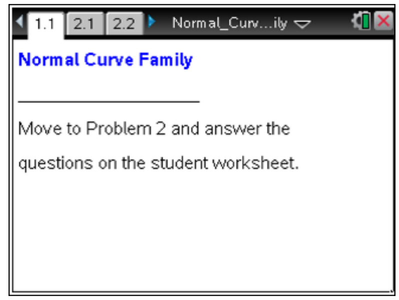
Exploring the Normal Curve Family

Student Activity

Name ________________

Class ________________

Open the TI-Nspire™ document *Normal_Curve_Family.tns*.



Have you ever heard a distribution described as *normal* or *approximately normal*? In this activity, you will investigate the family of normal curves and discover the defining characteristics of all curves in the family.

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1. The distributions of many real-world variables can be closely approximated by a normal distribution. The equation of a normal curve is approximately $p(x) \approx \frac{0.4}{\sigma} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$, where μ is the mean and σ is the standard deviation.
   a. Describe the shape, center, and spread of the curve on page 2.1.

   b. Find $p(1)$ when $\mu = 1$ and $\sigma = 1$. Explain how this point relates to the graph.

   c. Use the arrows to change μ and σ. Describe the changes in the graph of the normal curve.

2. The point at which a graph changes from concave up to concave down is called the **point of inflection**. How far is a point of inflection from the center of the graph? Explain how you know.

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3. a. Two characteristics of this curve are the maximum point (center) and the distance from the center to the point of inflection (measure of spread). Use the arrows to change μ and σ. Describe how the parameters in the equation affect the maximum point and why.

b. Predict the center, shape, and spread of the curve if $\mu = 3$ and $\sigma = 2$. Verify your prediction using the sliders.

Move to page 3.1.

4. Consider the dashed curve.
   a. Predict the values for μ and σ that were used to create the graph. Explain why you think your prediction makes sense.

   b. Verify the predictions by typing values into Column B of the spreadsheet. (The dotted line will become solid when you have the correct values.)

Move to page 4.1.

5. a. Describe the axis of symmetry for the curve.

   b. What happens to the axis of symmetry as μ and σ change?

6. a. The length of the segment connecting the point of inflection and the axis of symmetry represents the standard deviation. Describe the changes in the graph as the standard deviation increases.

   b. Compare a normal curve with a mean of –2 and a standard deviation of 1 to a normal curve with a mean of 1 and a standard deviation of 1.

7. a. Calculate the area of one grid box, and then count boxes to approximate the area between the curve and the horizontal axis when μ = 0.6 and σ = 1.8. (Note that the horizontal scale is marked in 1 unit intervals and the vertical scale is marked in 0.1 unit intervals.)

   b. Change the value of μ. Predict the total area between the curve and the horizontal axis. Verify by counting the boxes.

   c. Set μ to 0, and change the value of σ to 0.5. Use the grid boxes to approximate the area between the curve and the horizontal axis.

   d. Change σ to a new value. Predict the area between the curve and the horizontal axis. Verify by counting the boxes.

8. A normal curve has defining characteristics related to shape, center, spread, and area. What are these characteristics, and how can you recognize them in a graph?