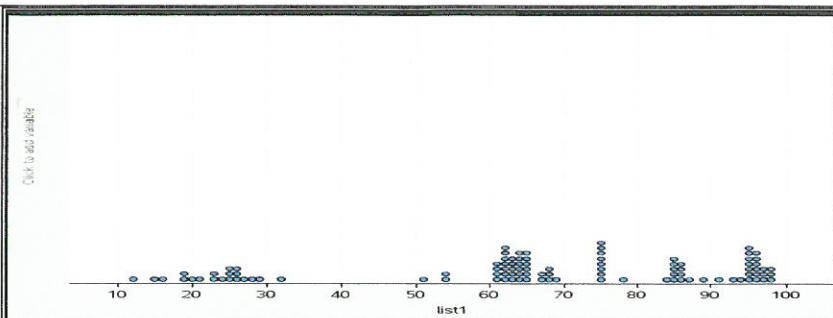


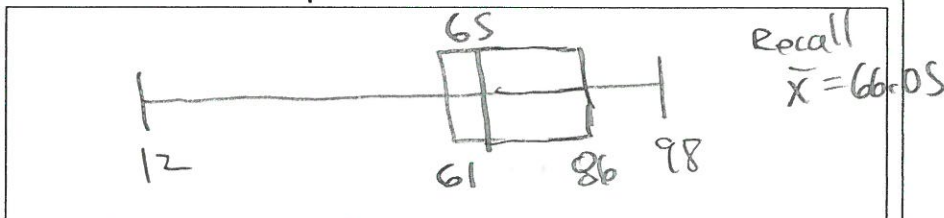
ALL data on this side of this piece of paper is related! Use the rounding rule based on the given data (hint read carefully)

Note original data was given to the nearest integer

" \bar{x} "	66.05
" Σx "	6605.
" Σx^2 "	499325.
" $s_x := s_{n-1} x$ "	25.239209115336
" $\sigma_x := \sigma_n x$ "	25.112695992267
"n"	100.
"MinX"	12.
" $Q_1 X$ "	61.
"MedianX"	65.
" $Q_3 X$ "	86.
"MaxX"	98.
"SSX := $\Sigma (x - \bar{x})^2$ "	63064.75



This is the dot plot of the data
Sketch the related box plot



Complete the following statements

This data is positively skewed because $\bar{x} > \text{median}$ DO NOT LET MODE IMPACT THIS DECISION

The usual range of data for this set of data is 15.7 to 116.5 (interval) 100.8 (length) $\bar{x} \pm 2s$

The ACTUAL range of data for this set of data is 12 to 98 (interval) 86 (length) $\text{Max} - \text{Min}$

The IQR for this set of data is 61 to 86 (interval) 25 (length)

The "rule of thumb standard deviation" for this data is 21.5 $\leftarrow \frac{Q_3 - Q_1}{4} = \frac{86 - 61}{4} = 21.5$

$$66.1 \pm 2(25.2) = 66.1 \pm 50.4$$

Variance of this sample using $\frac{\Sigma (x - \bar{x})^2}{n-1}$

$$\frac{\Sigma (x - \bar{x})^2}{n-1} = \frac{63064.75}{100-1} = \frac{63064.75}{99} \approx 637.0$$

Variance of this sample using $\frac{AB-C}{D} = \frac{n \Sigma x^2 - (\Sigma x)^2}{n(n-1)}$

$$\frac{AB-C}{D} = \frac{(100)(499325) - (6605)^2}{100(100-1)} \approx \frac{6306475}{9900} = 637.0$$

Range = $\frac{86}{4} = 21.5$

Standard deviation of this sample using

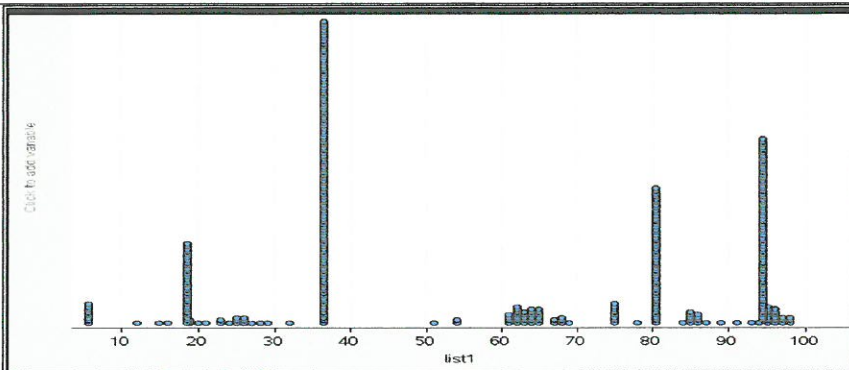
$$\sqrt{\frac{\Sigma (x - \bar{x})^2}{n-1}} = \sqrt{\frac{63064.75}{100-1}} \approx 25.2$$

Standard Deviation of this sample using $\sqrt{\frac{AB-C}{D}}$

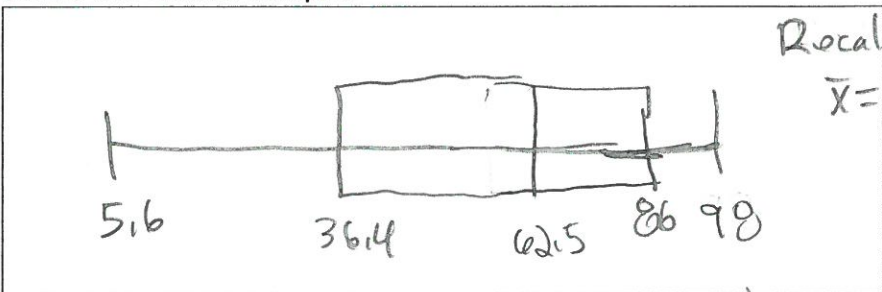
$$\sqrt{\frac{AB-C}{D}} = \sqrt{\frac{(100)(499325) - (6605)^2}{100(100-1)}} \approx 25.2$$

Note original data was given to the nearest tenth

" \bar{x} "	59.023770491803
" Σx "	21602.7
" Σx^2 "	1578671.89
" $s_x := s_{n-1} x$ "	28.840567090957
" $\sigma x := \sigma_n x$ "	28.801140459959
"n"	366.
"MinX"	5.6
" $Q_1 X$ "	36.4
"MedianX"	62.5
" $Q_3 X$ "	86.
"MaxX"	98.
"SSX := $\sum (x - \bar{x})^2$ "	303599.08319671



This is the dot plot of the data
Sketch the related box plot



Complete the following statements

This data is negatively skewed because $\bar{x} < \text{median}$ $59.02 < 2(28.84)$
 $59.02 < 57.68$
DO NOT LET MODE IMPACT THIS DECISION

The usual range of data for this set of data is 1.34 to 116.7 (interval) 115.36 (length)

The ACTUAL range of data for this set of data is 5.6 to 98 (interval) 92.4 (length)

The IQR for this set of data is 36.4 to 86 (interval) 49.6 (length)

The "rule of thumb standard deviation" for this data is 23.1

$$\frac{92.4}{4} = 23.1$$

Variance of this sample using $\frac{\sum (x - \bar{x})^2}{n-1}$

$$\frac{\sum (x - \bar{x})^2}{n-1} = \frac{303599.08}{366-1}$$

$$\approx \frac{303599.08}{365} \approx 831.78$$

Variance of this sample using

$$\frac{AB-C}{D} = \frac{n \sum x^2 - (\sum x)^2}{n(n-1)}$$

$$\frac{AB-C}{D} = \frac{(366)(1578671.89) - (21602.7)^2}{366(366-1)}$$

$$\approx \frac{11117264.45}{133590} \approx 831.78$$

Standard deviation of this sample using

$$\sqrt{\frac{\sum (x - \bar{x})^2}{n-1}} = \sqrt{\frac{303599.08}{366-1}}$$

$$\approx \underline{28.84}$$

Standard Deviation of this sample using $\sqrt{\frac{AB-C}{D}}$

$$\sqrt{\frac{AB-C}{D}} = \sqrt{\frac{(366)(1578671.89) - (21602.7)^2}{366(366-1)}}$$

$$\approx \underline{28.84}$$

Determine the variance and standard deviation of 8.2, 9, 10, 11.25, 13.256 using the two BY HAND methods,

use the round off rule at the END of the computation to report the answers _____

Mean of this sample = 10.3412

Variance of this sample using $\frac{\sum(x-\bar{x})^2}{n-1}$

$$\frac{\sum(x-\bar{x})^2}{n-1} = \frac{15.8219}{5-1}$$

$$\approx \frac{15.8219}{4} =$$

Standard deviation of this sample using

$$\sqrt{\frac{\sum(x-\bar{x})^2}{n-1}} = \sqrt{\frac{15.8219}{4}}$$

$$\approx \sqrt{3.9555}$$

$$\approx 1.9888$$

USE TABLE to show work

(you may not need all cells or columns)

(use of list features is encouraged, but failure to provide BY hand justification will result in drastic reduction in points)

x	x ²	(x- \bar{x}) ²
8.2	67.24	4.58473
9	81	1.79881
10	100	0.11641
11.25	126.5625	0.82591
13.256	175.721536	8.49605
$\sum x$	$\sum x^2$	$\sum (x-\bar{x})^2$
51.706		15.8219
$(\sum x)^2$	550.5240	
2673.5104		

Variance of this sample using

$$\frac{AB-C}{D} = \frac{n\sum x^2 - (\sum x)^2}{n(n-1)}$$

$$\frac{AB-C}{D} = \frac{(5)(2673.5104) - (51.706)^2}{5(4)}$$

$$\approx \frac{2752.62 - 2673.5104}{20} = \frac{79.1096}{20} = 3.9555$$

Standard Deviation of this sample using $\sqrt{\frac{AB-C}{D}}$

$$\sqrt{\frac{AB-C}{D}} = \sqrt{\frac{(5)(2673.5104) - (51.706)^2}{5(5-1)}}$$

$$\approx \sqrt{\frac{79.1096}{20}} = \sqrt{3.9555} \approx 1.9888$$

Define a symmetric set of data and give an thirteen number example of a symmetric set of data
 YOU CAN USE BETWEEN THREE AND FIVE DIFFERENT NUMBERS

7+4

--	--	--	--	--	--	--	--	--	--	--	--	--

Mean of your symmetric list of data = _____ Median of your symmetric list of data = 7+4

Midrange of your symmetric list of data = _____ Mode of your symmetric list of data = _____

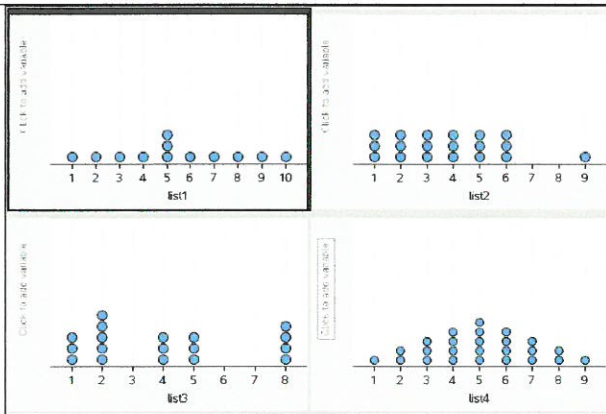
Define a symmetric set of data and give an fourteen number example of a symmetric set of data
 YOU CAN USE BETWEEN THREE AND FIVE DIFFERENT NUMBERS

7+4 8+4

--	--	--	--	--	--	--	--	--	--	--	--	--	--

Mean of your symmetric list of data = _____ Median of your symmetric list of data = $\frac{7+4+8+4}{2}$

Midrange of your symmetric list of data = _____ Mode of your symmetric list of data = _____



List1	List2	List3	List4
1 2 3 4 5 6 7 8 9 10	1 1 2 2 2 3 3 4 4 5 5	1 1 2 2 2 2 2 4 4	1 2 2 3 3 3 4 4 4 5 5 5

Only one of these lists is truly symmetric list 4

A second list follows the mean = median definition list 3

Explain why the other two do NOT have symmetry
mean ≠ median

Mean of list 1	Mean of list 2	Mean of list 3	Mean of list 4
5.416	3.7894	4	5
Median of list 1	Median of list 2	Median of list 3	Median of list 4
5	4	4	5

Percentile and Z scores

Use the given formulas to answer the questions on this study guide

$$Z = \frac{x - \mu}{\sigma} \quad Z = \frac{x - \bar{x}}{s} \quad \text{percentile} = \frac{\text{number of scores below this score}}{n} \cdot 100$$

(round to nearest integer)

$$L = \text{score} = \frac{\text{percentile}}{100} \cdot n \quad (\text{round UP to NEXT HIGHEST integer when a decimal})$$

$$L = \text{score} = \frac{\text{percentile}}{100} \cdot n \quad (\text{when NOT a decimal go to the score and the next score and average})$$

Given that your population mean is 160 and your standard deviation is 3.95, then answer the following questions

1. Complete the following table

$\mu - 3\sigma$	$\mu - 2\sigma$	$\mu - 1\sigma$	μ	$\mu + 1\sigma$	$\mu + 2\sigma$	$\mu + 3\sigma$
148.15	152.1	156.05	160	163.95	167.9	171.85

2. Use the table to answer the following questions

Approximately 68% of the data should lie within 156.05 and 163.95

Approximately 95% of the data should lie within 152.1 and 167.9

Approximately 99.7% of the data should lie within 148.15 and 171.85

Given that your population mean is 160 and your standard deviation is 3.95, then answer the following questions

3. Determine the given z scores related to particular values of x

a. 170 has a z score of 2.53 (round to two decimal places)

b. 167 has a z score of 1.77 (round to two decimal places)

c. 156 has a z score of -1.01 (round to two decimal places)

$$z_{170} = \frac{170 - 160}{3.95} = 2.53$$

$$z_{167} = \frac{167 - 160}{3.95} = 1.77$$

$$z_{156} = \frac{156 - 160}{3.95} = -1.01$$

4. Determine the x scores related to the particular values of z

a. A z score of 2.8 corresponds to an x value of 171.06 round to three decimal places

b. A z score of -2.3 corresponds to an x value of 150.915 round to three decimal places

c. A z score of 0.05 corresponds to an x value of 160.198 round to three decimal places

$$2.8 = \frac{x - 160}{3.95}$$

$$(2.8)(3.95) = x - 160$$

$$11.06 = x - 160$$

$$171.06 = x$$

$$0.05 = \frac{x - 160}{3.95}$$

$$(0.05)(3.95) = x - 160$$

$$0.1975 = x - 160$$

$$0.1975 + 160 = x - 160 + 160$$

$$160.1975 = x$$

$$x = 160.198$$

$$2.3 = \frac{x - 160}{3.95}$$

$$(-2.3)(3.95) = x - 160$$

$$-9.085 = x - 160$$

$$+160.00$$

$$150.915 = x$$

Use the following scores to help answer the following questions

1	2	15	16	18	19	20	24	25	26
27	27	28	29	29	29	29	29	29	29
36	37	38	39	39	39	39	39	41	41
45	45	56	78	95	95	96	96	97	97
97	98	99	99	99	100	101	102	103	104

5. If you scored a score of 96, what percentile did that score fall within?

If you scored a 96, then you are at the 72nd percentile, which means that you scored better than 72% of the scores in the list

$96 \rightarrow \text{rank } 37$
 $\frac{26}{50} \cdot 100 = 72\%$

6. If you scored a score of 29, what percentile did that score fall within?

If you scored a 29, then you are at the 26th percentile, which means that you scored better than 26% of the scores in the list

$29 = \text{rank } 14$
 $\frac{13}{50} \cdot 100 = 26\%$

7. Determine the score at the 60th percentile

The 60th percentile represents the average of 30th & 31st score which has a value of 43

$\frac{60}{100} \cdot 50 = 30 \rightarrow \text{in } 12^{\text{th}} \text{ place}$

$\frac{41 + 45}{2} = \frac{86}{2} = 43$

8. Determine the score at the 83th percentile

The 83th percentile represents the 42nd score which has a value of 98

$\frac{83}{100} \cdot 50 = 41.5$

9. Find P_{52}

P_{52} represents the average of 26th & 27th score which has a value of 39

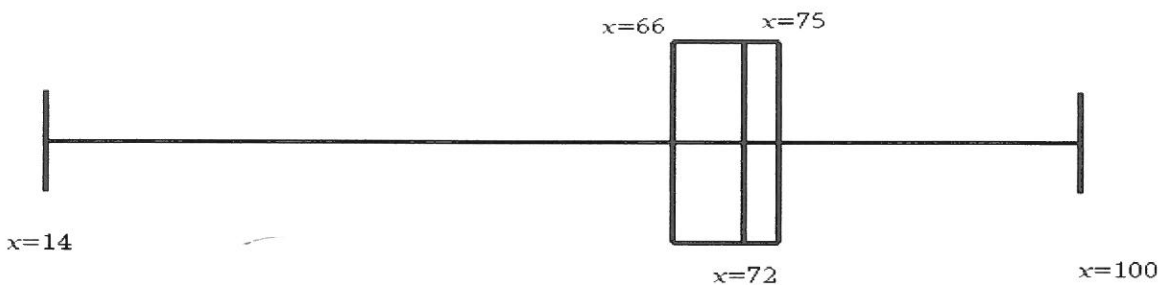
$\frac{52}{100} \cdot 50 = 26 \rightarrow \frac{26^{\text{th}} + 27^{\text{th}}}{2} = \frac{39 + 39}{2} = \frac{78}{2} = 39$

10. Find P_{27}

P_{27} represents the 14th score which has a value of 29

$\frac{27}{100} \cdot 50 = 13.5$

Refer to the given box plot to answer the following



11. Find $P_{25} = 66$ Find $P_{50} = 72$ Find $P_{75} = 75$
 $\hookrightarrow Q1 \text{ score}$ $\hookrightarrow Q3 \text{ score}$

The average height of an NBA player is 79 inches with a standard deviation of 5 inches.

The average weight of an NFL Player is 295 pounds with a standard deviation of 30 pounds

$295 - 2(30)$
 $295 + 2(30)$

19. Use the given information above to answer all of the related questions below

a. Using the empirical rule 95% of NFL players should weigh between 235 pounds and 355 pounds

b. Using the empirical rule 68% of NFL players should weigh between 265 pounds and 325 pounds

\uparrow \uparrow
 $295 - 30$ $295 + 30$

c. What is the z score associated with Stephen Curry, the NBA MVP, height who is 75 inches tall? -0.80 (round z scores to two decimal places)

$$z = \frac{75 - 79}{5} = \frac{-4}{5} = -0.80$$

d. What is the z score associated with LeBron James, an NBA all star height who is 80 inches tall? 0.20 (round z scores to two decimal places)

$$z = \frac{80 - 79}{5} = \frac{1}{5} = 0.20$$

e. If your cousin who is 73 inches tall became a NBA player, then what would the z score related to his height be? (round z scores to two decimal places)

$$z = -1.2$$

$$z = \frac{73 - 79}{5} = \frac{-6}{5} = -1.2$$

f. If your cousin who weighs 265 pounds became a NFL Player, then what would the z score related to his weight be? (round z scores to two decimal places)

$$z = -1.00$$

$$z = \frac{265 - 295}{30} = \frac{-30}{30} = -1$$

g. Your brother in law's height is said to be at the z score of -1.55 according to the ~~jockey's~~ ^{nba} scale, how tall is your brother in law (round the height to two decimal places)

71.25"
5' 11.25"

$$-1.55 = \frac{x - 79}{5} \rightarrow (-1.55)(5) = x - 79$$

$$-7.75 + 79 = x - 79 + 79 \rightarrow -7.75 = x - 79$$

$$|x = 71.25|$$

nfl

h. Your uncle's weight is said to be at the z score of 0.62 according to the ~~jockey's~~ ^{nba} scale, how much does your uncle weigh?(round the weight to two decimal places)

$$0.62(30) = x - 295$$

$$18.6 = x - 295 \rightarrow 295 + 18.6 = x$$

$$|x = 313.6|$$

$$0.62 = \frac{x - 295}{30}$$

Applications of Z scores and percentiles

12. Your height for your age, gender, and race is said to be in the 75th percentile explain what that means

I am as tall or taller than 75% of people at my age, gender, and race

60,000	62,500	82,500	88,000	99,000	99,500	102,000	106,000	107,000	108,000
109,000	110,000	111,000	112,000	115,000	116,000	117,000	117,500	119,000	119,500
120,000	125,000	125,500	126,000	129,000	135,000	142,000	148,000	225,000	512,000

Use the table above that is related to a SAMPLE of 30 incomes from your subdivision to answer the following questions

13. If your family income is \$120,000, then what is your related percentile rank for this sample?

21st rank → 20 scores below $\frac{20}{30} = 100 = 66.7$
67% percentile

14. What is the mean income for this SAMPLE?

124,817.24 ≈ 124800

15. What is the standard deviation for this SAMPLE? Round to the nearest 100

$s(x) = 83785.01 \approx 83800$

16. Is \$60,000 an outlier? If so state why.

$$\bar{x} \pm 3s = 124800 \pm 3(83800)$$

By $\bar{x} \pm 3s \rightarrow$ no

By $Q1 - 1.5 IQR$ to $Q3 + 1.5 IQR$ Yes

17. Is \$512,000 an outlier? If so state why

By both Yes

18. Complete the related table

$\bar{x} - 3s$	$\bar{x} - 2s$	$\bar{x} - 1s$	μ	$\bar{x} + 1s$	$\bar{x} + 2s$	$\bar{x} + 3s$

-126531.79 -42752.78 41032.23 124817.24 208607.25 292382.26 376172.27
 -126600 -42800 41000 124800 208600 292400 376200