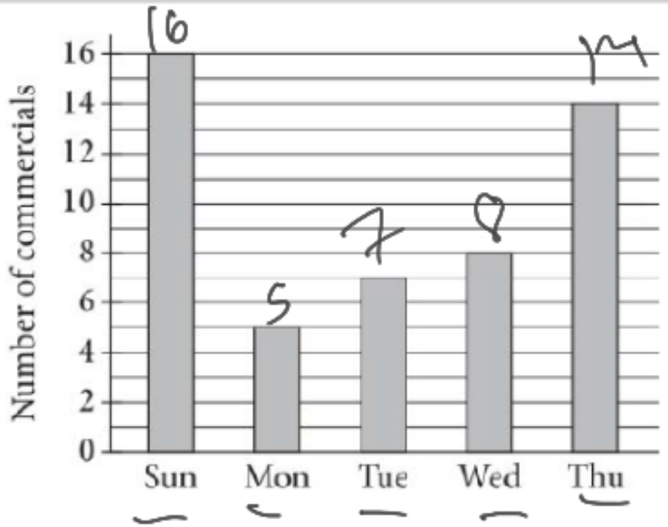
10, 21s

→ highest frequency is your mode

24 is also your mode.

Important to know when to use just L_1 or L_1 & L_2.

19



The bar graph shows the number of commercials Albert saw each day that he watched television last week. For these five days, how much greater is the mean number of commercials per day than the median number of commercials per day?

answer Choices

A) 2
B) 3
C) 5
D) 6

L1

16
5
7
8
14

$\bar{x} = 10$

med = 8

10 − 8 = 2

List A	List B
20	30
30	40
40	40
50	50
60	50
70	60

The table above shows two lists of numbers. Which of the following is a true statement comparing list A and list B? → L1

A) The means are the same, and the standard deviations are different.

B) The means are the same, and the standard deviations are the same.

C) The means are different, and the standard deviations are different.

D) The means are different, and the standard deviations are the same.

A

$\bar{x} = 45$

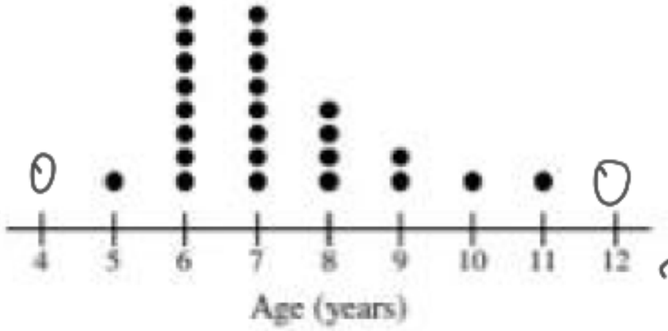
$S_x = 19.7\ldots$

B

$\bar{x} = 45$

$S_x = 10.48$

Age of 25 Bowlers When They Began Bowling



The dot plot above gives the ages, in years, at which 25 bowlers began bowling. Which of the following is true about the mean and median of the data?

A) The mean is less than the median.

B) The mean is greater than the median.

C) The mean is equal to the median.

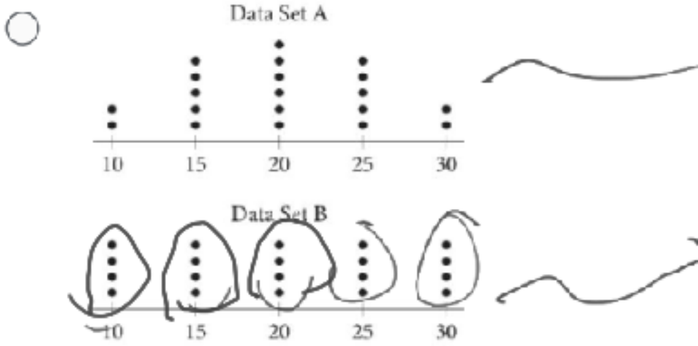
D) The relationship between the mean and the median cannot be determined from the dot plot.

L1	L2
4	0
5	1
6	8
7	8
8	4
9	2
10	1
11	1
12	0

$\bar{x} = 7.2$

med = 7

freqlist: L2



The dot plots shown each represent a data set. Which of the following statements best compares the means and the standard deviations of the two data sets?

A) The means are equal; the standard deviation of data set A is less than the standard deviation of data set B.

B) The means are equal; the standard deviation of data set A is greater than the standard deviation of data set B.

C) The standard deviations are equal; the mean of data set A is less than the mean of data set B.

D) The standard deviations are equal; the mean of data set A is greater than the mean of data set B.

Ages of 200 People Enrolled in a Hot Yoga Studio

Age	Frequency
18	34
19	21
23	37
25	38
30	46
45	24

mode: 30

median. 25

mean. 26.36

The table above shows the distribution of ages of the 200 people enrolled in a hot yoga studio. Which of the following gives the correct order of the mean, median and mode of the ages?

A) mode < mean < median

B) median < mode < mean

C) median < mean < mode

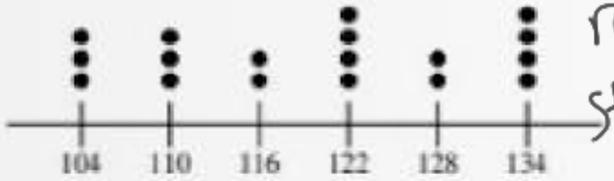
D) mean < median < mode

The 18 students in a baking class conducted an experiment in which they each recorded their blood sugar levels, in mg/dL, before and after eating a slice of cake. The dot plots below display the results.

Blood sugar level, in mg/dL, before eating

range 30

Standard dev 6.65



Blood sugar level, in mg/dL, after eating

range 30

standard dev 6.91

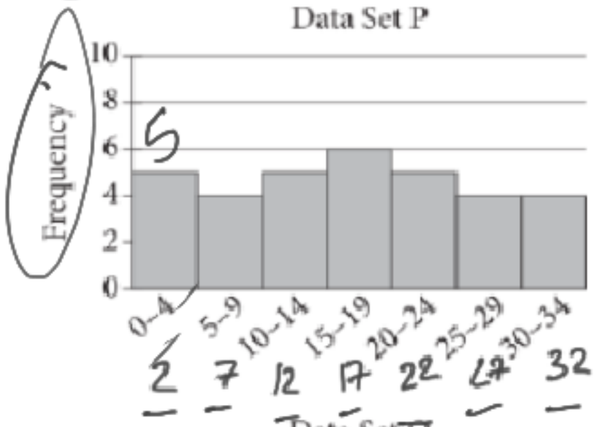
Let s_1 and r_1 be the standard deviation and range, respectively, of the data before eating, and let s_2 and r_2 be the standard deviation and range, respectively, of the data after eating. Which of the following is true?

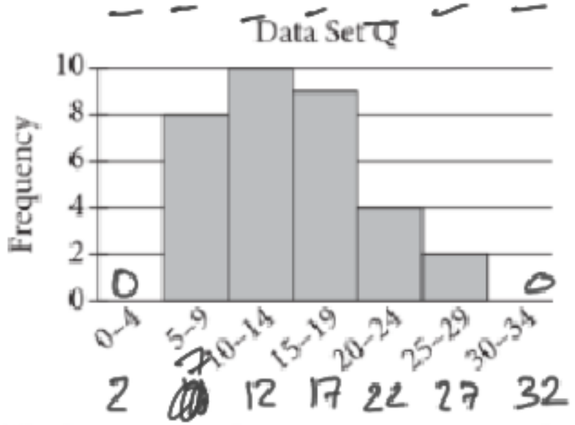
A) $s_1 \neq s_2$ and $r_1 = r_2$

B) $s_1 > s_2$ and $r_1 > r_2$

C) $s_1 = s_2$ and $r_1 < r_2$

D) $s_1 < s_2$ and $r_1 > r_2$





The histograms shown summarize two data sets, P and Q. Which of the following statements best compares the ranges and standard deviations of the two data sets?

A) Data set P has a greater range and a greater standard deviation than data set Q.

B) Data set Q has a greater range and a greater standard deviation than data set P.

C) Data set P has a greater range but a smaller standard deviation than data set Q.

D) Data set Q has a greater range but a smaller standard deviation than data set P.

L1	L2 (frequency)
2	5
7	4
12	5
17	6
22	5
27	4
32	4

x-axis is your L1

range: 30

standard: 9.99...

L1	L2
0	
8	
10	
9	
4	
2	
0	

standard 5.87

range: 20