

Vertical Progression:

6th Grade	<p>ELG 6.10 Summarize and describe distributions.</p> <ul style="list-style-type: none"> ○ 6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots. ○ 6.SP.B.5 Summarize numerical data sets in relation to their context, such as by: ○ 6.SP.B.5c Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. ○ 6.SP.B.5d Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.
7th Grade	<p>ELG 7.8 Draw informal comparative inferences about two populations</p> <ul style="list-style-type: none"> ○ 7.SP.B.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. <i>For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.</i> ○ 7.SP.B.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. <i>For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.</i>
8th Grade	<p>ELG 8.10 Investigate patterns of association in bivariate data.</p> <ul style="list-style-type: none"> ○ 8.SP.A.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

Students will demonstrate command of the ELG by:

- Measuring the difference between the centers of two data sets in terms of their mean absolute deviation.
- Finding the mean absolute deviation for data sets.
- Using measures of center and variability to make claims and comparisons about two populations.

Vocabulary:

- mean
- mean absolute deviation
- median
- mode
- population
- range
- sample
- variability

Sample Instructional/Assessment Tasks:

1) Standard(s): 7.SP.B.3-4

Source: <https://www.illustrativemathematics.org/content-standards/7/SP/B/3/tasks/1341>

Item Prompt:

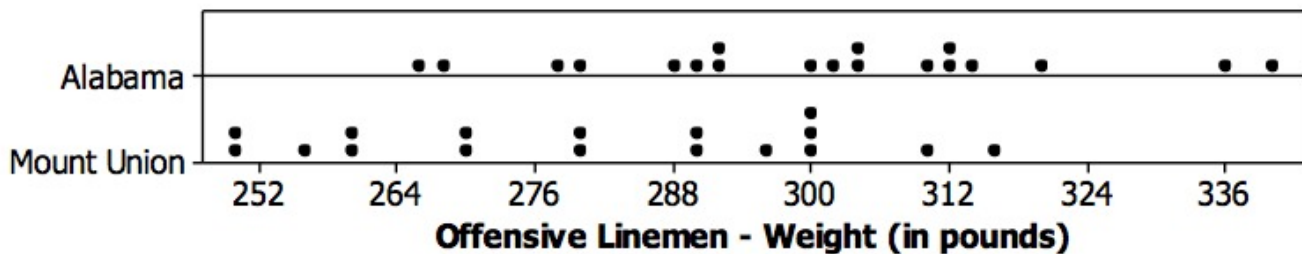
College football teams are grouped with similar teams into "divisions" (and in some cases, "subdivisions") based on many factors such as game attendance, level of competition, athletic department resources, and so on. Schools from the Football Bowl Subdivision (FBS, formerly known as Division 1-A) are typically much larger schools than schools of any other division in terms of enrollment and revenue. "Division III" is a division of schools with typically smaller enrollment and resources.

One particular position on a football team is called "offensive lineman," and it is generally believed that the offensive linemen of FBS schools are heavier on average than the offensive linemen of Division III schools.

For the 2012 season, the University of Mount Union Purple Raiders football team won the Division III National Football Championship while the University of Alabama Crimson Tide football team won the FBS National Championship. Below are the weights of the offensive linemen for both teams from that season.

(Accessed at <http://athletics.mountunion.edu/sports/fball/2012-13/roster>, <http://www.rolltide.com/sports/m-footbl/mtt/alab-m-footbl-mtt.html> on 1/14/13)

Alabama	Mount-Union
277	250
265	250
292	290
303	260
303	270
320	270
300	310
313	290
267	280
288	315
311	280
280	295
302	300
335	300
310	260
290	255
312	300
340	
292	



- Based on visual inspection of the dotplots, which group appears to have the larger average weight? Does one group seem to have greater variability in its weights than the other, or do the two groups look similar in that regard?
 - Compute the mean and mean absolute deviation (MAD) for each group. Do your measures support your answers in part (a)?
 - Choose from the following to fill in the blank: "The average Alabama offensive lineman's weight is about _____ than the average Mount Union offensive lineman's weight."
 - 20 pounds lighter
 - 15 pounds lighter
 - 15 pounds heavier
 - 20 pounds heavier
- "This difference in average weights is approximately _____ of either team."
- About half of the MAD
 - Slightly more than 1 MAD
 - Twice the MAD
- The offensive linemen on the Alabama team are not a random sample from all FBS offensive linemen. Similarly, the offensive linemen on the Mount Union Team are not a random sample from all Division III offensive linemen. However, for purposes of this task, suppose that these two groups can be regarded as random samples of offensive linemen from their respective divisions/subdivisions. If these were random samples, would you think that offensive linemen from FBS schools are typically heavier than offensive linemen from Division III schools? Explain your decision using answers to the previous questions and/or additional analysis.

Solution

- The center of the Alabama distribution is much higher on the number line than the center of the Mount Union distribution, so at first glance, it appears that the Alabama group has the higher average. The values for the Alabama distribution appear to have a spread and general concentration that is very similar to the Mount Union distribution, so we would conjecture that the distributions' spread measures would be rather similar.
- Alabama mean = 300, MAD = 15.68; Mount Union: mean = 280.88, MAD = 17.99
- D (20 pounds heavier); B (Slightly more than 1 MAD)
- Yes, it appears that offensive linemen from such FBS schools such as Alabama are typically heavier than Division III offensive linemen. In addition to any arguments/statements made earlier regarding the dotplots and summary measures, one could also mention that only 2 of the 17 Mount Union offensive linemen were above the average of the Alabama distribution, only 3 of the 19 Alabama offensive linemen are below the Mount Union average, and similar comparative arguments.

2) Standard(s): 7.SP.B.4

Source: <http://www.insidemathematics.org/assets/common-core-math-tasks/ducklings.pdf>

Item Prompt:

A local nature club is carrying out a survey of the number of ducklings in each family of ducks on a lake.

Here are the results of their survey:

4, 7, 6, 5, 8, 7, 5, 4, 10, 4, 9, 6, 5, 4, 4, 5, 9, 8, 4

- a. Write the results of the survey in the table below. The first box had been completed for you.

Number of ducklings in a family	4	5	6	7	8	9	10
Number of families	6						

- b. Find the median number of ducklings in each family.
 c. Calculate the mean number of ducklings in each family.
 d. After the survey, the nature club noticed a new family of ducks. Adding this family to the data did not change the mean of the survey. How many ducklings were in the new family? Explain how you know this.

Correct Answers:

- a.

Number of ducklings in a family	4	5	6	7	8	9	10
Number of families	6	4	2	2	2	2	1

- b. 5
 c. 6
 d. 6 explanations may vary

Note: Further explanation of the answers and examples of student work can be found via the link.