Mr. Thurlwell's Supplemental Packet

Algebra 1

Unit 8: Statistics & Probability

Name:_____

Assignment #1 (4.5) pg 250 1-8
Assignment #2 (4.6) pg 259 1-6
Assignment #3 (4.6) pg 260 7-11
Assignment #4 (12.2) pg 760 1-8
Assignment #5 (12.2)*** pg 761 9-13
Assignment #6 (12.4) pg 775 1-6
Assignment #7 (12.4) pg 776 7-16
Assignment #8 (12.7) pg 797 1-13
Assignment #9 (12.7) pg 797 14-16, 24-29
Assignment #10 (12.8) pg 806 1-4
Assignment #11 (12.8) pg 806 5-9

***=quiz to follow

4.5 Correlation and Best-Fitting Lines

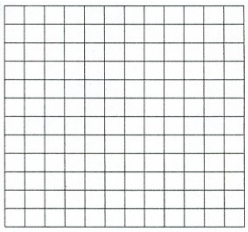
Concepts:

- Correlations
- Graphing Scatter Plots
- Best-Fitting Liens [calculator key strokes]

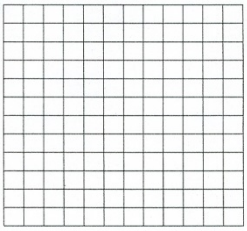
Correlations

We use _____ to tell if there is a relationship or correlation between data.

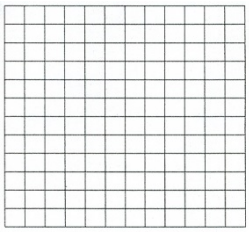
Negative Correlation



Positive Correlation



No correlation



Graphing Scatter Plots (by hand)

1. Carefully plot the _____ (if it is not already plotted)
2. Sketch a _____ (a line that goes through some points and is a balance through the graph) through the data.
3. Choose any _____ coordinates from the graph and use them to find slope.
4. Find the equation of the best-fitting line.

Ex. 1: The data pairs give the number of U.S. births from 2000 to 2007, where x is years since 2000 and y is in thousands. (0,4158) (1,4111) (2,4065) (3, 4000) (4, 3953) (5, 3900) (6, 3891) (7, 3895)

Plot the best-fit line for the data

a) determine if there is a positive, negative or no correlation of the data

b) draw a line that has about equal number of dots below and above the line

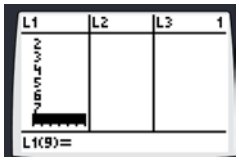
c) find the equation of the line

To find the Best-Fitting Line:

Step 1:

1st: LIST STAT & "Edit"

2nd:



Step 2:

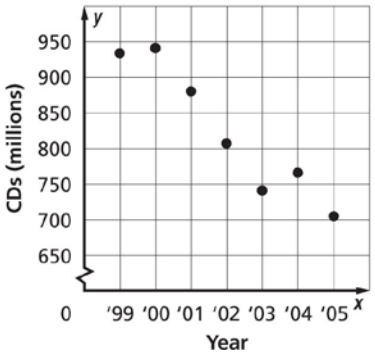
1st: LIST STAT

2nd:

Analyze the calculators equation to ours. Establish which you think is more accurate and why.

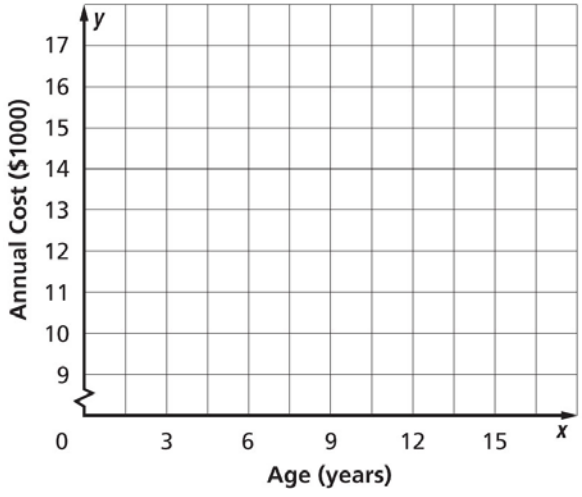
4-5 *Scatter Plots and Lines of Fit*

1. The scatter plot shows the number of CDs in millions that were sold from 1999 to 2005. If the trend continued, about how many CDs were sold in 2006?



2. The table shows the predicted annual cost for a middle income family to raise a child from birth until adulthood. Draw a scatter plot and describe what relationship exists within the data.

Cost of Raising a Child Born in 2003					
Child's Age	3	6	9	12	15
Annual Cost ($)	10,700	11,700	12,600	15,000	16,700



Source: *The World Almanac*

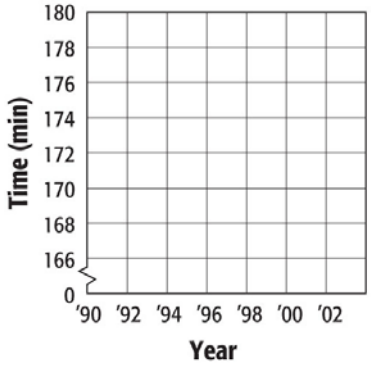
3. The median price of an existing home was $160,000 in 2000 and $240,000 in 2007. If x represents the number of years since 2000, use these data points to determine a line of best fit for the trends in the price of existing homes. Write the equation in slope-intercept form.

4. The table shows the average length in minutes of professional baseball games in selected years.

Average Length of Major League Baseball Games							
Year	'92	'94	'96	'98	'00	'02	'04
Time (min)	170	174	171	168	178	172	167

Source: Elias Sports Bureau

a. Draw a scatter plot and determine what relationship, if any, exists in the data.



b. Explain what the scatter plot shows.

c. Draw a line of fit for the scatter plot.

5. Write a positive or negative correlation you've observed.

4.6 Regression and Median-Fit Lines

Concepts:

- Correlation Coefficient
- Residual [calculator key strokes]
- Linear Interpolation and Extrapolation [calculator key strokes]
- Median-Fit Line calculator [calculator key strokes]

For examples 1-4, let's use this data below. It shows money made (and projected) by movies in the United States:

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Income($ billion)	31.52	30.75	29.72	28.59	28.16	29.15	29.93	31.03	32.76	35.33

NOTE:

1st:  then "0"

2nd: Be sure DiagnosticOn is on

you can use  and 'D' as a short cut

---

Correlation Coefficient

- _____
- _____

For key stroke help with linear regression, see section 4.5

- r^2 is a statistical measure of how close the data are to the fitted regression line.
- r is the _____

Ex. 1: Write the equation of the best-fit line for the data. Name the correlation coefficient. Round to the nearest thousandth.

Residual

- Residuals measure

  _____

- In other words, how far off the best-fit line, _____, is from the actual data
  - If the point falls below the best-fit line, the prediction is _____
  - If the point falls above the best-fit line, the prediction is _____
- Remember, not all data will lie on the line
  - Patterns are _____
  - Scattered is _____
- **Note:** The graphing calculator will use the x-axis to show distance with residuals

To graph and analyze the Residual plot for data:

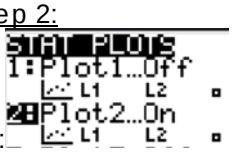
Step 1:

1st:

2nd:

Step 2:

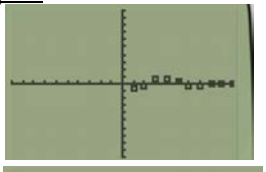
1st:



2nd:

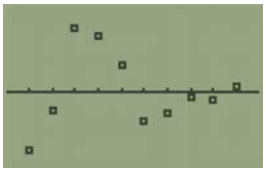
Step 3:

1st:



2nd:

3rd:



TIP
Utilize PLOT 2 for residual here on out. Use PLOT 1 for everything else

Ex. 2: Graph and analyze the residual plot for the data. Determine if the best-fit line models the data well.

Linear inter/extrapolation

- Interpolation
  - _____
- Extrapolation
  - _____
- You can get inter/extra 3 ways 1) _____, 2) _____,

  & 3) _____.

Using Interpolation & Extrapolation:

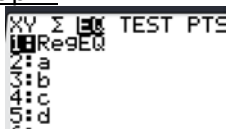
NOTE: First graph a scatter plot and perform Linear Regression.

Step 1:

1st: Y= then VARS

2nd :

Step 2:



1st

2nd: GRAPH →

Step 3:

1st: 2ND & CALC F4 TRACE

2nd:

Note: You will need to change your "Ylist" under "Plot" from "RESID" to "L_2"

Ex. 3: Estimate how the income in the year 2025.

Median-fit Line

- _____
- _____

Using Median-Fit Line:

NOTE: First graph a scatter plot

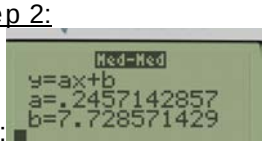
Step 1:

1st: STAT

2nd :

Step 2:

1st :



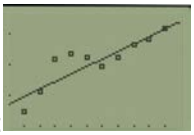
2nd: Enter into Y= using VARS just like interpolation & extrapolation

Step 3:

1st:

OR COPY YOUR VALUES

2nd:



Ex. 4: Find and graph the equation of a median-fit line for the data. Then, predict the income for next year.

Ex. 5 In celebration of our 27th Olympic games, this data represents the total number of medals the USA has won in the Summer Olympics since 1896, where year 0 = 1896, 1 = 1900, 2 = 1904, etc.

Olympic #	Medals
11	84
12	76
13	74
14	71
15	90
16	107
17	94
18	94

a) Write the equation of the best-fit line for the data. Name the correlation coefficient. Round to the nearest hundredth.

b) Graph and analyze the residual plot for the data. Determine if the best-fit line models the data well.

c) Estimate how many medals USA should have won in 2016.

d) Find and graph the equation of a median-fit line for the data. Then, predict the number of medals in the 2024 games.

4-6 *Regression and Median-Fit Lines*

Application

1. University of Georgia running back Todd Gurley ran for 1392 total yards in the 2012 season. The table below shows his cumulative total number of yards ran after select games.

Game Number	1	3	6	9	12	14
Cumulative Yards	100	276	582	864	1145	1392

Source: University of Georgia Athletics

a. Use a calculator to find an equation for the regression line showing the total yards y scored after x games.

b. What is the real-world meaning of the value returned for a?

c. What is the value of the correlation coefficient and how reliable is the regression line?

2. Ounces of gold are traded by large investment banks in commodity exchanges much the same way that shares of stock are traded. The table below shows the cost of a single ounce of gold on the last day of trading in given years.

Year	2002	2003	2004	2005	2006
Price	$346.70	$414.80	$438.10	$517.20	$636.30

Source: Global Financial Data

a. Use a calculator to find an equation for the regression line.

b. Then predict the price of an ounce of gold on the last day of trading in 2009. Is this point an interpolation or extrapolation point? Is this a reasonable prediction? Explain.

c. Graph and analyze the residual plot for the data. Explain if the best-fit line models the data well.

3. Matt is practicing golf as part of his school's golf team. Each week he plays a full round of golf and records his total score. His scorecard after five weeks is below.

Week	1	2	3	4	5
Golf Score	112	107	108	104	98

a. Use a calculator to find an equation for the median-fit line.

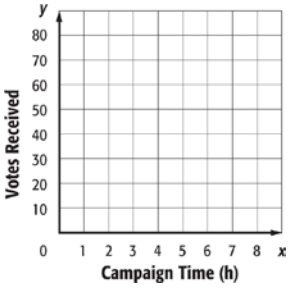
b. Then estimate how many games Matt will have to play to get a score of 86.

4. The vote totals for five of the candidates participating in Oswego East High School's student council elections and the number of hours each candidate spent campaigning are shown in the table below.

Hours Campaigning	1	3	4	6	8
Votes Received	9	22	24	46	78

a. Use a calculator to find an equation for the median-fit line.

b. Plot the data points and draw the median-fit line on the graph below.



c. Suppose a sixth candidate spends 7 hours campaigning. Is this point an interpolation or extrapolation point? Estimate how many votes that candidate could expect to receive.

4-6 *Regression and Median-Fit Lines Practice*

1)Write an equation of the regression line for the data in each table below. Then find the correlation coefficient.

Below is a table showing the U.S. Federal Reserve's prime interest rate on January 1 of various years.

Year	2006	2007	2008	2009	2010
Prime Rate (percent)	7.25	8.25	7.25	3.25	3.25

Source: Federal Reserve Board

2) **Write an equation of the regression line for the data in each table below. Then find the correlation coefficient.**

Below is a table showing the estimated population of Arizona in millions on July 1st of various years.

Year	2001	2002	2003	2004	2005	2006
Population	5.30	5.44	5.58	5.74	5.94	6.17

Source: U.S. Census Bureau

a. Find an equation for the median-fit line.

b. Predict the population of Arizona in 2009.

3) **Write an equation of the regression line for the data in each table below. Then find the correlation coefficient.**

Below is a table showing the number of students enrolled at Happy Days Preschool in the given years.

Year	2002	2004	2006	2008	2010
Students	130	168	184	201	234

a. Find an equation for the median-fit line.

b. Estimate how many students were enrolled in 2007.

12.2 Statistics and Parameters

Concepts:

- Populations & Parameters, Samples & Statistics
- Mean Absolute Deviation (MAD) [calculator key strokes]
- Variance & Standard Deviation [calculator key strokes]

Populations, Samples & Parameters

- Populations
  - All the members of the group of interested.
    - Ex. Surveying every student at Oswego East asking how many parking spaces we have.
    - _____ (create your own here)
- Parameters
  - Describes a characteristic of a population
    - Ex. The mean response from those students is 150.
    - _____ (create your own here)
- Sample
  - Represents part of a population.
    - Ex. Surveying only freshmen at Oswego East asking how many parking spaces we have.
    - _____ (create your own here)
- Statistic
  - Describes a characteristic of a sample
    - Ex. The mean response from freshmen is 200.
    - _____ (create your own here)

Ex. 1: Identify the sample and the population for each situation. Then describe the sample statistic and the population parameter.

a) At Apple Inc., a random sample of 1,000 employees is selected. The mean salary of the 1,000 employees is calculated.

b) At OEHS, a random sample of 40 seniors is selected. The median GPA of the seniors is calculated.

Variance/Standard Deviation

- Both the standard deviation and variance measure how spread out data is
  - _____
    - σ^2
  - _____(σ)
    - Shows how data deviates (strays from) from the mean.
      - Low- data is close to the mean.
      - High- data is spread out.
    - $\sqrt{\ }$ of the variance: $\left(\sqrt{\sigma^2}\right)=\sigma$

Understanding σ

Ryan Troy

- When the σ(S) is _____ compared to the mean, the data are _____.
- When the σ(S) is _____ compared to the mean, the data are spread _____.

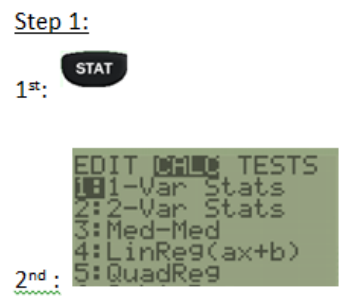
Ex. 2: Gob surveyed all his classmates to find out how many TVs each person has in their home. Given that data represented below, find and interpret the standard deviation of the data set. {4, 10, 6, 2, 1, 2, 4, 6, 5, 5, 9, 2, 8, 3}

Finding σ

NOTE: Input the data in to L_1

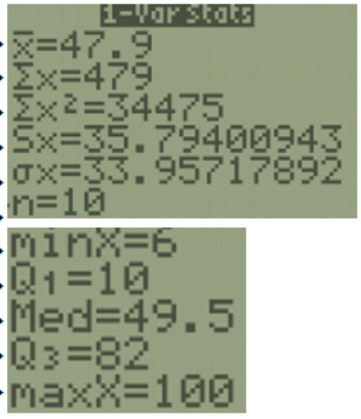
Step 1:

1st: STAT



2nd :

Interpreting:



Mean →
Sum of the data →
Sum of the data squared →
Sample standard deviation →
Population standard deviation →
Number data points →
Minimum data point →
1st Quartile →
Median →
3rd Quartile →
Maximum data point →

Ex. 3: Below is the running time (in minutes) of 12 "comic book" movies. Find and interpret the standard deviation of the data set.

Deadpool	*Avengers 2*	*The Dark Knight*	*Captain America*	*Ant-Man*	*Iron Man*	*Thor*	*The Incredible Hulk*	*The Amazing Spiderman*	*The Wolverine*	*X-Men: First Class*	*Guardians of the Galaxy*
108	141	152	124	117	126	115	112	136	126	132	122

Identify the sample and the population for each situation. Then describe the sample statistic and the population parameter.

1. A restaurant randomly selects 10 patrons on Saturday night. The mean amount spent on beverages is then calculated for the sample.

- **Sample:**
- **Sample Statistic:**
- **Population:**
- **Population Parameter:**

2. A veterinarian randomly selects 3 kittens from a litter. The mean weight of the 3 kittens is calculated.

- **Sample:**
- **Sample Statistic:**
- **Population:**
- **Population Parameter:**

3. A produce clerk randomly selects 20 bags of apples from a shipment and counts the total number of apples in each bag. The mean number of apples is calculated for the sample.

- **Sample:**
- **Sample Statistic:**
- **Population:**
- **Population Parameter:**

Find and interpret the mean absolute deviation.

4. A researcher counts the number of river otters observed on each acre of land in a state park:
{0, 10, 14, 6, 0, 8, 4}.

5. A fisherman records the weight of each black bass he catches during a fishing trip: {12, 7, 8, 13, 6, 14}.

Find and interpret the standard deviation of each set of data.

6. {10, 9, 11, 6, 9}

7. {6, 8, 2, 3, 2, 9}

8. {23, 18, 28, 36, 15}

9. {44, 35, 40, 37, 43, 38, 40}

10. A city councilor wants to know how much revenue the city would earn by installing parking meters on Main Street. He counts the number of cars parked on Main Street each weekday: {64, 79, 81, 53, 63}. Find and interpret the standard deviation.

12.4 Comparing Sets of Data [Day 1]

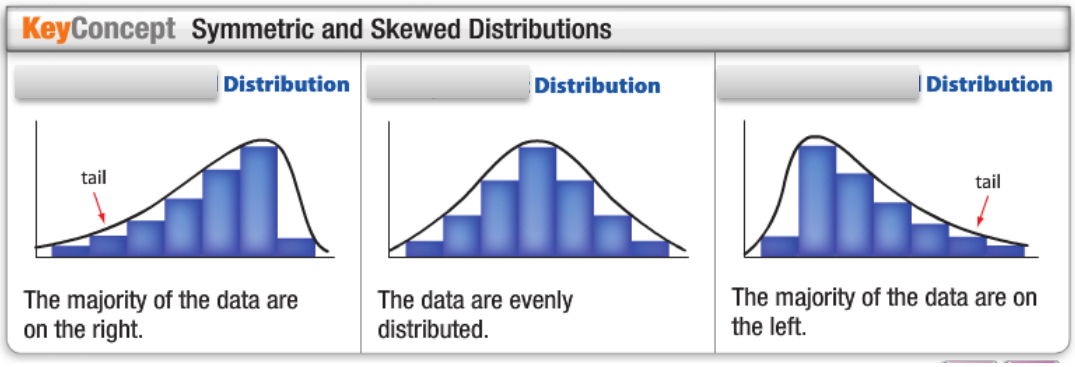
Concepts:

- Distributions: Histograms & Box-and-Whisker [calculator key strokes]
- Choosing appropriate statistics [calculator key strokes]

Distribution of data – _____

Histogram – _____

Histogram:



Constructing a Histogram:

NOTE: Input the data in to L_1

Step 1:

1st: 2ND Y= (Stat Plot)

2nd: Turn Plot 1 On.

3rd: Select

Step 2:

1st: ZOOM 9

Ex. 1: Use a graphing calculator to construct a histogram for the data, and use it to describe the shape of the distribution.

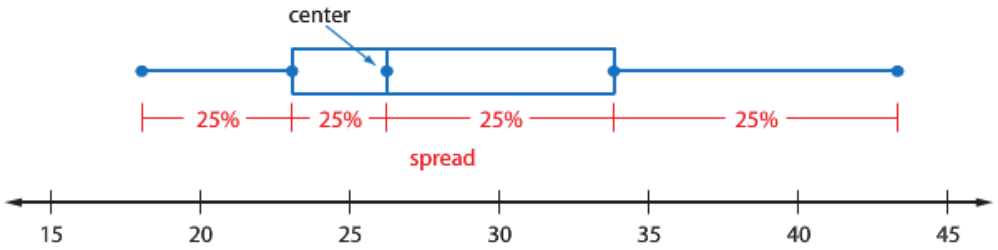
9, 18, 22, 12, 24, 25, 19, 25, 2,

5, 28, 12, 22, 19, 28, 15, 23, 6,

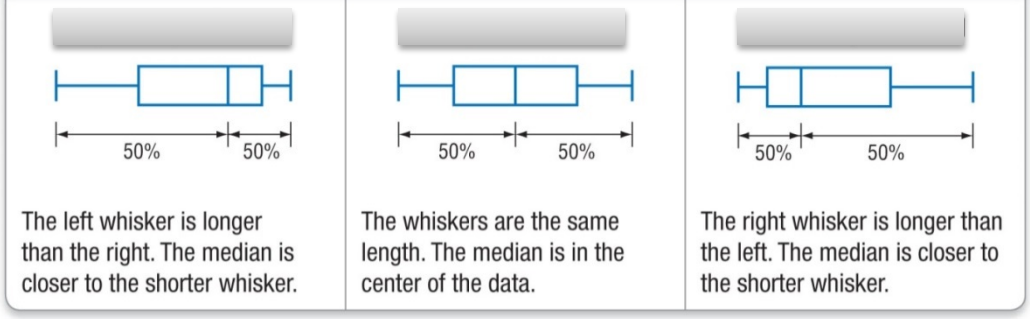
8, 27, 17, 14, 22, 21, 13, 24, 21,

9, 25, 16, 24, 16, 25, 27, 21, 10

Box-and-Whisker Plot:



KeyConcept Symmetric and Skewed Box-and-Whisker Plots



The left whisker is longer than the right. The median is closer to the shorter whisker.	The whiskers are the same length. The median is in the center of the data.	The right whisker is longer than the left. The median is closer to the shorter whisker.

Constructing a Box-and-Whisker Plot:

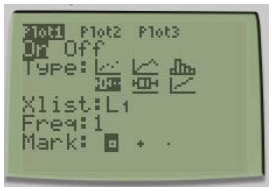
NOTE: Input the data in to L_1

Step 1:

1st: 2ND Y= (Stat Plot)

2nd: Turn Plot 1 On.

3rd: Select



Step 2:

1st: ZOOM 9

Ex. 2: Using the same data from Example 1 and a graphing calculator to construct a box-and-whisker plot for the data, and use it to determine the shape of the distribution.

Choose Appropriate Statistics

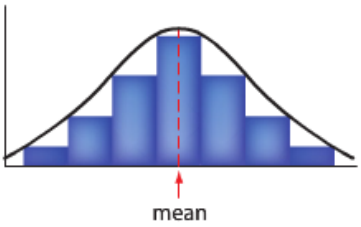
Terminology we're going to use:

- **Mean**
- **Median**
- **Standard deviation**
- **Range**
- **Quartiles**
- **Outliers** an extremely _____ or extremely _____ value when compared with the rest of the values in the set) have a strong effect on the _____ of a data set, while the median is less affected.

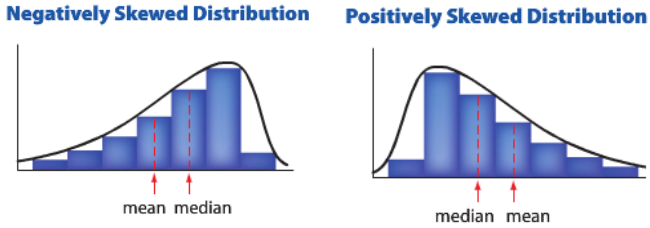
1st Determine the type of distribution:

Option 1

➢ **If (relatively) Symmetric Distribution:**



- The _____ accurately reflects the center of the data.
- Use mean and standard deviation to describe center and spread.



Option 2

➢ **If Skewed Distribution:**

- **Outliers** (an extremely _____ or extremely _____ value when compared with the rest of the values in the set) have a strong effect on the _____ of a data set, while the median is less affected.
- The mean lies away from the majority of the data, towards the tail (_____ end).
- Use _____ to describe center and spread.
  - Includes 5 numbers: **median**, **range** (max *x*- min *x*), **quartiles** (Q_1, & Q_3)
    - Center: _____
    - Spread includes:
      - Range of all data used: _____ data used – _____ data used
      - Half of data is between upper and lower quartile: _____

Summary for Describing Center and Spread of Data:

Step 1:
1st: Graph histogram or box-and-whisker.

2nd: Determine if distribution is symmetric or skewed.

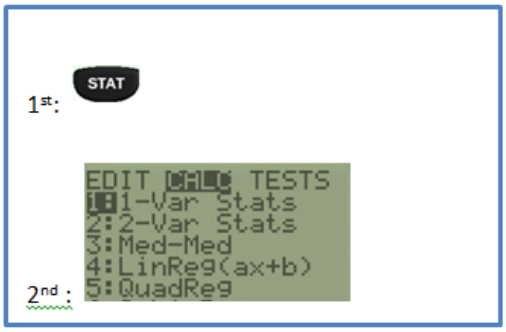
Step 2:
Symmetric: Use mean and standard deviation.

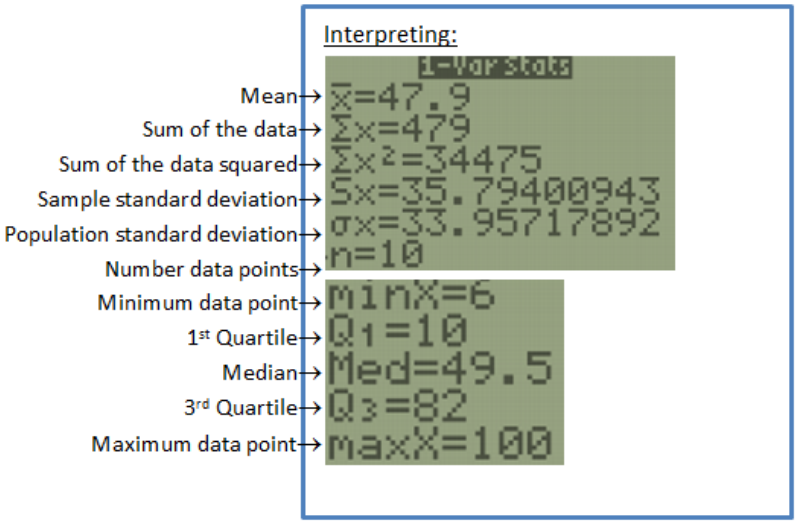
Skewed: Use range, median, and quartiles.

The distribution is **symmetric**, so use the mean and standard deviation. The mean was _____ with a standard deviation about _____.

The distribution is **skewed left/right**, so use the five-number summary. The median is ___, the upper quartile is __ and the range is ___.

Remember from 12.2…





Ex. 3: Describe the center and spread of the data given that represent the average speed in mph of cars on Interstate 88 using either the mean and standard deviation or the five-number summary. Justify your choice by constructing a histogram for the data.

78, 68, 72, 71, 79, 67, 71, 78, 70
80, 76, 82, 82, 70, 84, 72, 71, 85
67, 86, 74, 86, 73, 72, 77, 87, 70
66, 88, 75, 72, 76, 71, 90, 69, 94

Ex. 4: The averages for the bowlers on five teams are shown below. Describe the center and spread of the data using either the mean and standard deviation or the five-number summary. Justify your choice by constructing a box-and-whisker plot for the data.

Bowling Average				
142	180	161	131	201
179	152	177	196	148
198	123	203	170	187
159	193	176	137	183

12.4 Comparing Sets of Data [Day 2]

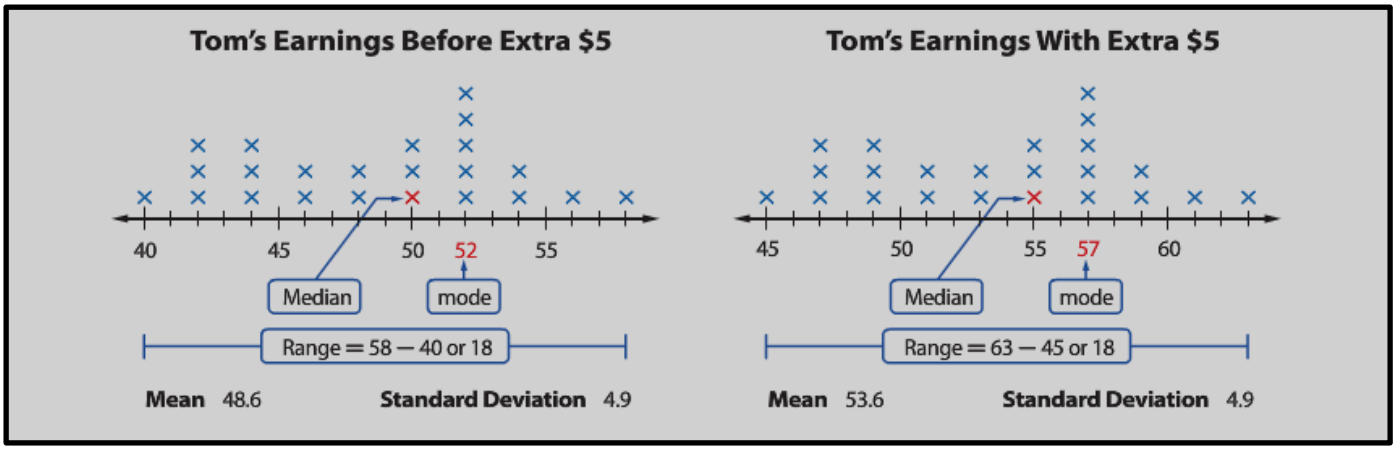
Concepts:

- Comparing Transformations [calculator key strokes]
- Distributions

Linear Transformation – _____

Transformations Using Addition:

Below is an X-plot that represents Tom's daily pay mowing lawns. Suppose will earn a $5 raise next summer.



When Tom's earnings were increased by $5…

a. What happens to each value? _____

b. How are the following affected?:

- Mean: _____
- Median: _____
- Mode: _____
- Range: _____
- Standard deviation: _____

- If a real number *k* is added to every value in a set of data:

  - The mean, median, and mode of the new data set can be found by _____ to each of the numbers from the original set.

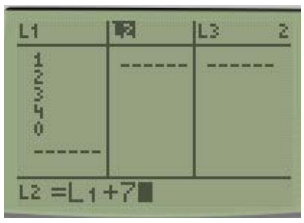
  - The range and standard deviation will _____.

NOTE: These results occur when any positive or negative number is added to every value in a set of data.

To find Data after a Transformation:

NOTE: Enter data in L_1.

Step 1:



Step 2:

1-Vars Stats (Change to L_2)

or 1-Var Stats L_2

Ex. 5: Find the mean, median, mode, range, and standard deviation of the data set obtained after adding –6 to each value. 26, 17, 19, 20, 23, 24, 19, 15, 20, 27, 19, 15, 14

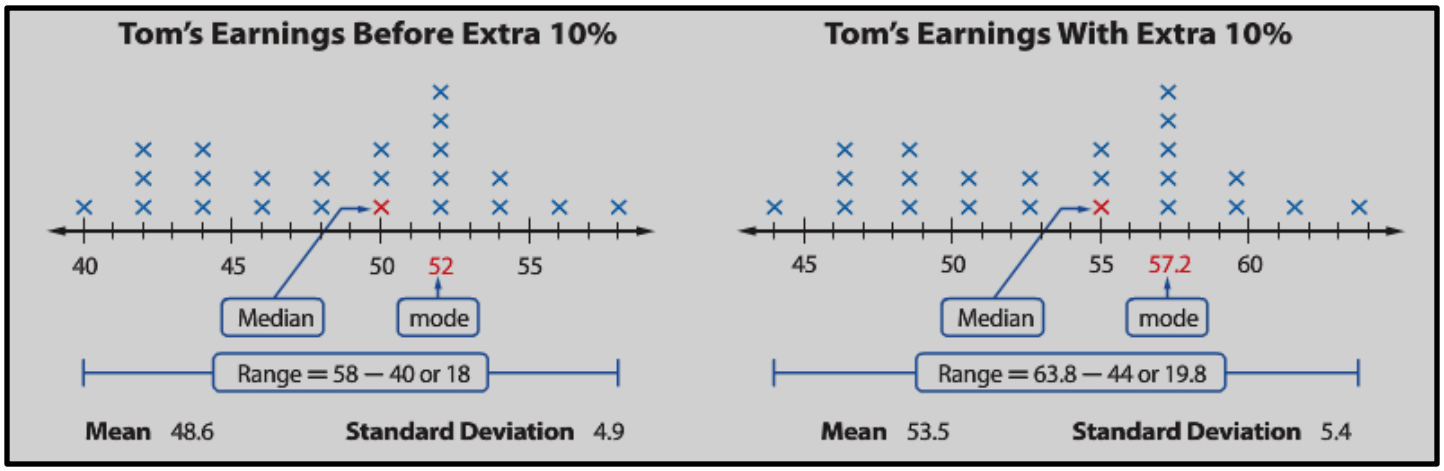
Method 1: Find all information using original data set. Then make the necessary changes.

Method 2: Make the changes to the original data. Then find all of the information using the new data.

Ex. 6: The following data represent the average English test scores in Ms. Schremp's 5th period class. Ms. Schremp decided that the test was not well written, so she decided to curve the tests by adding 7 percentage points to everyone's test. Find the mean, median, mode, range, and standard deviation of the data set obtained after adding 7 points to each score. 73, 78, 61, 54, 88, 90, 63, 78, 80, 61, 86, 78

Transformations Using Multiplication:

Below is the same X-plot that represents Tom's daily pay mowing lawns. Suppose will earn a 10% raise next summer.



With a daily increase of 10% (multiplying by 1.10):

a. What happens to each value?

b. How are the following affected?:

- Mean: _____
- Median: _____
- Mode: _____
- Range: _____
- Standard deviation: _____

- If a positive number *k* is multiplied to every value in a set of data:

  - The mean, median, mode, range, and standard deviation of the new data set can be found by _____ by each of the numbers from the original set.

NOTE: These results occur when any positive number is multiplied to every value in a set of data.

Ex. 7: The following data represents the average number of hours Geno works in a week. During the summer, Geno is going to work two and a half times the number of hours he worked during the school year. Find the mean, median, mode, range, and standard deviation of the data set obtained after his wages are changed.
4, 2, 3, 1, 4, 6, 2, 3, 7, 5, 1, 4

Method 1:

Method 2:

Ex. 8: Find the mean, median, mode, range, and standard deviation of the data set obtained after multiplying each value by 0.6. 28, 24, 22, 25, 28, 22, 16, 28, 32, 36, 18, 24, 28

Ex. 9: Brittany and Justin are playing a computer game. Their high scores for each game are shown below.
a. Use a graphing calculator to create a histogram for each set of data. Then describe the shape of each distribution.

Brittany's Scores
29, 43, 54, 58, 39, 44, 39, 53, 32, 48, 39, 49, 38, 31, 41, 44, 44, 45, 48, 31

Justin's Scores
48, 26, 28, 53, 39, 28, 30, 58, 45, 37, 30, 31, 40, 32, 30, 44, 33, 35, 43, 35

b. Compare the data sets using either the means and standard deviations or the five-number summaries. Justify your choice.

Ex. 10: Steve and Kurt went fishing for the weekend. The weights of the fish they each caught are shown below.

Steve's Fish (pounds)
1.6, 2.1, 2.6, 1.3, 2.7, 3.2, 1.4, 2.3, 3.5, 1.9, 2.2, 2.7, 3.5, 1.4, 3.7, 3.4, 1.8, 2.5, 3.0

Kurt's Fish (pounds)
1.1, 3.2, 2.3, 3.7, 1.7, 2.7, 2.1, 4.0, 1.0, 2.9, 2.9, 1.2, 3.3, 2.3, 4.5, 2.4, 3.9

a. Use a graphing calculator to create a box-and-whisker plot for each data set. Then describe the shape of the distribution for each data set.

b. Compare the data sets using either the means and standard deviations or the five-number summaries. Justify your choice.

12-4 Practice
Comparing Sets of Data

Find the mean, median, mode, range, and standard deviation of each data set that is obtained after adding the given constant to each value.

1. 62, 58, 57, 65, 68, 71, 49, 48, 52, 47; + 5.8

2. 2, 8, 1, 5, 1, 3, 1, 7, 5, 4, 3, 1; + (–0.3)

3. 4.3, 3.8, 3.1, 4.5, 3.7, 4.4, 4.9, 3.9; + (–2.4)

4. 17, 21, 18, 32, 29, 24, 19, 32; + 7.6

Find the mean, median, mode, range, and standard deviation of each data set that is obtained after multiplying each value by the given constant.

5. 94, 90, 88, 92, 85, 92, 86, 98, 92, 90; × 0.8

6. 41, 44, 47, 40, 43, 41, 42, 48; × 2.3

7. 63, 62, 59, 68, 67, 72, 70, 75, 64, 61; $\times \frac{1}{3}$

8. 9, 7, 5, 2, 8, 4, 5, 6, 9, 5, 2, 1; $\times \frac{4}{9}$

9. The weekly totals of recycled paper in pounds for two neighboring high schools are shown below.

West Aurora High School
86, 57, 52, 43, 48, 55, 47, 64, 51, 77, 50, 62, 74, 70, 68, 53, 81, 53

Oswego East High School
68, 79, 58, 101, 83, 65, 47, 73, 62, 77, 49, 84, 103, 70, 54, 97, 88, 94

a. Use a graphing calculator to construct a box-and-whisker plot for each set of data. Then describe the shape of each distribution.

b. Compare the data sets using either the means and standard deviations or the five-number summaries. Justify your choice.

12-4 Application
Comparing Sets of Data

1. The weights of 15 swimmers going scuba diving are shown below.

Weight (pounds)
211, 123, 183, 176, 224, 115, 109, 136, 152, 177, 127, 196, 143, 166, 170

a. Find the mean, median, mode, range, and standard deviation of the swimmers' weights.

b. The scuba gear that the swimmers will be wearing weighs 56 pounds. Find the statistics of the swimmers' weights while wearing the scuba gear.

2. The distances that 18 participants threw a football are shown.

Distance (feet)
96, 94, 114, 85, 96, 109, 90, 109, 67, 82, 98, 79, 69, 70, 106, 96, 112, 84

a. Find the mean, median, mode, range, and standard deviation of the participants' distances.

b. Find the statistics of the participants' distances in yards.

3. The monthly average high temperatures for Lexington, Kentucky are shown.

Temperature (°F)
40, 45, 55, 65, 74, 82, 86, 85, 78, 67, 55, 44

a. Find the mean, median, mode, range, and standard deviation of the temperatures.

b. Find the statistics of the temperatures in degrees Celsius. Recall that $C = \frac{5}{9}(F - 32)$.

4. The weekly total points of Scott's and Jen's fantasy baseball teams are shown.

Scott's Team
109, 99, 121, 137, 131, 141, 77, 83, 139, 92, 42, 133, 98, 153, 124, 102, 113, 117, 112, 128, 107, 147

Jen's Team
113, 121, 98, 104, 106, 123, 175, 141, 109, 129, 49, 110, 112, 144, 106, 119, 127 88, 132, 93, 137, 123

a. Use a graphing calculator to construct a box-and-whisker plot for each set of data. Then describe the shape of each distribution.

b. Compare the data sets using either the means and standard deviations or the five-number summaries. Justify your choice.

c. How does eliminating the outliers of each data set affect the statistics and comparison from part **b**?

12.7 Probability of Compound Events

Concepts:

- Probability

Simple Event – _____ Ex. _____

Probability – _____

Ex. 1: You buy 5 raffle tickets. What is the probability that you will win if 200 tickets were sold?

Ex. 2: What is the probability that you will roll a 5 on a toss of a six-sided number cube?

Ex. 3: The population of the United States is about 265 million. The probability that a citizen lives in Iowa is 0.011. What is the population of Iowa?

Ex. 4: You have a bag of 56 marbles, 24 of which are blue. What is the probability that you will choose a blue marble?

Ex. 5: You toss two coins. What is the probability that both are tails?

Compound Event – _____

Ex. _____

Joint Probability – _____

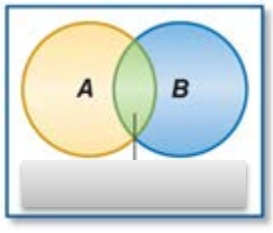
Probability of Independent Events:

Independent Events – _____

*If two events, *A* and *B*, are independent, then the probability of both events occurring is

_____.

P*(*A* **and *B*) = _____



Ex. 6: Ulysses is flying from Birmingham to Chicago on a flight with a 90% on-time record. On the same day, the chances of rain in Denver are predicted to be 50%. What is the probability that Ulysses' flight will be on time and that it will rain in Denver?

Ex. 7: A bag contains 4 blue socks, 8 black socks, 3 yellow socks, and 2 red socks. A sock is selected, replaced, and a second sock is selected. Find the probability of selecting a blue sock, then a not yellow sock. P(blue, not yellow)

Dependent Event – _____

Ex. _____

*If two events, *A* and *B*, are dependent, then the probability of both events occurring is

_____.

**P*(*A* and *B*) = _____

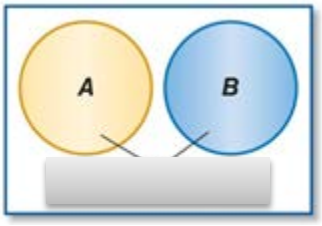
Ex. 8: At the school carnival, winners in the ring-toss game are randomly given a prize from a bag that contains 4 sunglasses, 6 hairbrushes, and 5 key chains. Three prizes are randomly drawn from the bag and not replaced. Find *P*(sunglasses, hairbrush, key chain).

Ex. 9: Adam randomly draws four cards from a standard deck one at a time without replacement. Find the probability that the cards are drawn in the following order:

a. P(club, spade, club, heart)

b. P(six, seven, not queen, six)

Probability of Mutually Exclusive Events:



Mutually Exclusive – _____

Ex. _____

*If two events, *A* and *B*, are mutually exclusive, then the probability that either *A* **or** *B* occurs is _____.

P*(*A* **or *B*) = _____

Ex. 10: A card is being drawn from a standard deck. Find the probability of *P*(7 or 8).

Ex. 11: A die is being rolled. Find each probability.

a. P(2 or 3)

b. P(less than 3)

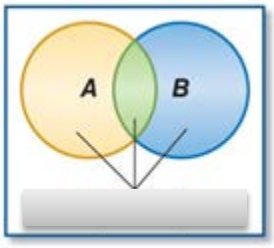
Probability of Events that are Not Mutually Exclusive:

*Not mutually exclusive – _____

Ex. _____

*If two events, *A* and *B*, are not mutually exclusive, then the probability that either *A* or *B* occurs is _____.

**P*(*A* or *B*) = _____



Ex. 12: In the game of bingo, balls or tiles are numbered 1 through 75. These numbers correspond to columns on a bingo card, as shown in the table. A number is selected at random. What is the probability that it is a multiple of 5 or is in the N column?

B	I	N	G	O
1–15	16–30	31–45	46–60	61–75

Ex. 13: In Mrs. Bankowski's class, 7 boys have brown eyes and 5 boys have blue eyes. Out of the girls, 6 have brown eyes and 8 have blue eyes. If a student is chosen at random from the class, what is the probability that the student will be a boy or have brown eyes?

12.8 Probability Distributions

Concepts:

- Probability Distribution
- Expected Value [calculator key strokes]

Random Variable – _____

Discrete Random Variable – _____

Ex. 1: a. The owner of a pet store asked customers how many pets they owned. The results of this survey are shown in the table. Find the probability that a randomly chosen customer has 2 pets.

Number of Pets	Number of Customers
0	3
1	37
2	33
3	18
4	9

b. Find the probability that a randomly chosen customer has at least 3 pets.

Ex. 2: a. A survey was conducted concerning the number of movies people watch at the theater per month. The results of this survey are shown in the table. Find the probability that a randomly chosen person watches at most 1 movie per month.

Number of Movies (per month)	Number of People
0	7
1	23
2	30
3	29
4	11

b. Find the probability that a randomly chosen person watches 0 or 4 movies per month.

Probability Distribution – _____

Probability Graph – _____

*The probability of each value of X: _____

*The sum of the probabilities of all values of X is _____.

Ex. 3: a. The table shows the probability distribution of the number of students in each grade at Sunnybrook High School. Show that the distribution is valid.

X = Grade	$P(X)$
9	0.29
10	0.26
11	0.25
12	0.2

b. If a student is chosen at random, what is the probability that he or she is in grade 11 or 12?

c. Make a probability graph of the data.

Ex. 4: a. The table shows the probability distribution of the number of children per family in the city of Maplewood. Is the distribution valid?

X = Number of Children	$P(X)$
0	0.11
1	0.23
2	0.32
3	0.26
4	0.08

b. If a family was chosen at random, what is the probability that they have at least 2 children?

c. Make a probability graph of the data.

Expected Value E(X) – _____

*Calculated by finding _____

_____.

* $E(X) = [X_1 \cdot P(X_1)] + [X_2 \cdot P(X_2)] + ... + [X_n \cdot P(X_n)]$, where *n* is the total number of values of *X*.

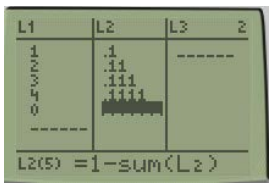
NOTE: When calculating probability of each event, remember to include the probability of 0 as well.
(1 – probability of winning something)

To find the Expected Value:

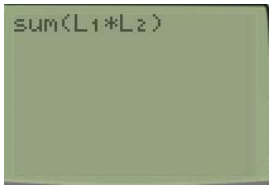
NOTE: Enter data in L_1 & L_2.

Step 1:

1st: 

2nd: 

Step 2:



Ex. 5: Brandy paid $5 for an entry into a contest with the following prize values.

a. Create a probability distribution.

Prize Value	Probability
$500	1 in 5000
$5000	1 in 50,000
$20,000	1 in 500,000
$50,000	1 in 2,000,000

b. Calculate the expected value.

c. Interpret your results.

Ex. 6: Edsel paid $1 for an entry into a contest with the following prize values. Create a probability distribution, calculate the expected value, and interpret the results.

a.

Prize Value	Probability
$25	1 in 100
$100	1 in 500
$250	1 in 1000
$500	1 in 5000

b.

c.