**Total Time needed 70 minutes**

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| **Handouts:**   * Exploring Data Sets Task | **Materials:**   * TI-Navigator * TI-Nspires * ***Exploring Data SetsPart1.tns*** * ***Exploring Data SetsPart2.tns*** * Nspire QuickPoll documents ready to go. |

**Objective**

Students will create their own data sets that have the same means but different variability. They will test their conjectures of which sets have more variability using the Nspire. Students reflect on and explain their thinking and describe previously held misconceptions they may have. Students will communicate to others their understanding of how the mean, spread, and shape of a data set are related.

**Introduction (10 minutes)**

Begin the task by telling students we are going to explore sets of numbers that they make up themselves. Tell students they have **7 minutes** to complete the following portion of the task through #1 and #2. DO NOT send the accompanying TI Nspire document to the students yet.

*Without doing any hand calculations (relying on your intuitive understandings), create three sets of ten integers from 0 to 10 that all have the same mean but different amounts of variability. Write your sets in the space provided and answer the following questions.*

*Set1:*

*Set2:*

*Set3:*

Anticipated responses:

* all the same number
* 1,2,3,...,9,10
* 2 3s. 2 4s. 2 5s. 2 6s. 2 7s
* 8 5s 1 4s. 1 6s
* 5 1s. 5 9s

*1. Which set has the most variability?*

*2. Which set has the least variability?*

Anticipated responses:

* Students will vary in their approaches to determining variability. Some may display the misconception that even spread of data (2 of each value) makes the data set more variable.

**Dotplot Nspire Portion (30 minutes)**

Send the Part 1 Nspire document to students and direct them to open it. Tell students it will be important for us to step through the document together and not to skip ahead. Direct students to enter their data sets where the document asks them to and to use pages 1.3-1.5 to investigate their initial conjectures in #1 and #2 above. Tell students they will have **5 minutes** to enter their data. They will have an additional **10 minutes** to explore with pages 1.3 – 1.5 (drag points if they wish) and write an answer to Question A below. After 5 minutes of exploration, remind students that there is only 5 minutes remaining for them to answer Question A.

***Open the TI-Nspire document Exploring Data SetsPart1.tns***

*Enter your number sets into the Nspire on sheet 1.2. Double check to make sure your data sets indeed have the same means (and make adjustments if necessary) on pages 1.3-1.5.*

1. *Were you correct with your predictions of which data set had the most and least variability? What do you think influenced your initial intuitions? How has your initial thinking changed after thinking through pages 1.3-1.5?*

Conduct an open response Quickpoll to get students’ responses to question A in the system. This will take **5 minutes**.

Anticipated responses:

* The mean distance of all the data points in the data set from mean is an intuitive way of thinking about spread.
* Some students may think “even” spread is “more” spread.
* Some students may think that data lumped in the middle with a couple of extreme outliers is more variable than data that has a lot of data points on both ends of the range.

Conduct a **10 minute** discussion of students’ responses to this Quickpoll to bring out students’ misconceptions and adjustments to thinking. Ask Students to share their pages 1.3 – 1.5 in the discussion. Also, include the exploring data sets **model student** sets 1, 2, and 3 as potential responses noting the skewed distribution. Ask if the mean is a good measure of typical in each case. Use the dotplots to model the **mean as balance point** (if we move one point toward the mean one unit on one side, we must move another point one toward the mean on the other side to maintain balance). A larger spread would require more distance moving of points. Tell students that “average distance from the mean” is one informal way of understanding what the standard deviation of a data set tells us. Also bring 50 Unifix cubes and model data sets in the model student file as fair share as a way of understanding the mean at GAISE level A (data could be seen in the context of 10 friends bring xx number of cookies and wish so share them equally).

Next, send Question #3 as a multiple choice Quickpoll with “A) Go up, B) Stay the same, C) Go down as the choices.” Then, have the students view pages 1.8 – 1.10 and write down a response for Question B below. (**10 minutes total**)

*3. If we add 100 to each value in all 3 of your data sets, how will this affect the mean and average distance from the mean of those data sets? Respond below.*

*Mean:  
Average distance from the mean:*

Anticipated responses:

* Go up 100 for both

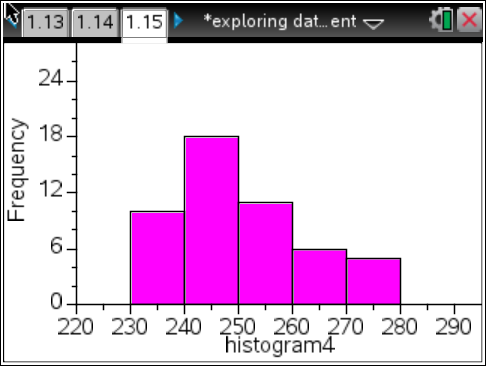
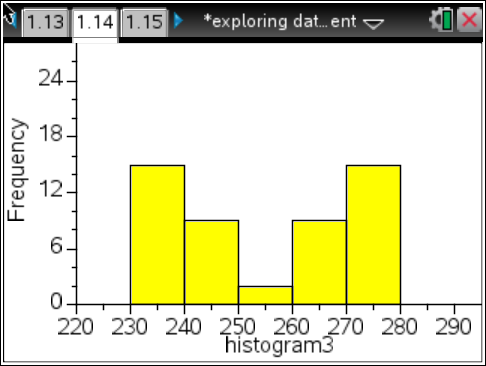
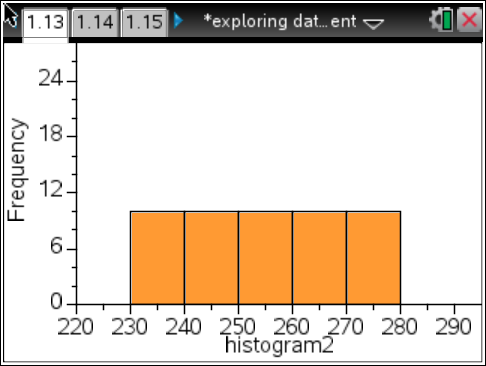
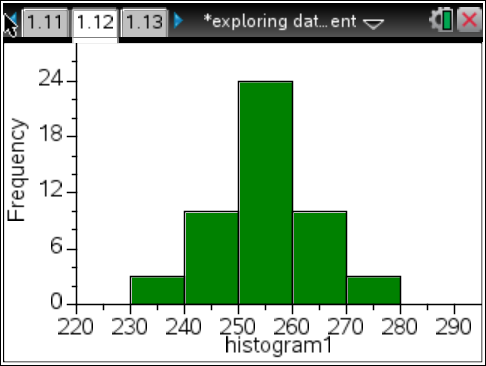
1. *View pages 1.8-1.10 to check your conjectures in #3 above. Were you correct with your predictions regarding the mean and average distance from the mean? What do you think influenced your initial intuitions? How has your initial thinking changed after thinking through pages 1.8-1.10?*

Tell students they will have an opportunity to re-visit this portion when they reflect on their understanding at the end of the task.

**Histogram Nspire Portion (10 minutes)**

Direct students to spend **2 minutes** individually ranking the histograms below from most variable to least variable. Send out a multiple choice Quickpoll to see which students believe will be most and least variable. Write some students’ ranking conjectures on board (**5 minutes**). Continued below…

*4. Consider the histograms below. Which of these histograms have the most variability? Rank the histograms from the most variable to the least. Respond below.*



Send the file ***Exploring Data SetsPart2.tns*** to the students. Give students time to reflect on the Nspire document and to discuss it in groups. Tell them they have **5 minutes** to write a response to Question C below.

***Open the TI-Nspire document Exploring Data SetsPart2.tns***

1. *After viewing pages 1.2 – 1.5 in this Nspire document, where you correct with your predictions of which histogram had the most and least variability? What do you think influenced your initial intuitions? How has your initial thinking changed after seeing the results of the QuickPoll and class discussion?*

**Assessment Portion (20 minutes)**

Give groups chart paper to communicate their responses to Questions 5 and 6. These prompts are meant to give students an opportunity to explained what they learned from this task regarding data sets, the mean, variability, etc. Give students 10 minutes to create posters, 10 minutes to report out.

*Respond to the questions below using words, pictures, and/or symbols.*

*5. Communicate your understanding of the variability of a set of numbers. Include thoughts on variability's relationship to the mean and shape of the distribution of the set.*

Anticipated response:

Variability can be thought of as range, but viewing it as mean distance from the mean is more dynamic. The value of the mean does not necessarily affect the variability of the data set. Variability has to do with the spread of the data set, which can be seen by measuring how far from the mean each data point is and averaging that. It can also be seen by looking at the shape of the distribution and imagining moving data points toward the middle one unit at a time. The more we would have to move, the more the variability.

*6. Communicate your understanding of the mean of a set of numbers. Include thoughts on the mean's relationship to the variability and shape of the distribution of the set.*

Understand mean as balance point. Also, understand that the mean can be pulled toward outliers and away from what’s typical.

**Total Time needed 75 minutes**