Lesson Plan: Exploring Variance and Standard Deviation with Desmos

Objective:

Students will understand and calculate the variance and standard deviation of a data set using the Desmos graphing calculator.

Materials:

- Computers or tablets with internet access
- Desmos Graphing Calculator (accessible via Desmos.com)
- Handouts with data sets or access to a shared document

Lesson Duration:

45-60 minutes

Introduction (10 minutes)

1. **Introduce Key Concepts**:
   - Briefly review what variance and standard deviation measure: the spread or dispersion of a data set.
   - Explain the formulas for variance (

$$\sigma^2$$

     for population or

$$s^2$$

     for sample) and standard deviation (

$$\sigma$$

     for population or

$$s$$

     for sample).
     - Variance:

$$\sigma^2 = \frac{1}{N}\sum(x_i - \mu)^2$$

       (for population) or

$$s^2 = \frac{1}{n-1}\sum(x_i - \bar{x})^2$$

(for sample)

- Standard Deviation:

$$\sigma = \sqrt{\sigma^2}$$

or

$$s = \sqrt{s^2}$$

2. **Introduce Desmos**:
   - Show students how to access and use the Desmos graphing calculator.
   - Explain that they will use Desmos to visualize data and compute variance and standard deviation.

Guided Practice (15 minutes)

1. **Create a Data Set**:
   - Provide students with a simple data set or allow them to choose one. For example, use: [3, 7, 5, 9, 10].
2. **Enter Data into Desmos**:
   - Guide students to enter the data into Desmos:
     - Have them input the data into a list. For instance, in Desmos type: `A = [3, 7, 5, 9, 10]`.
3. **Calculate Mean**:
   - Show how to calculate the mean using Desmos:
     - Type `mean(A)` in Desmos to get the mean value.
4. **Compute Variance and Standard Deviation**:
   - Calculate variance and standard deviation using Desmos functions:
     - Variance for sample: `variance(A)`
     - Standard Deviation for sample: `stdev(A)`
5. **Verify Results**:
   - Have students compare their Desmos results with hand-calculated values to ensure understanding.

Independent Practice (15-20 minutes)

1. **Provide Additional Data Sets**:
   - Distribute different data sets to students or have them use a data set from a given source (e.g., data from a class survey, sports statistics).
2. **Perform Calculations**:
   - Students use Desmos to calculate the mean, variance, and standard deviation for their data sets.
3. **Interpret Results**:
   - Ask students to interpret the meaning of their results in the context of their data. For example, what does the standard deviation tell them about the spread of their data?

Closure (5-10 minutes)

1. **Discuss Findings**:
   - Have a class discussion about what students observed. Were there any surprises? How did the variance and standard deviation help them understand the data better?
2. **Recap and Q&A**:
   - Summarize key points and answer any remaining questions. Reiterate the importance of variance and standard deviation in analyzing data.
3. **Homework/Extension**:
   - Assign a set of data for students to analyze at home or provide additional practice problems.

Additional Tips:

- **Interactive Desmos Features**: Use Desmos' built-in statistical functions and plots to help visualize data distributions and calculations.
- **Group Work**: Consider having students work in pairs or small groups to foster collaboration and discussion.
- **Scaffold Learning**: If needed, provide step-by-step guides or videos for using Desmos to ensure all students are comfortable with the tool.

This lesson plan should give students a hands-on experience with variance and standard deviation while utilizing Desmos to facilitate their learning.