

**Pennsylvania Governor's Institute  
for Mathematics Educators  
2004**

**Names of Group Members:** Doug Murdoch, Maria Hausman,  
Craig Douty, and Susan Stamm

**Topic/Theme:** Probability Distribution Demonstrated with Dice

**Level:** Statistics/ Algebra II

**Time Element:** 3 periods (1 1/2 block)

**NCTM Standards Addressed:**  
Data Analysis, Statistics, Probability, Algebra

**PA Math Standards Addressed:**  
2.2 Computation and Estimation  
2.6 Statistics and Data Analysis  
2.7 Probability and Predictions  
2.8 Algebra and Functions

**Math Assessment Anchors Addressed:**  
**M.11.E.1:** Formulate or answer questions that can be addressed with data and/or organize, display, interpret or analyze data.  
**M.11.E.2:** Select and/or use appropriate statistical methods to analyze data.  
**M.11.E.3:** Understand and/or apply basic concepts of probability or outcomes.  
**M.11.E.4:** Develop and/or evaluate inferences and predictions or draw conclusions based on data or data displays.

**Reading Assessment Anchors Addressed:**  
**R11.A.2:** Demonstrate the ability to understand and interpret nonfiction text, including informational, e.g., textbooks, print media (magazines, brochures, etc.), editorials, public documents; autobiography; biography; and essay appropriate to grade level.

**Objectives:** Students will explore the normal distribution by experimenting with dice combinations, data analysis, and discussion.

**Instructional Strategies and Plan (include strategies used to help different types of learners, i.e. auditory, visual, etc.): SWBAT:**

1. Examine the theoretical probability of dice through discovery methods. (Part 1)
2. Collect data by rolling dice on the calculator after it is modeled by the teacher. (Part 2)
3. Formulate functions and input data in a spreadsheet for analysis. (Part 2)
4. Summarize results through discussion questions. (Part 2)

**Materials/Resources:**

1. Worksheets
2. Dice (colored dice for demonstration)
3. Graphing Calculator TI-82, TI-83, TI-83+, TI-84
4. Calculator Links
5. Computer Lab Access (for Excel/spreadsheet program)

**Interdisciplinary Connections:**

- **Reading:** Identification of a concept definition, characteristics, examples, and non-examples.
- **Technology:** Use a dice roll simulation on a graphing calculator, and generate a spreadsheet with functions to analyze data.

**Assessment Strategies:**

- **Formative Evaluation (checking student understanding during the lesson):**  
Students will be expected to roll the dice, collect the data, input the data into the spreadsheet, apply formulas, and use a calculator program to simulate dice roll.
- **Summative Evaluation (how will it be determined that the objectives were achieved?):**  
Students will be graded on the formula spreadsheet and the answers to their free response questions. (Answer key provided with lesson worksheets)

**Correctives/Remediation:**

- Students will complete the Frayer model to build conceptual knowledge of normal distributions and identify examples, nonexamples, characteristics, and create an operational definition.
- Students will conduct a second experiment with a Galton machine to simulate the normal distribution on the website:  
<http://www.ms.uky.edu/~mai/java/stat/GaltonMachine.html>

**Extensions/Enrichment:**

Students will find the theoretical probability and distribution for three and four dice.

**Special Accommodations (special needs students)****Description of the Special Needs Student Selected:**

Emily:

1. Severe hearing loss in both ears.
2. Language comprehension, reading, and expressive skills are 4 years below grade level.
3. Above grade level in basic math computation
4. Difficulty with word problems and abstract concepts.
5. Uses an assistive listening device in the classroom to allow her to hear better
6. Difficulty comprehending lengthy verbal explanations.
7. Does not use sign language.
8. Learns best using visual representation of information or a process when possible.

**Accommodations to Use with this Student:**

1. Preferential seating.
2. Teacher will speak at a slower pace and remain in one place when addressing the class with instructions.
3. Teacher will assess comprehension during the lesson.
4. Provide her with a student notetaker/ project recorder.
5. Give her interactive roles, such as the roller of the dice in this lesson.
6. Provide her with a copy of teacher's discussion notes.