

Grade 3 Clarifying Lessons: Pretzel Probability

OLD Resources. These resources have NOT yet been updated to align with the revised elementary mathematics TEKS. These revised TEKS were adopted by the Texas State Board of Education in 2005, with full implementation scheduled for 2006–07. These resources align with the original TEKS that were adopted in 1998 and should be used as a starting point only.

What is a Clarifying Lesson?

A model lesson teachers can implement in their classroom. Clarifying Lessons combine multiple TEKS statements and may use several Clarifying Activities in one lesson. Clarifying Lessons help to answer the question "What does a complete lesson look like that addresses a set of related TEKS statements, and how can these TEKS statements be connected to other parts of the TEKS?"

TEKS Addressed in This Lesson

Probability and statistics: 3.14C

Underlying processes and mathematical tools: 3.15A, B, C, D; 3.16A; 3.17A, B

Materials

- paper sacks
- markers
- cubes (10 each of six colors)
- stickers

Lesson Resources

*Collection of Math Lessons from Grades 3-6:
Operations and Computation* by Marilyn Burns

Lesson Overview

Students make predictions and draw conclusions based on sampling and probability concepts.

Mathematics Overview

Students make predictions and draw conclusions based on sampling and probability concepts.

Set-up (to set the stage and motivate the students to participate)

1. Inform students that companies frequently include prizes in their products to stimulate sales. (Show Happy Meal or Cracker Jacks.) A pretzel company recently put a sticker in each box of pretzels. It takes six different stickers to make a complete set. The company is striving to be fair, so they are packaging and shipping an equal number of each sticker to stores. When you buy a box, you have an equal chance of getting any 1 of the 6 stickers. (3.15A)
2. Ask students, "How many boxes of pretzels would you expect to have to buy to get a complete set of stickers?" Let students discuss their predictions in small groups, share their predictions with the whole class, and write their predictions in their journals. (3.15A)
3. Inform students that because we do not actually have the boxes of pretzels, we will simulate the pretzel purchases. (Mention flight simulators.) (3.15B, C, D)
4. Show students a paper sack containing six cubes (one each of six colors). Ask students what they think the "chance" is of getting a red cube. Lead into a discussion of probability/chance. (3.14C)
5. Draw from the sack several times noting the color of the cube each time. (Replace the cube and shake the sack after each draw.) (3.15B, C, D)
6. Ask the class, "How many draws do you expect we will need in order to have at least one draw of each color?" (3.14C)
7. Discuss similarities between this activity and buying pretzels to get all the different stickers. (3.15B, C, D)
8. Have students work in groups to repeat this simulation as many times as possible in the time given and record the results. (3.15B, D, C; 3.16A)
9. As a class, create a frequency table to show the frequencies of the numbers of tries it took to get one cube of each color. (3.16A)

Teacher Notes (to personalize the lesson for your classroom)**Guiding Questions (to engage students in mathematical thinking during the lesson)**

- Are you drawing any one color more than others? (3.14C)
- When is the experiment over? (3.15B, C, D)
- What is the fewest number of draws you've had to make so far? (3.16A)

- What is the fewest number of draws possible? (3.14C)
- What is the most number of draws you've had to make so far? (3.15B, C, D)
- What is the most number of draws possible? (3.14C)
- Have any of your group's experiments given you the same results? (3.16A)
- Why is it necessary to replace the cube drawn after each draw? (3.15B, C, D)

Teacher Notes (to personalize the lesson for your classroom)

Summary Questions (to direct students' attention to the key mathematics in the lesson)

To assess students' interpretation of their data, ask questions such as:

- From the data you collected, how many boxes of pretzels do you expect to have to buy to get all 6 stickers? Why? (3.14C; 3.17A, B)
- What results from the experiments would you expect if the numbers of cubes differed; if there were 3, 4, or 10 colors, for example, instead of 6? (3.14C; 3.17A, B)

To focus students' attention on the important characteristics of the simulation, ask questions such as:

- How does drawing the cubes represent the pretzel problem? (3.15B, C, D)
- Suppose you used a six-sided die instead of 6 cubes; would this have been an appropriate simulation? Why or why not? (3.14C; 3.15B, C, D)

Teacher Notes (to personalize the lesson for your classroom)

Assessment Task(s) (to identify the mathematics students have learned in the lesson)

- Have students write in their mathematics journal how many boxes of pretzels they think they would have to purchase in order to get a complete set of stickers, using what they have learned from the paper sack and cube experiment to support their decision.
- Have students write a comparison of the pretzel situation to drawing the cubes out of the paper sack.

Teacher Notes (to personalize the lesson for your classroom)

Extension(s) (to lead students to connect the mathematics learned to other situations, both within and outside the classroom)

- With 10 cubes of each of the six colors, students can repeat the experiment several times and compare the results to the original experiment.
- Students can role play the purchase of pretzels with real sacks and stickers. (These materials could be put in a learning center and done over an extended period of time.)
- Students can read *Charlie and the Chocolate Factory* for a language arts extension.

Teacher Notes (to personalize the lesson for your classroom)