Seniors Work Harder Than Juniors

Our Team: Three students investigated this proposition.

Jeneane DeJesus

Emily Centeno

Samantha Dorman

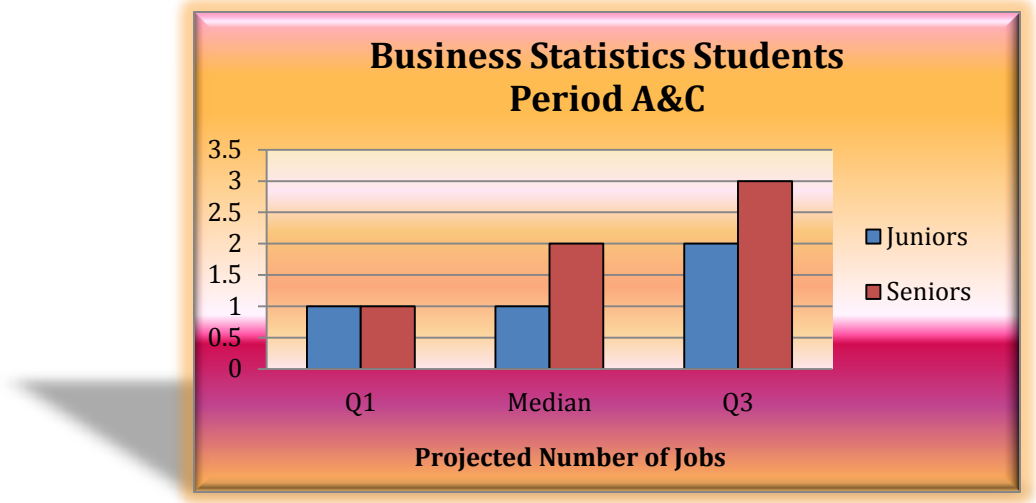
Methods: The data was gathered in a student survey administered to all Business Statistics students in the first week of the fall semester. Students completed the surveys at home, and were given assignment credit for their participation. No student was marked down for not answering individual questions. 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, a 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.

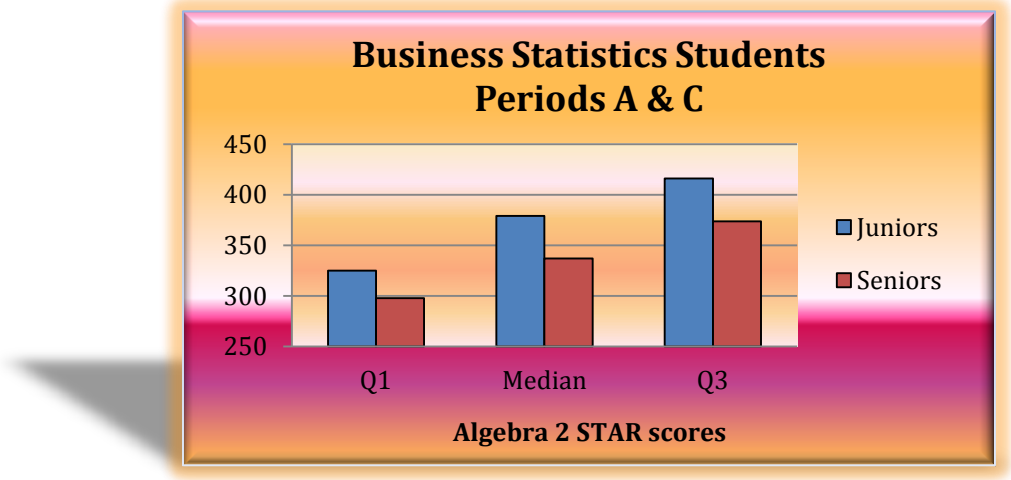
- #1 Are periods A & C senior Business Statistics students planning to have more jobs than periods A & C junior Business Statistics students?
- #2 Did periods A & C senior Business Statistics students score higher than periods A & C junior Business Statistics students on the Algebra 2 STAR test?
- #3 Do periods A & C senior Business Statistics students plan to submit more college applications than periods A & C junior Business Statistics students?

Summary of Findings:

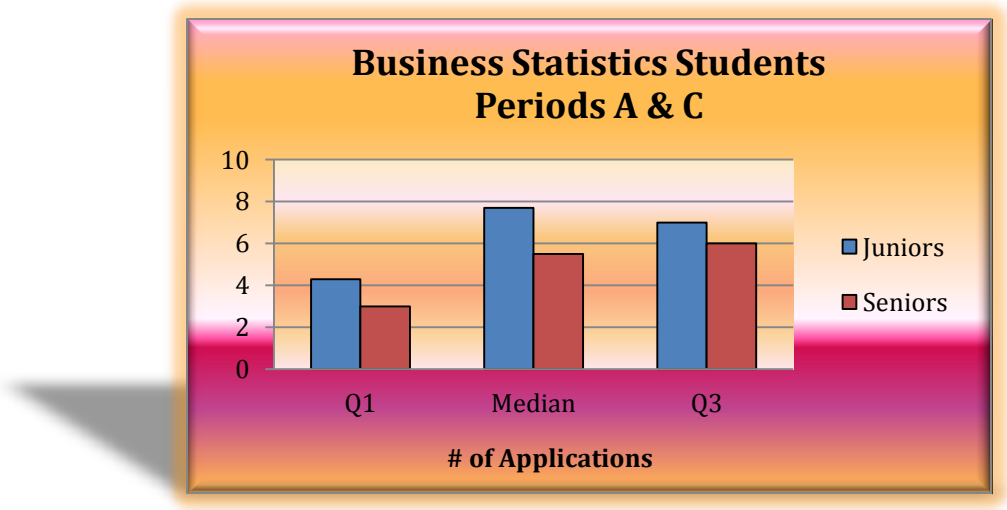
Question #1: Examination of the projected number of jobs for periods A & C Business Statistics students reveals that the first quartile value for seniors and juniors were essentially the same; the median for seniors was one job higher than the median for juniors; and the third quartile value for seniors was one job higher than the third quartile value for juniors.



Question #2: Examination of Algebra 2 STAR scores for periods A & C junior Business Statistics students reveals that the first quartile value for seniors was 27.2 points higher than the first quartile value for seniors; the median for juniors was 42 points higher than the median for seniors; and the third quartile value for juniors was 42.2 points higher than the third quartile value for seniors.



Question #3: Examination of the projected number of applications from periods A & C senior Business Statistics students reveals that the first quartile value for juniors was 1.3 applications higher than first quartile value for seniors; the median for juniors was 2.2 applications higher than the median for seniors; and the third quartile value for juniors was one application higher than the third quartile value for seniors.



Conclusion:

Based on these specific findings, we conclude the proposition is not supported. The first question did support our proposition. Senior Business Statistics students planned to have more jobs than junior Business Statistics students. However, the other two questions did not support the proposition. Junior Business Statistics students scored higher on their Algebra 2 STAR exams, and junior Business Statistics students planned to submit more college applications than seniors. Overall, it cannot be said that senior Business Statistics students work harder than junior Business Statistics students.

Detailed Findings:

The report has been organized as follows:

Description of Distribution:

Comparison of Distributions:

Population: Periods A & C Junior Business Statistics Students

Variable: Projected Number of Jobs **Type:** Quantitative, Ratio, Discrete

Shape: A histogram was examined to determine the shape of the distribution. The histogram was displayed using a bin width of **4** (job) increments.

This plot was found to be **uni**modal and slightly skew right.

The Fisher skew statistic was 1.4. This statistic fell inside the computed range of **-1.5 to +1.5** indicating that the distribution's shape is slightly skew right.

Center: Mean = **1.7**(jobs), Median = **1** (jobs), Mode = **1** (jobs)

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.

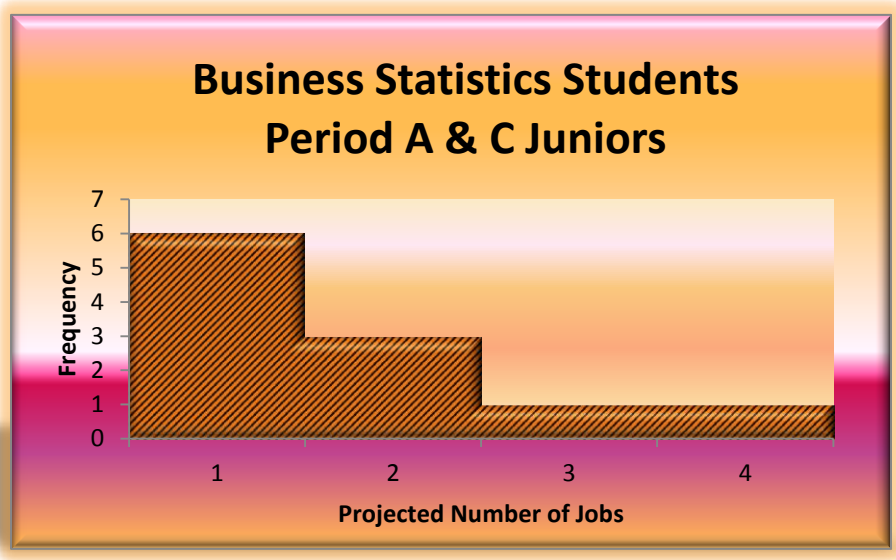
Spread: Range = **3**(jobs), IQR =**1** (jobs), $\sigma = 0.9$(jobs)

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 **2.5**(jobs) results in an upper outlier threshold of **4.0**(jobs). Subtracting 1.5 times the IQR from the first quartile value of **1.5**(jobs) results in a lower outlier threshold of **0**(jobs). 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 **1.7**(jobs) establishes an upper outlier threshold of **4.3** (jobs) and a lower threshold of **-0.9**(jobs). 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.



Population: Periods A & C Senior Business Statistics Students

Variable: Projected Number of Jobs **Type:** Quantitative, Ratio, Discrete

Shape: A histogram was examined to determine the shape of the distribution. The histogram was displayed using a bin width of **10** (job) increments.

This plot was found to be **uni**modal and highly skew right.

The Fisher skew statistic was **3.5**. This statistic fell outside the computed range of **-0.08 to +0.08** indicating that the distribution's shape is highly skew right.

Center: Mean =**2.1** (jobs), Median = **2** (jobs), Mode = **1** (job)

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.

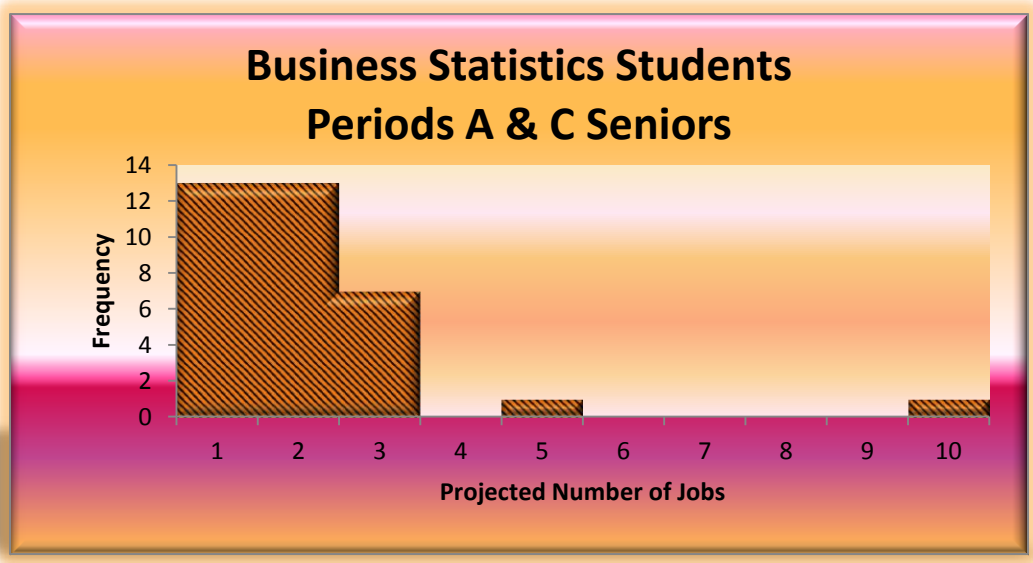
Spread: Range =**9** (jobs), IQR =**2** (jobs), $\sigma =$ **1.6** (jobs)

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 (jobs) results in an upper outlier threshold of **6.0** (jobs). Subtracting 1.5 times the IQR from the first quartile value of **1** (job) results in a lower outlier threshold of -2.0. (jobs). Examination of the data found **one** outlier that exceeded these thresholds, 10.

Standard Deviation (σ) Method: Adding and subtracting three standard deviations from the mean of **2.1** (jobs) establishes an upper outlier threshold of **6.9** (jobs) and a lower threshold of **-2.7** (jobs). Examination of the data found **one** outlier that exceeded these thresholds, 10.

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



Population: Periods A & C Junior Business Statistics Students

Variable: Algebra 2 STAR Scores **Type:** Quantitative, Interval, Discrete

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

This plot was found to be **uni**modal and slightly skew right.

The Fisher skew statistic was **1.4**. This statistic fell inside the computed range of **-1.5 to +1.5** indicating that the distribution's shape is slightly skew right.

Center: Mean = **383** (points), Median = **379** (points), Mode = **N/A** (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.

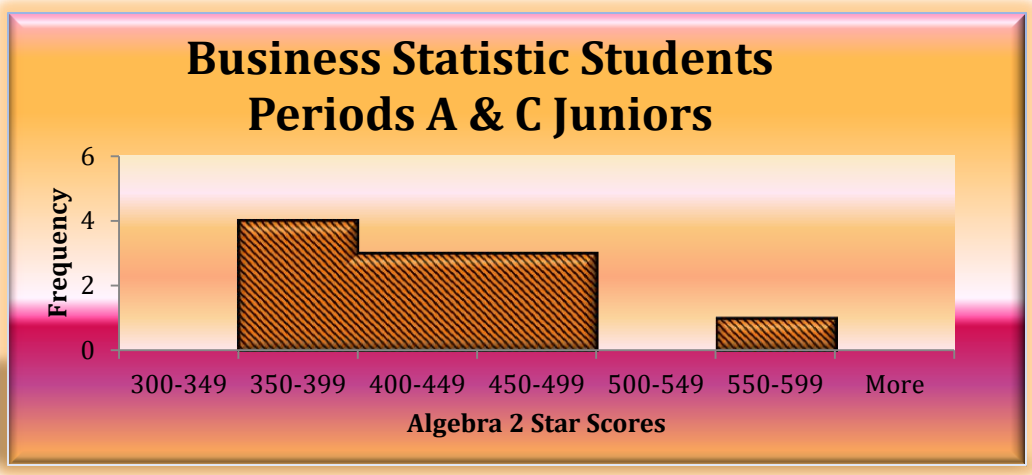
Spread: Range = **240** (points), IQR = **91** (points), $\sigma = 69$ (points)

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

Outliers: IQR Method: Adding 1.5 times the IQR to the third quartile value of **416** (points) results in an upper outlier threshold of **552.5** (points). Subtracting 1.5 times the IQR from the first quartile value of **325** (points) results in a lower outlier threshold of **188.5** (points). Examination of the data found two outliers that exceeded these thresholds, 300, 600.

Standard Deviation (σ) Method: Adding and subtracting three standard deviations from the mean of **383** (points) establishes an upper outlier threshold of **590** (points) and a lower threshold of **176** (points). Examination of the data found one outlier that exceeded these thresholds, 600.

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



Population: Periods A & C Senior Business Statistics Students

Variable: Algebra 2 STAR Scores **Type:** Quantitative, Interval, Discrete

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

This plot was found to be **uni**modal and slightly skew left.

The Fisher skew statistic was **-0.4**. This statistic fell inside the computed range of **-0.7 to +0.7** indicating that the distribution's shape is slightly skew left.

Center: Mean = **339.5** (points), Median = **337** (points), Mode = **316** (points)

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.

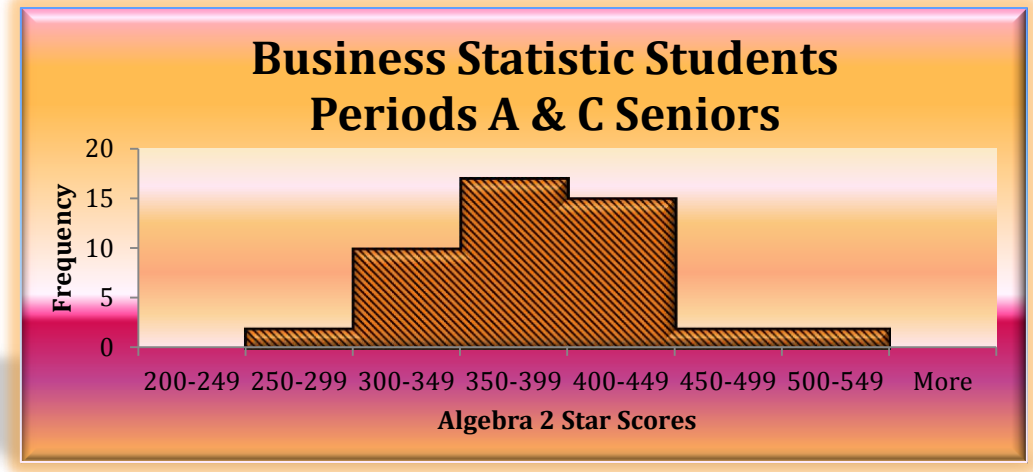
Spread: Range = **236** (points), IQR = **76** (points), $\sigma = 52.4$ (points)

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

Outliers: IQR Method: Adding 1.5 times the IQR to the third quartile value of **373.7** (points) results in an upper outlier threshold of **487.7** (points). Subtracting 1.5 times the IQR from the first quartile value of **297.7** (points) results in a lower outlier threshold of **183.7** (points). Examination of the data found one outliers that exceeded these thresholds, 500.

Standard Deviation (σ) Method: Adding and subtracting three standard deviations from the mean of **339.5** (points) establishes an upper outlier threshold of **496.8** (points) and a lower threshold of **182.2** (points). Examination of the data found one outliers that exceeded these thresholds, 500.

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



Population: Periods A & C Junior Business Statistics Students

Variable: Number of Applications **Type:** Quantitative, Interval, Discrete

Shape: A histogram was examined to determine the shape of the distribution. The histogram was displayed using a bin width of 5 (# of applications) increments.

This plot was found to be **uni**modal and highly skew right.

The Fisher skew statistic was 2.9. This statistic fell outside the computed range of **- 1.5 to +1.5** indicating that the distribution's shape is highly skew right.

Center: Mean = 7.7 (# of applications), Median = 5 (# of applications), Mode = 5 (# of applications)

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.

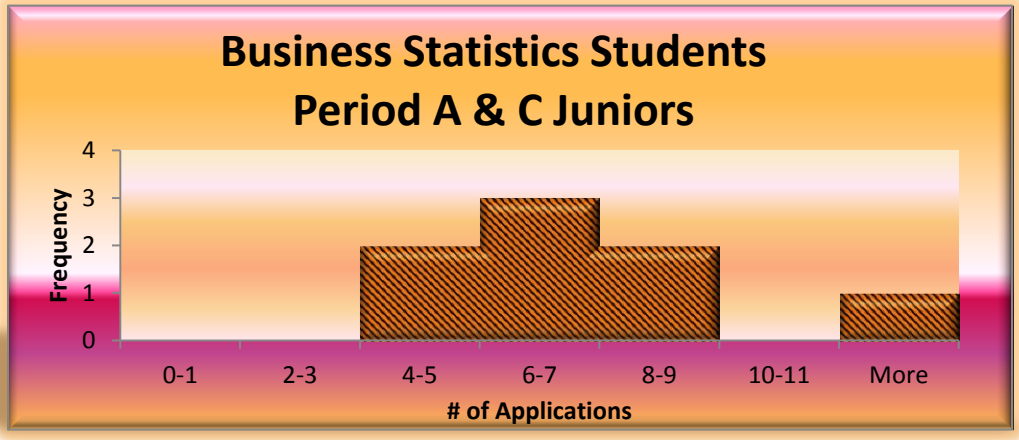
Spread: Range = 27 (# of applications), IQR = 2.75 (# of applications), $\sigma = 8$ (# of applications)

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 7 (# of applications) results in an upper outlier threshold of 11.1 (# of applications). Subtracting 1.5 times the IQR from the first quartile value of 4.25 (# of applications) results in a lower outlier threshold of 0.125 (# of applications). Examination of the data found 1 outlier that exceeded these thresholds, 30.

Standard Deviation (σ) Method: Adding and subtracting three standard deviations from the mean of 7.7 (# of applications) establishes an upper outlier threshold of 31.7 (# of applications) and a lower threshold of -16.3 (# of applications). Examination of the data found no outliers that exceeded these thresholds.

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



Population: Periods A & C Senior Business Statistics Students

Variable: Number of Applications **Type:** Quantitative, Interval, Discrete

Shape: A histogram was examined to determine the shape of the distribution. The histogram) was displayed using a bin width of **5** (# of applications) increments.

This plot was found to be **uni**modal and highly skew right.

The Fisher skew statistic was **1.9**. This statistic fell outside the computed range of **- 0.76 to + 0.76** indicating that the distribution's shape is highly skew right.

Center: Mean = **5.5**(# of applications), Median = **4.5**(# of applications), Mode = **5**(# of applications)

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.

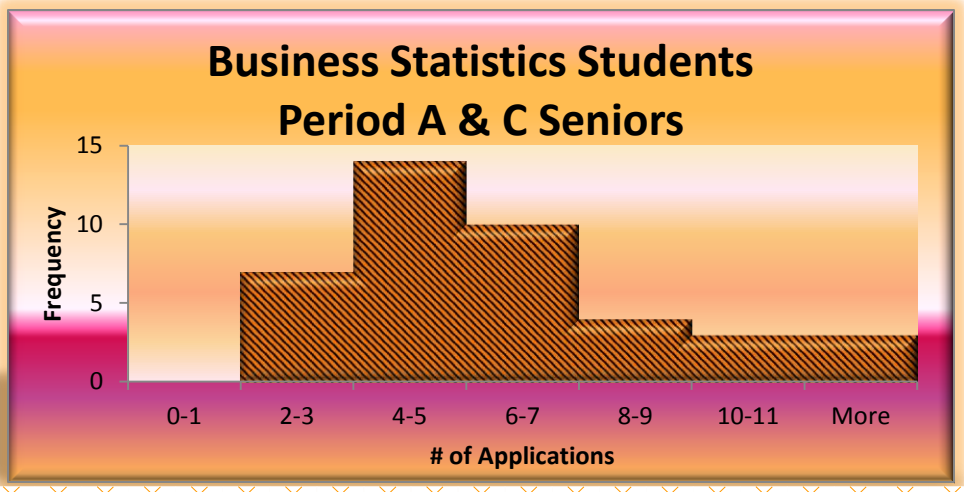
Spread: Range = **19** (# of applications), IQR = **3** (# of applications), $\sigma = 4$ (# of applications)

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 **6** (# of applications) results in an upper outlier threshold of **10.5** (# of applications). Subtracting 1.5 times the IQR from the first quartile value of **3** (# of applications) results in a lower outlier threshold of **-1.5** (# of applications). Examination of the data found 1 outlier that exceeded these thresholds, (20).

Standard Deviation (σ) Method: Adding and subtracting three standard deviations from the mean of **5.5** (# of applications) establishes an upper outlier threshold of **17.6** (# of applications) and a lower threshold of **-6.7** (# of applications). Examination of the data found 1 outlier that exceeded these thresholds. (20)

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



Variable: Projected Number of Jobs in the population of Periods A & C Junior Business Statistics Students

Variable: Projected Number of Jobs in the population of Periods A & C Seniors Business Statistics Students

	Periods A & C Junior Business Statistics Students	Periods A & C Seniors Business Statistics Students	**Comparison**
Shape	slightly skew right	highly skew right	The distribution for Periods A & C Junior Business Statistics Students is highly skew right) while the distribution for Periods A & C Seniors Business Statistics Students is slightly skew right.
Center	Mean = **1.7**(jobs) Median = **1**(jobs)	Mean = **2.1**(jobs) Median = **2**(jobs)	Since both distributions are skewed, the best measure for comparing central tendencies is the median. The center of the distribution for Periods A & C Junior Business Statistics Students is about 4 units lower than the distribution for Periods A & C Seniors Business Statistics Students.
Spread	Range =3 IQR = 1 $\sigma = 1.0$	Range = 9 IQR = 2 $\sigma = 1.6$	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 Periods A & C Seniors Business Statistics Students has more spread than the distribution for Periods A & C Junior Business Statistics Students.
Outliers	no Using the IQR Method	(10) Using the IQR Method	The distribution for Periods A & C Seniors Business Statistics Students has **1** outlier while the distribution for Periods A & C Junior Business Statistics Students has none.

Variable: Algebra 2 Star Scores in the population of Periods A & C Junior Business Statistics Students

Variable: Algebra 2 Star Scores in the population of Periods A & C Senior Business Statistics Students

	Periods A & C Junior Business Statistics Students	Periods A & C Senior Business Statistics Students	**Comparison**
Shape	slightly skew right	slightly skew left	The distribution for Periods A & C Junior Business Statistics Students) is slightly skew right while the distribution for Periods A & C Senior Business Statistics Students is slightly skew right.
Center	Mean= **383**(points) Median= **379**(points)	Mean = **339.5** (points) Median = **337** (points)	Since both distributions are skewed, the best measure for comparing central tendencies is the median. The center of the distribution for Periods A & C Junior Business Statistics Students is about 43.5 units higher than the distribution for Periods A & C Senior Business Statistics Students.
Spread	Range = 240 IQR = 91 $\sigma = 68.6$	Range = 236 IQR = 76 $\sigma = 52.4$	Since both distributions are skewed, the best measure for comparing spread are the range and interquartile range. Examination of these statistics shows both distributions have similar spreads.
Outliers	(300, 400, 500, 600) Using the IQR Method	(200, 300, 400, 500) Using the IQR Method	Neither distribution has outliers.

Variable: Number of Applications in the population of Periods A & C Senior Business Statistics students

Variable: Number of Applications in the population of Periods A & C Senior Business Statistics students

	Period A & C Business Statistics Seniors	Period A & C Business Statistics Juniors	Comparison
Shape	highly skew right	highly skew right	The distributions have the same shape.
Center	Mean = 5.5 (# of applications) Median = 4.5 (# of applications)	Mean = 7.7 (# of applications) Median = 5 (# of applications)	Since both distributions are skewed, the best measure for comparing central tendencies is the median. The center of the distribution for the Periods A & C Senior Business Statistics Students is about .5 units lower than the distribution for the Periods A & C Junior Business Statistics Students.
Spread	Range = 19 IQR = 3 $\sigma = 4$	Range = 27 IQR = 2.75 $\sigma = 8$	Since both distributions are skewed, the best measure for comparing spread is the range and interquartile range. Examination of these statistics shows the distribution for Periods A & C Junior Business Statistics Students has more spread than the distribution for Periods A & C Senior Business Statistics Students.
Outliers	(20) Using the IQR Method	(30) Using the IQR Method	The distribution for Periods A & C Senior Business Statistics Students has 1 outlier, while the distribution for Periods A & C Junior Business Statistics Students has 1 outlier.