Male Students
Are Smarter than
Female Students

OUR TEAM:

Three students investigated this proposition.

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METHODS:

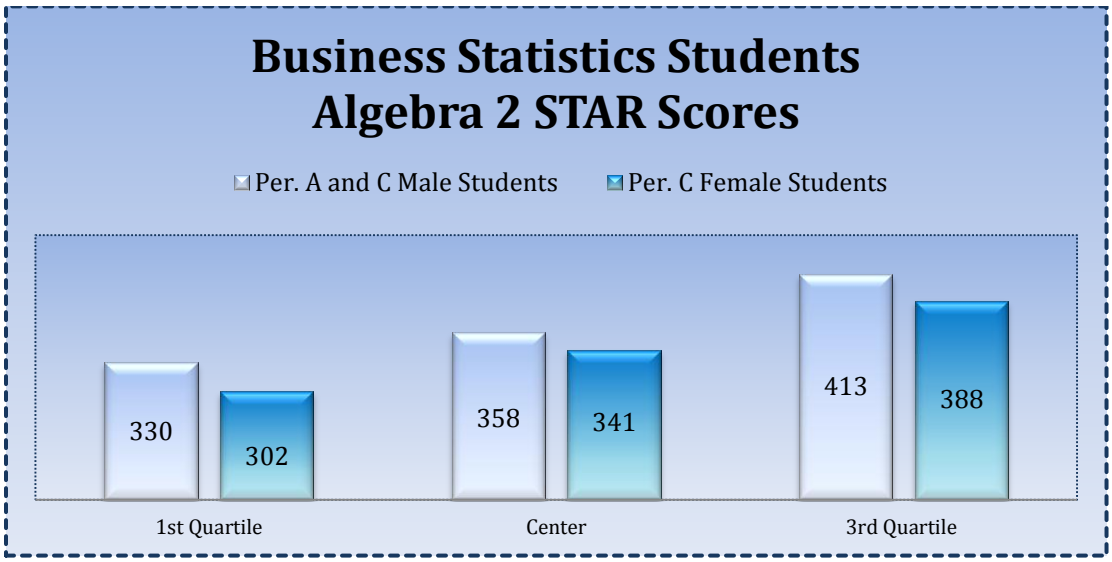
The data was gathered in a student survey administered to all Business Statistics students in the first week of the fall semester. Students completed the surveys at home, and were given assignment credit for their participation. No student was marked down for not answering individual questions. Our team used Excel's single variable data analysis functions and graphic displays to examine the data for patterns and relationships that would be most relevant to assessing the proposition. In the detailed distribution comparisons, hand-written parallel box plots were prepared to meet the remaining assignment requirements.

After completing our initial review of the data, we narrowed our investigations to the following three questions.

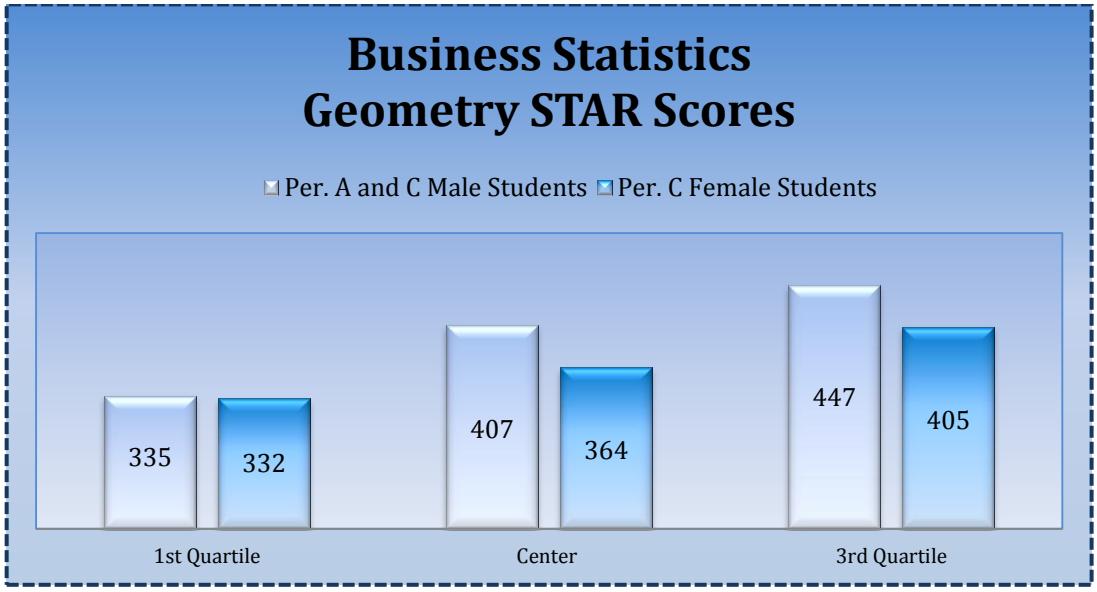
- #1 Did period C female Business Statistics students have higher Algebra 2 STAR scores than period A & C male Business Statistics students?
- #2 Did period A & C female Business Statistics students score higher on the Geometry STAR test than Period A & C male Business Statistics Students?
- #3 Did period C female Business Statistics students achieve higher math GPAs than period A & C male Business Statistics students?

SUMMARY OF FINDINGS:

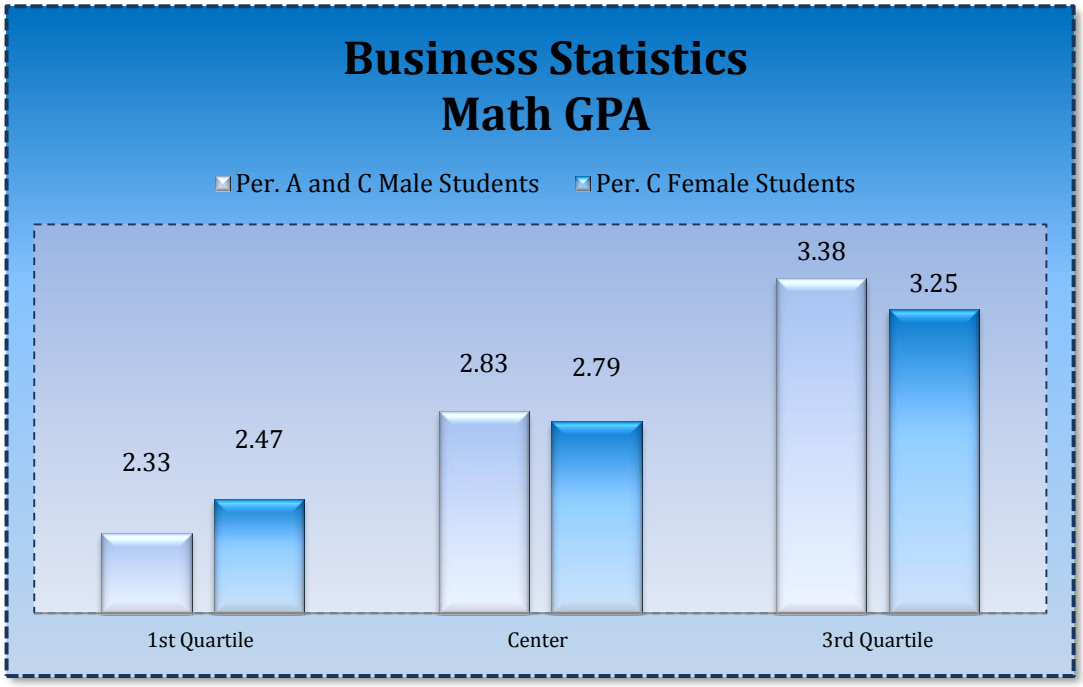
Question #1: Examination of Algebra 2 STAR scores for periods A and C male Business Statistics students and period C female Business Statistics students reveals that the first quartile value for males was 28 points higher than the first quartile value for females; the median for males was 17 points higher than the median for females; and the third quartile value for males was 25 points higher than the third quartile value for females.



Question #2: Examination of Geometry STAR scores for periods A and C Business Statistics students reveals that the first quartile value for both genders were essentially the same; the median for males was 43 points higher than the median for females; and the third quartile value for males was 52 points higher than the third quartile value for females.



Question #3: Examination of math grade point averages for periods A and C male Business Statistics students and period C female Business Statistics students reveals that the first quartile value for males was .14 points lower than the first quartile value for females; the median for males was four-tenths higher than the median for females; and the third quartile value for males was .13 points higher than the third quartile value for females.



CONCLUSION:

Based on these specific findings, we conclude the proposition is supported. Male students are smarter than female students. Male students received higher first quartile, median and third quartile values on both the Algebra 2 and Geometry STAR exams. Overall, math grade point averages were essentially the same for both genders.

DETAILED FINDINGS:

The report has been organized as follows:

Description of Distribution:

Comparison of Distributions:

Table A. compares distribution of:

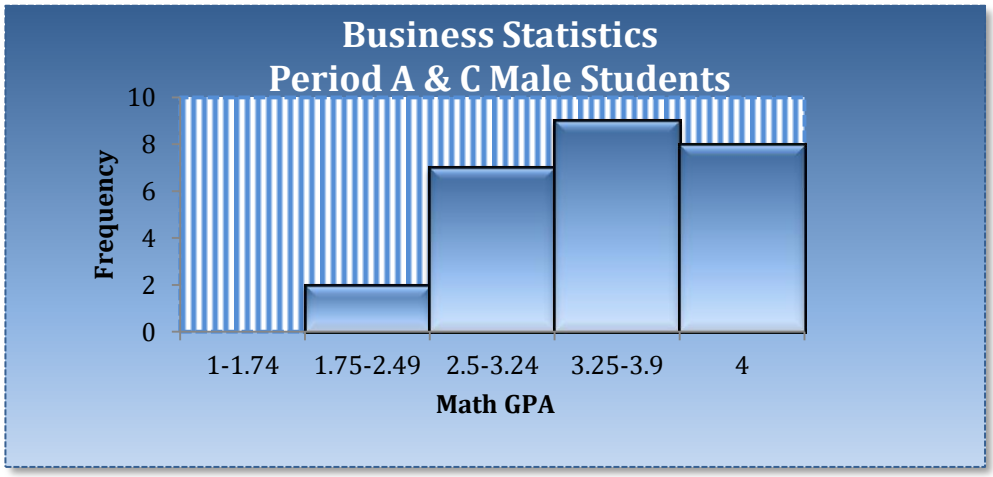
Table B. compares distribution of:

Table C. compares distribution of:

Period A&C Male Students Math G.P.A.

Population: Period A and C Male Business Statistics Students

Variable: Math GPA **Type:** Quantitative, Interval, Continuous



Shape: A histogram was examined to determine the shape of the distribution. The histogram was displayed using a bin width of .75 point increments.

The histogram appears to be **uni**modal and slightly skew left

The Fisher skew statistic was **-0.57**. This statistic fell inside the computed range of **-0.94 to +.94** indicating that the distribution's shape is slightly skew left.

Center: Mean = **2.86** point, Median = **2.83** point, Mode = **3.13** point

The best measure of central tendency is the median because the distribution is skewed. This skew left shape causes the mean to be greater than the median.

Spread: Range = **2.75** point, IQR = 1.04 point, $\sigma =$ **0.68** point

The best measure of spread is the Range and Interquartile Range because the distribution is skewed.

Outliers: IQR Method: Adding 1.5 times the IQR to the third quartile value of **3.38** point results in an upper outlier threshold of **4.94** point. Subtracting 1.5 times the IQR from the first quartile value of **2.33** point results in a lower outlier threshold of 0.77 point. Examination of the data found no outliers that exceeded these thresholds.

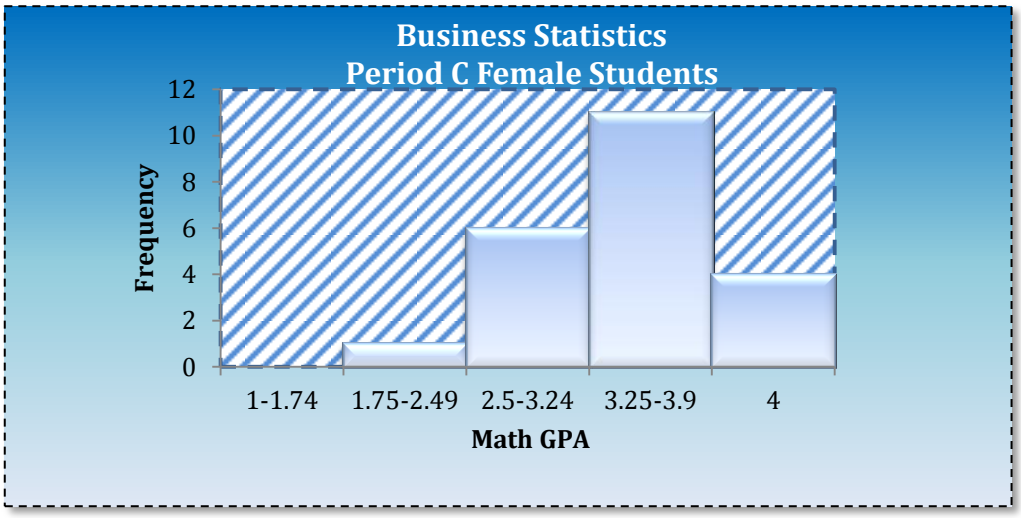
Standard Deviation σ Method: Adding and subtracting three standard deviations from the mean of **2.86** point establishes an upper outlier threshold of **4.89** point and a lower threshold of **0.82** point. Examination of the data found no outliers that exceeded these thresholds.

The best measure of outliers is the IQR method because the distribution is skewed.

Period C Female Students Math G.P.A.

Population: Period C Female Business Statistics Students

Variable: Math GPA **Type:** Quantitative, Interval, Continuous



Shape: A histogram was examined to determine the shape of the distribution. The histogram was displayed using a bin width of .75point increments.

The histogram appears to be **uni**modal and slightly skew left

The Fisher skew statistic was **-0.72**. This statistic fell inside the computed range of **-1.04 to +1.04** indicating that the distribution's shape is slightly skew left.

Center: Mean = **2.84** point, Median = **2.79** point, Mode = **3.17** point

The best measure of central tendency is the median because the distribution is skewed. This skew left shape causes the mean to be greater than the median.

Spread: Range = **2.67** point, IQR = 0.78 point, $\sigma =$ **0.59** point

The best measure of spread is the Range and Interquartile range because the distribution is skewed.

Outliers: IQR Method: Adding 1.5 times the IQR to the third quartile value of **3.25** point results in an upper outlier threshold of **4.42** point. Subtracting 1.5 times the IQR from the first quartile value of **2.47** point results in a lower outlier threshold of **1.3** point. Examination of the data found 1 outliers that exceeded these thresholds, (1.17).

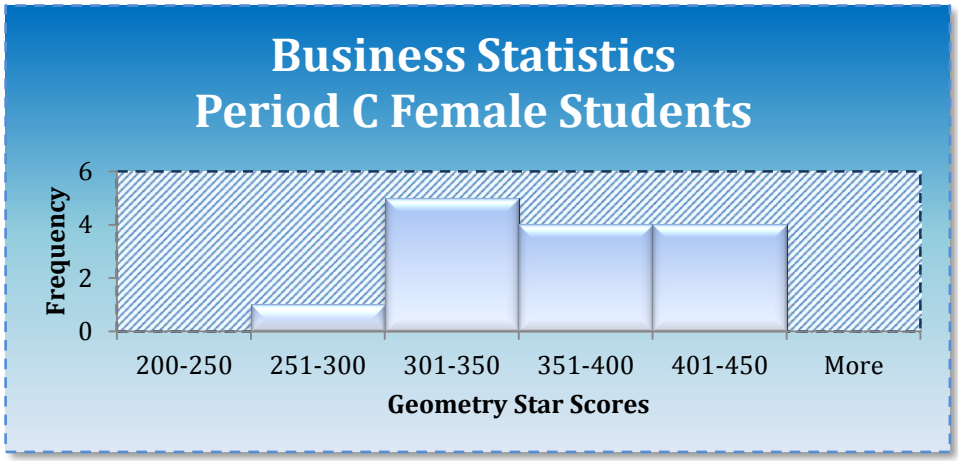
Standard Deviation (σ) Method: Adding and subtracting three standard deviations from the mean of **2.84** point establishes an upper outlier threshold of **4.62** point and a lower threshold of **1.05** point. Examination of the data found no outliers that exceeded these thresholds.

The best measure of outliers is the IQR Method because the distribution is skewed.

Period C Female Geometry Star Scores

Population: Period C Female Business Statistics Students

Variable: Geometry Star Scores **Type:** Quantitative, Interval, Continuous



Shape: A histogram was examined to determine the shape of the distribution. The histogram was displayed using a bin width of 50 points increments.

The histogram appears to be **uni**-modal and nearly symmetric.

Skew: The Fisher skew statistic was **.12**. This statistic fell near 0 indicating that the distribution's shape is nearly symmetric.

Center: Mean = **366** points, Median = **364** points, Mode = **389** points The best measure of central tendency is the mean because the distribution is symmetric. This symmetric shape causes the mean to be equal to the median.

Spread: Range = **139** points, IQR = **72** points, $\sigma =$ **43**points

The best measure of spread is the standard deviation because the distribution is symmetric.

Outliers: IQR Method: Adding 1.5 times the IQR to the third quartile value of **405** point results in an upper outlier threshold of **513**points. Subtracting 1.5 times the IQR from the first quartile value of 332 points results in a lower outlier threshold of **224** points. Examination of the data found no outliers that exceeded these thresholds.

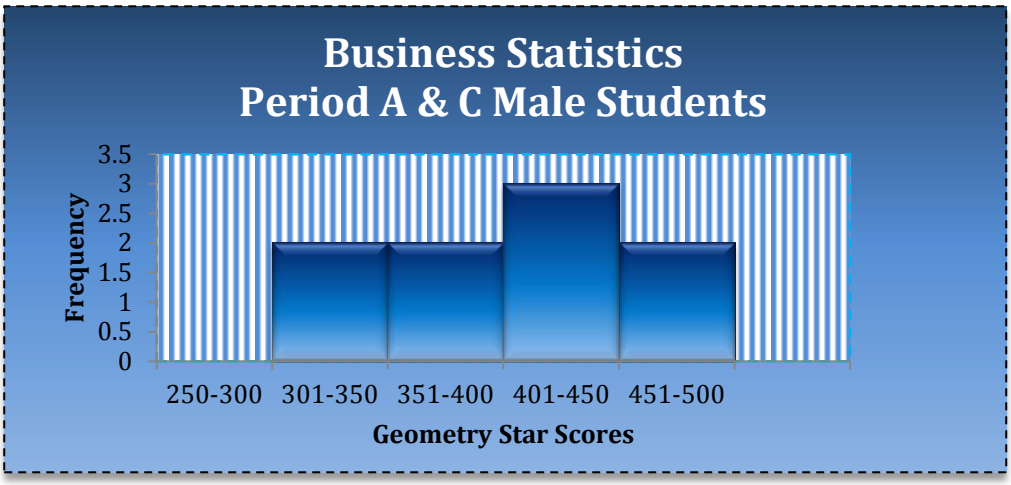
Standard Deviation (σ) Method: Adding and subtracting three standard deviations from the mean of **369** points establishes an upper outlier threshold of **501** points and a lower threshold of **237** points. Examination of the data found no outliers that exceeded these thresholds.

The best measure of outliers is the standard deviation because the distribution is symmetric.

Period A&C Male Geometry Star Scores

Population: Period A and C Male Business Statistics Students

Variable: Geometry Star Scores **Type:** Quantitative, Interval, Continuous



Shape: A histogram was examined to determine the shape of the distribution. The histogram was displayed using a bin width of 50 points increments.

The histogram appears to be **uni-**modal and slightly skew left.

The Fisher skew statistic was **-.029**. This statistic fell outside the computed inside the computed range of **-.1.63 to +1.63** indicating that the distribution's shape is slightly skew left.

Center: Mean = **402**points, Median = **407** points, Mode = **441** points

The best measure of central tendency is the median because the distribution is skewed. This skew left shape causes the mean to be less than the median.

Spread: Range = **190** points, IQR = **112** points, $\sigma =$ **65** points
The best measure of spread is the range and interquartile range because the distribution is skewed.

Outliers: IQR Method: Adding 1.5 times the IQR to the third quartile value of **447** points results in an upper outlier threshold of **670** points. Subtracting 1.5 times the IQR from the first quartile value of **335** points results in a lower outlier threshold of **167** points. Examination of the data found no outliers that exceeded these thresholds.

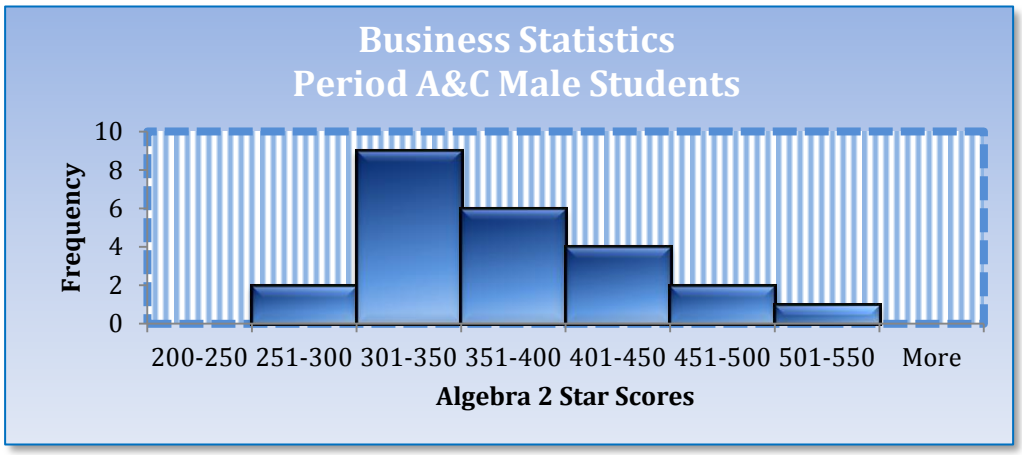
Standard Deviation σ Method: Adding and subtracting three standard deviations from the mean of **370** points establishes an upper outlier threshold of **508** points and a lower threshold of **232** points. Examination of the data found no outlier that exceeded these thresholds.

The best measure of outliers is the IQR Method because the distribution is skewed.

Period A&C Male students Algebra II Star Scores

Population: Period A and C Male Business Statistics Students

Variable: Algebra 2 Star Scores **Type:** Quantitative, Interval, Continuous



Shape: A histogram was examined to determine the shape of the distribution. The histogram was displayed using a bin width of 50 point increments.

All of these plots was found to be **uni**modal and slightly skew right.

The Fisher skew statistic was **0.86**. This statistic fell inside the computed range of **-1.00 to +1.00** indicating that the distribution's shape is slightly skew right.

Center: Mean = **370** points, Median = **358** points, Mode = **269** points

The best measure of central tendency is the median because the distribution is skewed. This skew right shape causes the mean to be greater than the median.

Spread: Range = **281** points, IQR = **83** points, $\sigma =$ **67** points

The best measure of spread is the range and interquartile range because the distribution is skewed.

Outliers: IQR Method: Adding 1.5 times the IQR to the third quartile value of **413** points results in an upper outlier threshold of **538** points. Subtracting 1.5 times the IQR from the first quartile value of **330** points results in a lower outlier threshold of **205** points. Examination of the data found one outlier that exceeded these thresholds.(550).

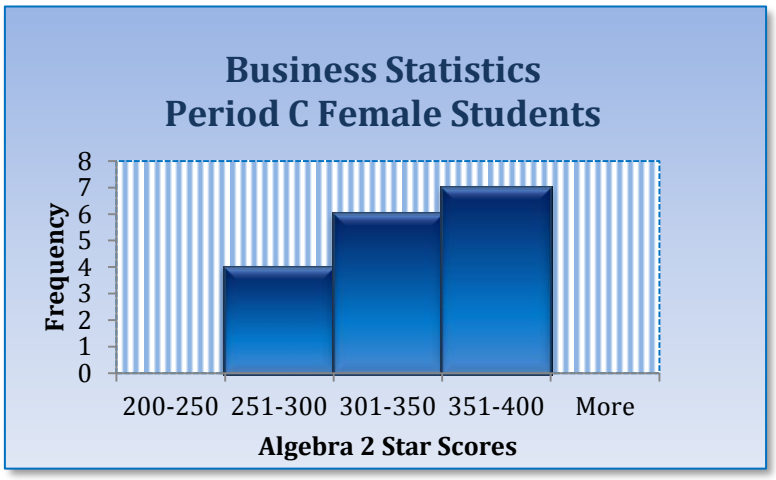
Standard Deviation (σ) Method: Adding and subtracting three standard deviations from the mean of **370** points establishes an upper outlier threshold of **570** points and a lower threshold of **169** points. Examination of the data found no outliers that exceeded these thresholds.

The best measure of outliers is the IQR Method because the distribution is skewed.

Period C Female Students Algebra II Star Scores

Population: Period C Female Business Statistics Students

Variable: Algebra 2 Star Scores **Type:** Quantitative, Interval, Continuous



Shape: A histogram was examined to determine the shape of the distribution. The histogram was displayed using a bin width of 50 point increments.

All of these plots was found to be **uni**modal and nearly symmetric.

The Fisher skew statistic was **0.13**. This statistic fell near 0 indicating that the distribution nearly symmetric.

Center: Mean = **341** points, Median = **334** points, Mode = **288** points

The best measure of central tendency is the mean because the distribution is symmetric. This symmetric shape causes the mean to be equal to the median.

Spread: Range = **111** points, IQR = **86** points, $\sigma =$ **42** points

The best measure of spread is the standard deviation because the distribution is symmetric.

Outliers: IQR Method: Adding 1.5 times the IQR to the third quartile value of **388** points results in an upper outlier threshold of **516** points. Subtracting 1.5 times the IQR from the first quartile value of **302** points results in a lower outlier threshold of **174** points. Examination of the data found no outliers that exceeded these thresholds.

Standard Deviation (σ) Method: Adding and subtracting three standard deviations from the mean of **341** points establishes an upper outlier threshold of **467** points and a lower threshold of **216** points. Examination of the data found no outliers that exceeded these thresholds.

The best measure of outliers is the Standard Deviation because the distribution is symmetric.

Variable: Accumulative math GPA in the population of Period A and C Male Students

Variable: Accumulative math GPA in the population of Period C Female Students

	GPA for male students	GPA for female students	Comparison
Shape	slightly skew left	slightly skew left	The distributions have the same shape.
Center	Mean = 2.86 point Median = **2.83** point	Mean = **2.84** point Median = **2.79** point	Since both distributions are skewed, the best measure for comparing central tendencies is the median. The center of the distribution for GPA for male students is nearly the same to the distribution for GPA for female students.
Spread	Range = 2.75 IQR = 1.04 σ = .68	Range = 2.67 IQR = .78 σ = .59	Since both distributions are skewed, the best measure for comparing spread are the range and interquartile range. Examination of these statistics shows the distribution for GPA for male students has more spread than the distribution for GPA for female students.
Outliers	none using both methods	1.17 using the IQR Method	The distribution for GPA for female students has **1** outliers while the distribution for GPA for male students has none.

Variable: Geometry star scores in the population of Period A and C Male Students

Variable: Geometry star scores in the population of Period C Female Students

	Females Geo. Star scores	Males Geo. Star scores	Comparison
Shape	Symmetric	Slightly skew left	The distribution for Females Geometry star scores is nearly symmetric while the distribution for Males Geometry star scores is slightly skew left.
Center	Mean = **366** points Median = **364** points	Mean = **402** points Median = **407** points	Since the distribution for Males Geometry star scores is skewed, the best measure for comparing central tendencies is the median. Since the distribution for Females Geometry star scores is symmetric, the best measure for comparing central tendencies is the mean. The center of the distribution for Males Geometry star scores is higher than the distribution for Females Geometry star scores.
Spread	Range = 139 IQR = 72 $\sigma = 43$	Range = 190 IQR = 112 $\sigma = 65$	Since the distribution Males Geometry star scores is skewed, the best measure for comparing spread are the range and interquartile range Since the distribution for Females Geometry star scores is symmetric, the best measure for comparing spread is the Standard Deviation. Examination of these statistics shows the distribution for Male Student Algebra 2 SS has more spread than the distribution for Females Geometry star scores
Outliers	none using the Standard Deviation Method	none using the IQR Method	Neither distribution has outliers.

Variable: Algebra 2 star scores in the population of Period A and C Male Students

Variable: Algebra 2 star scores in the population of Period C Female Students

	Male Student Algebra 2 Star Scores(SS)	Female Student Algebra 2 Star Scores(SS)	Comparison
Shape	Slightly Skew right	Symmetric	The distribution for Male Student Algebra 2 SS is Slightly Skew right while the distribution for Female Student Algebra 2 SS is Symmetric.
Center	Mean = **370** points Median = **358** points	Mean = **341** points Median = **344** points	Since the distribution for Male Student Algebra 2 SS is skewed, the best measure for comparing central tendencies is the median. Since the distribution for Female Student Algebra 2 SS is symmetric, the best measure for comparing central tendencies is the mean. The center of the distribution for Male Student Algebra 2 SS is higher than the distribution for Female Student Algebra 2 SS.
Spread	Range = 281 IQR = 83 $\sigma = 67$	Range = 111 IQR = 86 $\sigma = 42$	Since the distribution for Male Student Algebra 2 SS is skewed, the best measure for comparing spread are the range and interquartile range Since the distribution for Female Student Algebra 2 SS is symmetric, the best measure for comparing spread is the Standard Deviation. Examination of these statistics shows the distribution for Male Student Algebra 2 SS has more spread than the distribution for Female Student Algebra 2 SS.
Outliers	1 using the IQR Method	none using the Standard Deviation Method	The distribution for Male Student Algebra 2 SS has **1** outlier while the distribution for Female Student Algebra 2 SS has none.