

## SD Common Core State Standards Disaggregated Math Template

|                |                            |                 |  |                     |   |
|----------------|----------------------------|-----------------|--|---------------------|---|
| <b>Domain:</b> | Statistics and Probability | <b>Cluster:</b> | Develop understanding of statistical variability | <b>Grade level:</b> | 6 |
|----------------|----------------------------|-----------------|--|---------------------|---|

| Correlating Standard in Previous Year | Number Sequence & Standard   | Correlating Standard in Following Year  |
|---------------------------------------|--|---|
| NA                                    | <p>6.SP.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.</p> <p><i>For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.</i></p> | <p>7.SP.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.</p> <p>based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.</p> |

| Student Friendly Language:  |
|---|
| I can tell the difference between statistical questions and those that are not. |
| I can write a statistical question.   |

| Know<br>(Factual)  | Understand<br>(Conceptual)<br>The students will understand that: | Do<br>(Procedural, Application, Extended Thinking)  |
|--|--|---|
| <ul style="list-style-type: none"> <li>Examples of numerical data</li> <li>Question-writing</li> </ul> | A statistical question is open-ended.                            | <p>Recognize statistical questions.</p> <p>Formulate questions that anticipate variability in a population.</p> |

| Key Vocabulary:   |
|---|
| statistical question      data      variability      population      poll      survey   |
| <b>Relevance and Applications:</b> How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?  |
| Gathering data: "Identify which Presidential candidate your classmates support."<br>Conducting polls: "Ascertain community support for a new city swimming pool."<br>Finding a consensus: "Survey which architectural plan is best for the new middle school."<br>Finding an average: "Find the average time it takes community members to commute to work each day,"<br>"How many hours per week do my classmates sleep?", or "How many hours per week do my classmates watch television?" |

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| Correlating Standard in Previous Year | Number Sequence & Standard  | Correlating Standard in Following Year  |
|---------------------------------------|---|---|
|                                       | 6.SP.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. | 7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. 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. |

### Student Friendly Language:

When given a data set, I can describe its distribution using its center (median or mean), outliers, and range.

| Know<br>(Factual)  | Understand<br>(Conceptual)<br>The students will understand that:   | Do<br>(Procedural, Application, Extended Thinking)   |
|--|--|--|
| <ul style="list-style-type: none"> <li>Distribution representations including line plots, histograms, box and whisker plots, and pictographs</li> <li>Statistical questions</li> </ul> | <p>Distribution can be described using center and range.</p> <p>Data collected can be represented on graphs which show the shape of the data distribution.</p> | <p>Interpret the distribution of a data set</p> <p>Summarize and describe a data set's center and overall shape using range, peak, median, average, and mean.</p> <p>Create a data display from the results of a statistical question.</p> |

### Key Vocabulary:

center    mean    average    median    range    peak    distribution    dot plots    histogram  
 box and whisker plot    pictograph    frequency table    statistical questions    minimum    maximum

**Relevance and Applications:** How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question “why do I have to learn this”?

When given a distribution representation of any of the following examples, describe its center, spread, and overall shape.

Analyze store inventory

Bowling scores

Test scores

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| Correlating Standard in Previous Year | Number Sequence & Standard   | Correlating Standard in Following Year  |
|---------------------------------------|--|---|
| no previous standard                  | 6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number. | 7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. 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. |

**Student Friendly Language:**

When given a set of data, I can calculate the mean, median and/or mode to represent my data with one number.  
 When given a set of data, I can calculate the range to show the variation in my data.

| Know<br>(Factual)  | Understand<br>(Conceptual)<br>The students will understand that:   | Do<br>(Procedural, Application, Extended Thinking)  |
|--|--|---|
| <ul style="list-style-type: none"> <li>• Measures of Center                             <ul style="list-style-type: none"> <li>○ Mean - average</li> <li>○ Median - middle</li> </ul> </li> <li>• Measures of Variation                             <ul style="list-style-type: none"> <li>○ Range - the difference between the largest data point and the smallest</li> </ul> </li> </ul> | Measures of center produce a single number to describe the data set.<br>Measures of variation describe the spread of a set of data.<br>In order to find the median, the data must first be ordered from least to greatest.<br>If there are two middle numbers, we find the average of those two numbers. | Calculate the mean, median, and range.<br><br>Explain which measure of center best represents the data and why.<br><br>Explain the meaning of the measures of center and the measures of variation in context of a real-world situations. |

**Key Vocabulary:**

data      mean      median      range      center      outliers      inference      population  
 measures of center      measures of variation      skewed      most common      least common      typical

**Relevance and Applications:** How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question “why do I have to learn this”?

A teacher would like to know how his/her class performed on an assessment. Calculate the mean, median, mode and range. Which looks to be an outlier? Is the range an accurate representation of the data?

How much time (outside) of class are students working on homework? Interview your classmates and find the mean, median, mode, and range. Which would you use to persuade the teacher that he/she is assigning too much homework?

How many calories are in a cheeseburger? Gather data from at least 5 eating establishments and find the mean, median, mode and range. Display your findings in a bar graph and a box and whisker plot.

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|                |                            |                 |                                      |                     |   |
|----------------|----------------------------|-----------------|--------------------------------------|---------------------|---|
| <b>Domain:</b> | Statistics and Probability | <b>Cluster:</b> | Summarize and describe distributions | <b>Grade level:</b> | 6 |
|----------------|----------------------------|-----------------|--------------------------------------|---------------------|---|

| Correlating Standard in Previous Year  | Number Sequence & Standard  | Correlating Standard in Following Year   |
|--|---|--|
| <p>5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit (<math>1/2, 1/4, 1/8</math>). Use operations on fractions for this grade to solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.</p> | <p>6.SP.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.</p> | <p>7.SP.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</p> |

| Student Friendly Language:  |
|---|
| <p>I can create a number line.<br/>I can use dot plots, histograms, and box and whisker plots to display my data.</p> |

| Know<br>(Factual)  | Understand<br>(Conceptual)<br>The students will understand that:  | Do<br>(Procedural, Application,<br>Extended Thinking)   |
|--|---|---|
| <ul style="list-style-type: none"> <li>● Number line</li> <li>● Dot plot</li> <li>● Histogram</li> <li>● Box and whisker plots</li> <li>● Intervals/increments</li> <li>● Outliers</li> <li>● Quartiles</li> </ul> | <p>Numerical data can be displayed in various ways.</p> <p>Some visual representations can be misleading.</p> <p>A box plot uses outliers.</p> <p>A histogram can also be a bar graph.</p> <p>Using intervals/increments can change the appearance of a number line.</p> <p>Dot plots are simple plots on a number line where each dot represents a piece of data in the data set</p> <p>Dot plots are suitable for small to moderate size data sets and are useful for highlighting the distribution of the data including clusters, gaps, and outliers.</p> <p>A histogram shows the distribution of continuous data using intervals on the number line.</p> <p>A box plot shows the distribution of values in a data set by dividing the set into quartiles.</p> | <p>Create a number line using a dot plot.</p> <p>Explain and demonstrate why certain visual aides can be misleading.</p> <p>Make inferences when presented data and number lines.</p> <p>Create a histogram using equal intervals.</p> <p>Identify the quartiles in a box and whisker plot.</p> <p>Create a box and whisker plot.</p> |

**Key Vocabulary:**

|          |             |                 |           |           |                       |                      |
|----------|-------------|-----------------|-----------|-----------|-----------------------|----------------------|
| data     | number line | dot plot        | histogram | bar graph | box and whisker plots | intervals/increments |
| outliers | inference   | frequency table |           | minimum   | maximum               | quartiles            |

**Relevance and Applications:** How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question “why do I have to learn this”?

An office manager would like to see how many sick days his/her employees used during the year. Create a number line to showcase the information.

How much time (outside) of class are students working on homework? Interview your classmates and create a number line to show the data. Prepare a letter or a speech to give to your teacher explaining how he/she could change their homework procedure.

How many times a week does a family eat out? Gather data from 50 students and create a box and whisker plot showing your data. What conclusions can you draw from your plot?

Nineteen students completed a writing sample that was scored on organization. The scores for organization were 0, 1, 2, 2, 3, 3, 3, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 6, 6. Create a data display. What are some observations that can be made from the data display?

Students can use applets to create data displays. Examples of applets include the Box Plot Tool and Histogram Tool on NCTM's Illuminations.

Box Plot Tool - <http://illuminations.nctm.org/ActivityDetail.aspx?ID=77>

Histogram Tool -- <http://illuminations.nctm.org/ActivityDetail.aspx?ID=78>

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| <b>Domain:</b> | Statistics and Probability | <b>Cluster:</b> | Summarize and describe distributions. | <b>Grade level:</b> | 6 |
|----------------|----------------------------|-----------------|---------------------------------------|---------------------|---|

| <b>Correlating Standard in Previous Year</b>  | <b>Number Sequence &amp; Standard</b>   | <b>Correlating Standard in Following Year</b>   |
|---|---|---|
| 5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit ( $\frac{1}{2}$ , $\frac{1}{4}$ , $\frac{1}{8}$ ). Use operations on fractions for this grade to solve problems involving information presented in line plots. <i>For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.</i> | 6.SP.5 Summarize numerical data sets in relation to their context, such as by:<br>a. Reporting the number of observations.<br>b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.<br>c. 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.<br>d. 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. | 7.SP.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> |

|  |
|--|
| <b>Student Friendly Language:</b>  |
| I can summarize data sets by identifying the number of observations.<br>I can summarize data sets by showing how the data was collected and the units of measurements used.<br>I can summarize data sets by describing patterns and measures of the center and variability.<br>I can choose a measure of center that best describes a specific data set. |

| <b>Know (Factual)</b>   | <b>Understand (Conceptual)</b><br>The students will understand that:  | <b>Do (Procedural, Application, Extended Thinking)</b>  |
|---|---|---|
| <ul style="list-style-type: none"> <li>Measures of center</li> <li>Measures of variability</li> <li>Mean absolute deviation</li> <li>Data distribution</li> </ul> | Data can be displayed and interpreted numerous ways.<br><br>Data can be examined to find measures of center which are mean and median.<br><br>Data can be examined in measures of variability which are range, interquartile range (IQR), outliers and mean absolute deviation.<br><br>The shape of the data can tell a story about a set of data | Describe a data set including the number of observations, how it was collected and units of measurement.<br>Describe the box plot, dot plot and histogram using the measures of center and variability.<br>Using the same box plot, examine the interquartile range or mean absolute deviation and analyze the data for possible outliers.<br>Determine if a set of data has any outliers.<br>Discuss the effect of outliers on a set of data and how "mean absolute deviation (MAD)" or by just looking at the interquartile range can better describe the data distribution in a set of numbers.<br>Analyze the mean, mode and median of a set of data and decide which central tendency best illustrates this set of numbers and support their opinion with a viable argument. |

|   |
|---|
| <b>Key Vocabulary:</b>  |
| numerical data sets      observations      measures of center (central tendencies)      median      mean deviation<br>measures of variability      interquartile range      range      mean absolute deviation<br>data distribution      outlier      skewed      five number summary |

**Relevance and Applications:** How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question “why do I have to learn this”?

The weather service has asked you to find the average precipitation in your region for the month of April. What measure of center would most accurately convey the average? How might the measure of center you select depend on the specific data points?

Your teacher is trying to determine your grade for the semester. How would you advise your teacher to compile your test scores into one grade? What measure of center would be most appropriate?

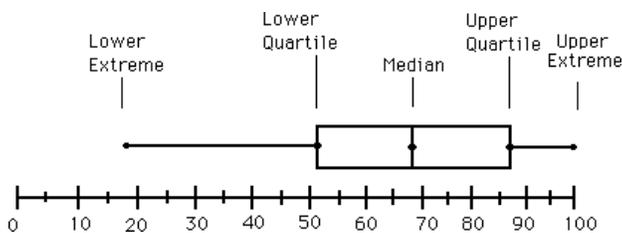
Tammy Sue has four 20-point projects for math class. Tammy Sue’s scores on the first 3 projects are shown below:  
 Project 1: 18  
 Project 2: 15  
 Project 3: 16  
 Project 4: ??

What does she need to make on Project 4 so that the average for the four projects is 17? Explain your reasoning.

*Solution:*

One possible solution to is calculate the total number of points needed ( $17 \times 4$  or 68) to have an average of 17. She has earned 49 points on the first 3 projects, which means she needs to earn 19 points on Project 4 ( $68 - 49 = 19$ ).

What is the IQR of the data below:



*Solution:*

The first quartile is 52; the third quartile is 87. The IQR is 35, which is  $(87-52)$ . This value indicates that the values of the middle 50% of the data vary by 35.

The following data set represents the size of 9 families:

3, 2, 4, 2, 9, 8, 2, 11, 4.

What is the MAD for this data set?

*Solution:*

The mean is 5. The MAD is the average variability of the data set. To find the MAD:

1. Find the deviation from the mean.
2. Find the absolute deviation for each of the values from step 1
3. Find the average of these absolute deviations.

The table below shows these calculations:

| Data Value | Deviation from Mean | Absolute Deviation |
|------------|---------------------|--------------------|
| 3          | -2                  | 2                  |
| 2          | -3                  | 3                  |
| 4          | -1                  | 1                  |
| 2          | -3                  | 3                  |
| 9          | 4                   | 4                  |
| 8          | 3                   | 3                  |
| 2          | -3                  | 3                  |
| 11         | 6                   | 6                  |
| 4          | -1                  | 1                  |
|            |                     | $26/9 = 2.89$      |

This value indicates that on average family size varies 2.89 from the mean of 5.