Normal Curve Application

TEACHER NOTES

Math Objectives

- Determine how changes in the mean or standard deviation are reflected in the data of a real-world problem.

- Compare the graphs of two normal curves and answer questions relating to a real-world problem.

Vocabulary

- normal curve

- mean

- standard deviation

About the Lesson

- This lesson is a follow-up lesson to the Statistics activity *Normal Curve Family*.

- The intent of the lesson is to help students make the connection between the mean and standard deviation of a normal curve and a real-world context.

- Students change the values of the mean and standard deviation using sliders. The changes in the values are reflected in the graph of the normal curve. Using the endpoints given, students will relate these changes to the real-world situation of test scores.

- A *Lists & Spreadsheet* application is used to graph the normal curve of two different sets of data given the mean and standard deviation. Students will use the shape and the range of the curve to make a comparison between the two curves.

Related Lessons

- Prior to this lesson: Normal Curve Family

- After this lesson: *Z*-scores and the Empirical Rule
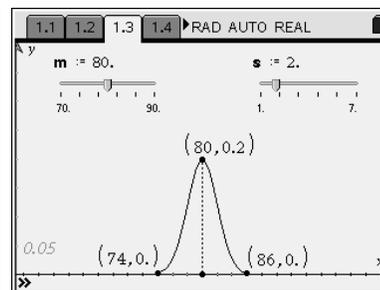
TI-Nspire™ Technology Skills:

- Download TI-Nspire document
- Open a document
- Move between pages
- Grab slider to change values
- Enter values in a spreadsheet

Tech Tips:

- *Make sure the **font size** on your TI-Nspire handhelds are set to Medium.*

Lesson Materials:

Student Activity

Normal_Curve_App_Student.PDF

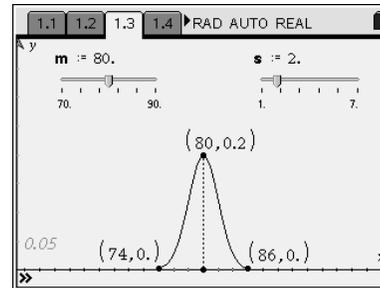*Normal_Curve_App_Student.DOC*

TI-Nspire document
Normal_Curve_App.tns

Discussion Points and Possible Answers:

TI-Nspire Problem/Page 1.3

Tech Tip: *In this activity, students will not move the three points on the curve. To change the value of **m** or **s**, students should move the cursor to the corresponding up and down arrows and, when the arrow becomes shaded, press ⊙ .*

1. What happens to the range of test scores as the standard deviation is increased? As it is decreased?	**The range increases when the standard deviation is increased and decreases when it is decreased.** ***Teacher Tip:*** *Students should focus more on the values of the x-coordinates for the points on the screen. The y-coordinates hold no value for this activity.*
2. If the mean of your class's scores is 80 and the standard deviation is 6, what is the lowest score you would most likely get?	**62**
3. As the standard deviation is changed, what do you notice about the mean? Why do you think this happens? *Hint: Use the test scores to explain your answer.*	**The mean does not change. It does not change because normally distributed data are symmetric about the mean. If one test score that is below the mean gets closer to the mean, there is a test score above the mean that moves the same distance closer to the mean.**
4. To maintain a normal curve, how would the test scores have to change to increase the mean of the scores? To decrease the standard deviation?	**To increase the mean, ALL of the test scores would have to increase. To decrease the standard deviation, all students with grades in the tails of the curve would have to score closer to the mean test score.**

TI-Nspire Problem/Page 2.2
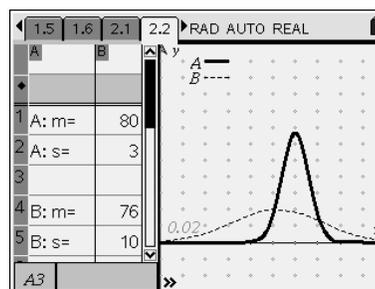
Tech Tip: *The curve for A or B will not appear until both the values for the mean and standard deviation have been entered in the spreadsheet.*

5.	Compare the curves of classes A and B in relation to the problem.	**Class A has a higher average test score, and more of the test scores fall closer to the mean. Class B's test scores have a wider range.**
		*Tech Tip: If students want to find the range of the test scores, they can use the **Point On** tool to place a point on the curve and then drag the point, observing the x-coordinate. They should not use the **Graph Trace** tool, as it will change the window settings.*
6.	Suppose the highest score possible for this test is 100. In which class are you more likely to get a better score? In which class is it possible to get the highest score?	**Class A; Class B**
7.	In which class would you rather be? Explain.	**Answers may vary. Sample: I would rather be in Class A because the overall test performance of the class is higher, even though Class B provides the opportunity to do better than the best student in Class A.**

Wrap Up:

Upon completion of the discussion, the teacher should ensure that students understand:

- How changes in the mean and standard deviation are reflected in the real-world data.
- How to compare two normal curves.