

## Necco® Mania

You have each been given a package of Necco® candies. Conduct an investigation to explore the candy colors and make the following prediction.

In a batch of 10,000 candies, how many pink, yellow, green, brown, black, orange, purple and white candies does the Necco® Candy Company produce?

Write them a letter telling them about your investigation and what your findings were. Make sure you tell why and how you did what you did, so they get an accurate picture. Ask them to write back to tell you how close your prediction was to what they actually produce.

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# Exemplars

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## Necco® Mania

### Suggested Grade Span

3-5

### Task

You have each been given a package of Necco® candies. Conduct an investigation to explore the candy colors and make the following prediction.

In a batch of 10,000 candies, how many pink, yellow, green, brown, black, orange, purple and white candies does the Necco® Candy Company produce?

Write them a letter telling them about your investigation and what your findings were. Make sure you tell why and how you did what you did, so they get an accurate picture. Ask them to write back to tell you how close your prediction was to what they actually produce.

### Alternate Versions of Task

#### More Accessible Version:

You have each been given a package of Necco® candies. Conduct an investigation to explore the candy colors and make the following prediction.

In a batch of 100 candies, how many pink, yellow, green, brown, black, orange, purple and white candies do the Necco® Candy Company produce?

Write them a letter telling them about your investigation, and what your findings were. Make sure you tell why and how you did what you did, so they get an accurate picture. Ask them to write back to tell you how close your prediction was to what they actually produce.

#### More Challenging Version:

You have each been given a package of Necco® candies. Conduct an investigation to explore the candy colors and make the following prediction.

In a batch of 10,000 candies, how many pink, yellow, green, brown, black, orange, purple and white candies does the Necco® Candy Company produce?

Write them a letter telling them about your investigation and what your findings were. Make sure you tell why and how you did what you did, so they get an accurate picture. Ask them to write back to tell you how close your prediction was to what they actually produce.

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Conduct an investigation to determine the most popular Necco® candy color of students your age. Make additional recommendations to the company about your findings.

## Context

This task was presented to students following a unit on probability. Students had done several activities exploring the concept of chance and activities that required them to formulate and solve problems that involved collecting, organizing, analyzing and describing data. They had also compared theoretical and experimental probability, providing them with a solid foundation with which to approach this task.

## What This Task Accomplishes

People often make decisions based on their perceived likelihood of an event by informally collecting and organizing data for a specific situation. People are generally able to make good decisions based on their predictions of chance using a relatively small set of data. According to the NCTM standards, ". . . however, there is evidence that over time we develop a small number of limited strategies that we apply automatically and repeatedly in varied contexts and to situations involving larger amounts of data. Often, the application of the strategy is ineffective or totally erroneous. . ." (*Dealing with Data and Chance*, NCTM Addenda Series 5 - 8, p.1).

Providing students with experiences in analyzing larger sets of data, as compared to data collected using a sampling method, students will learn through their own experiences the limitations of making judgments based on limited samples. Also, in studying probability, a natural context is provided for developing or applying ratios, fractions, percents and decimals.

## What the Student Will Do

Students will either use their own package of candy or a compilation of their classmates' candy to predict the produced ratio of each candy color. Some students will figure out the number of packages that are in 10,000 candies, then multiply their own candy color amounts by each of those colors. More thoughtful students may get a class average of each color produced on which to base their predictions. Still others will create a ratio based on the class total, then find an equivalent fraction with 10,000 as a denominator.

## Time Required for Task

2 hours

## Interdisciplinary Links

You could connect this problem to language arts by having students learn the correct form for a business letter. Students could create advertisements for the candy, study mass production and/or inventions, as well as investigate the candy ingredients and nutritional information.

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## Teaching Tips

When/if the company responds to your question, students should go back and re-examine their predictions. Ask them to evaluate their predictions and conjecture as to why their results are inaccurate or accurate. This is an important and necessary step. You can adapt this problem to any candy you have available in mass quantity. M&M's® are the classic, but you could even use cereals or anything else which comes in different color quantities. You can also adjust the amount of candies from 10,000 to better meet the needs of your students.

Although you will want to use the *Exemplars* rubric (Novice, Apprentice, Practitioner, Expert) to assess your students' work, I used the following to grade my students' performance on this task:

## Grading Guidelines:

Letter:

- 5 tells all key decisions (what you did)
- 5 reasoning is logical (why you did what you did)
- 5 shows comprehensive understanding of the task
- 5 spelling is accurate
- 5 work is neat

Conclusion:

- 5 makes a prediction about the number of each color produced
- 5 makes an effort to notice interesting patterns or applies other math knowledge to this problem or tells how you would use these results in the "real world"
- 5 makes an effort to personalize the problem by perhaps discussing the probability of getting your favorite color in a package or gives advice to the company about their product in relation to numbers of candy colors

Representation: (8 1/2" x 11" paper)

- 5 has a descriptive title
- 5 is neat
- 5 effective use of color
- 5 is creative
- 5 communicates information clearly
- 5 properly executed
- 5 has labels/keys
- 5 spelling is correct

Math Language:

- 5 is accurate and appropriate
- 5 uses a variety of words, symbols and notation

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5 spelling is correct

Overall Presentation:

2 name on all papers

3 papers in neat/logical order

Bonus:

5 Hand in this paper with your name on it attached to your report

## Suggested Materials

- Candy that is available in mass quantity and comes in a variety of colors
- Calculators
- Chart paper
- Unifix cubes
- Computers
- Markers
- Crayons
- Graph paper
- Stencils

## Possible Solutions

Student solutions will vary.

### More Accessible Version Solution:

Solutions will vary. When assessing the student's solution look for correct mathematical reasoning supported by evidence gathered.

### More Challenging Version Solution:

Solutions will vary. When assessing the student's solution look for correct mathematical reasoning supported by evidence gathered.

## Task Specific Assessment Notes

### Novice

A solution that shows misunderstanding of the problem. A solution with no mathematical conclusion or one that does not address 10,000 candies. A solution that exhibits no reasoning or application of theoretical or experimental probability. I had no students perform at this level.

### Apprentice

A solution that shows an attempt to address 10,000 candies or attempts to use appropriate

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equations, but has an incorrect solution. A solution that shows some understanding of the problem, but has a random or weak explanation of strategy.

## **Practitioner**

A solution that shows understanding and use of appropriate equations in addressing 10,000 candies. A solution in which the strategy is described and applies some knowledge of theoretical or experimental probability.

## **Expert**

A solution that generalizes knowledge from previous mathematical experiences with probability and/or ratios. A solution that successfully creates multiple solutions and elaborates on the process or strategy used. A solution that addresses the sampling method and its effect on the solution.