**Total Time needed 45 minutes**

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| **Handouts:**   * What is Normal Task | **Materials:**   * TI-Navigator * TI-Nspires * ***What is Normal StaRT.tns*** * Nspire QuickPoll documents ready to go. |

**Objectives**

The students will identify patterns that define the normal distributions and use the patterns to classify other distributions as normal.

**Problem 1 (15 minutes)**

Send the Nspire file to the students and ask them to read page 1.2 and 1.3. Tell students to answer question 1 and then randomly call on students to check for accuracy. The purpose of this question is to make sure students can read the table.

*Suppose you were to roll a standard die. The result is considered a success if the die shows a 3. This occurs with a probability of 1/6.*

*What if you roll the die 300 times? About how many times would you expect a success? We expect about 50, but we also expect our results to be different from trial to trial.*

*In statistics, this is called* ***sampling variability****. The collection of all possible successes from all possible trials would be called the* ***sampling distribution****.*

*On page 1.4, a simulation of this experiment (100 trials of rolling a die 300 times) has been performed.*

*1 row = 1 trial*

*Column B = # of successes in each trial.*

1. *What happened in the first trial of this experiment? The second? The 100th?*

Anticipated responses

* The students may struggle with scrolling to find the result of the 100th trial.
* They might identify success as a 6 instead of a 3.

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Once you are confident that the students can correctly read interpret the data, they may continue to page 1.5 and page 1.6. After answering question 2, they should submit one conjecture via **QUICKPOLL.** You should lead a discussion to gauge the validity of these conjectures.

*Page 1.6 shows a histogram of the successes. This histogram is an approximation of the sampling distribution of all possible successes.*

1. *What conjectures can you make about the distribution of the number of success?*

Anticipated responses

* 50 is the most likely success.
* The only possible successes are between 36 and 64.
* It is not possible to get 40 successes.
* Most samples yield between 40 and 60 successes.

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**Problem 2 (30 minutes)**

The students may now continue to page 2.1, investigate the properties of the normal curve on page 2.2 and answer question 3. Each student should submit one conjecture via **QUICKPOLL**. The teacher should lead students in a discussion to investigate the validity of these conjectures.

*The normal curve on the page 2.2 is controlled by sliders. The dashed, red line represents the position of the mean, and the dotted, blue lines cut the area beneath the curve into vertical cross­sections, each with a width equal to one standard deviation. The grey shaded area is a calculation of the area under the curve between the two points on the horizontal axis. You can control this area by moving the black dots on the axis.*

1. *What conjectures can you make about the areas under a normal distribution curve?*

Anticipated responses

* They should notice that the mean splits the area into 50/50.
* The greater the standard deviation, the flatter the curve.
* 68% is always contained within 1 standard deviation, 95% within 2, and 99.7% within 3.
* The total area under the curve is 1.

After the class has had an opportunity to make conjectures, send a **QUICKPOLL** to capture one conjecture per student. Lead a discussion pertaining to the validity of these conjectures. In particular, ask students if they can find counterexamples or if they support the conjectures.

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Question 4 is included to make sure that attention is drawn to the areas between 1, 2, and 3 standard deviations under the normal curve.

*It is common practice in statistics to think about the area contained within one, two, and three standard deviations from the mean. If you haven't already, return to the previous curve and approximate these probabilities.*

1. *What percent of the data is within one standard deviation? What about two standard deviations? What about three standard deviations?*

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Once students have established the empirical rule, they should use this rule to verify that the distribution for the dice-rolling simulation follows a normal distribution. They should use this strategy to complete question 5.

*In statistics, the collection of these three probabilities is called the* ***empirical rule****. On the page 2.5, you will find the histogram from the dice-rolling simulation.*

1. *Use what you know about the empirical rule to determine if this distribution roughly follows a normal distribution. Provide numerical evidence of you claim.*

Randomly select student to begin discussion. Put them **LARGE AND IN CHARGE.**

**Total Time needed 45 minutes**