

# m&m<sup>TM</sup> Count & Crunch

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## PART ONE

Give students an overview of the entire project. Inform them that they will apply their probability and statistics skills to make a prediction on the number of candies for each color in the one-pound bag. They are not to eat the candies from the individual bags; they will be saving these at the conclusion of each day. There will be a chance to eat the candies from the larger bag at the conclusion of the project. (The numbers here correspond to those on the student handouts.)

1. Have the students estimate the number of candies in the bag and the quantity of each color. In the chart provided, they are to record their guesses as raw numbers as well as percentages.
2. Each group is to open its bag and the members are to count the actual quantity of each color and the total number of candies. These are to be recorded, and the percentages calculated.
3. The students create a bar graph to represent their data.
4. The next step involves creating pie charts. Be sure the students understand that the pie charts are to accurately represent the percentage of each color for both the estimated and actual candy counts. For instance, if the blue candy count is 13%, then the blue pie sector should measure 13% of 360 which is approximately 37 degrees.

## PART TWO

5. Have the students determine the weight and diameter of a single candy. The weight of an individual candy can be determined by dividing the number of actual candies by the total weight which is printed on the bag. The instructor may tell the students this simple strategy or leave them to explore a variety of strategies with weights and scales.
6. Step six of the project stresses unit conversion. Make sure that students know that, although there are 12 inches in a foot, there are 144 square inches in a square foot. In part 6d, assign each group one color that they are to use to answer the question.

## PART THREE

7. Step seven is the statistical study. Have a chart on the board in which each group can present its data. The class can then compute the mean, median, mode and range. This is a good time to discuss which of the central tendencies best represents the data.
8. Students now shift their attention to the one-pound bag by predicting the quantity of each color and the total number of candies. Most teachers choose to demonstrate this with a proportion, yet when left to their own invention, many students will convert all ratios to decimal form and simply multiply it to all the appropriate quantities. Counting the candies in the large bag is best accomplished by distributing the m&m's among all the groups and compiling the results.

## PART FOUR

9. For the student-derived probability experiment, assign each group a different situation to test. For instance, one group can test the simple probability of drawing a red candy from the bag, while another group can test the probability of drawing a green then a blue candy. Each group will calculate the probability of their assigned situation for their small bag, then make 50 trials and record the relative frequency. Once the experiment is complete, have the students compare the results of the trials with the calculated probability.

### Concepts

Probability & statistics, ratio & proportion, percentage, unit conversion, area, bar graphs and pie charts

**Time:** 3-4 hours

### Materials

1 individual package of m&m's per group of 3-5 students. 1 one-pound bag of m&m's per class, protractors, rulers, coloring pencils/markers and student handout.

### Preparation

Since this project incorporates such a variety of skills, it serves best as reinforcement or review. Students should be familiar with some of the basic principles of probability and statistics. You will need to save each group's bag of candy at the conclusion of each day. A piece of tape with a name on it can be used to seal and identify each bag.

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1. Estimate the quantity of each color and the total number of candies in your bag. Also guess the percentage of the total that each color comprises. Record your results in the left chart below.
2. Open your bag and count the actual number of each color and calculate the percentage.

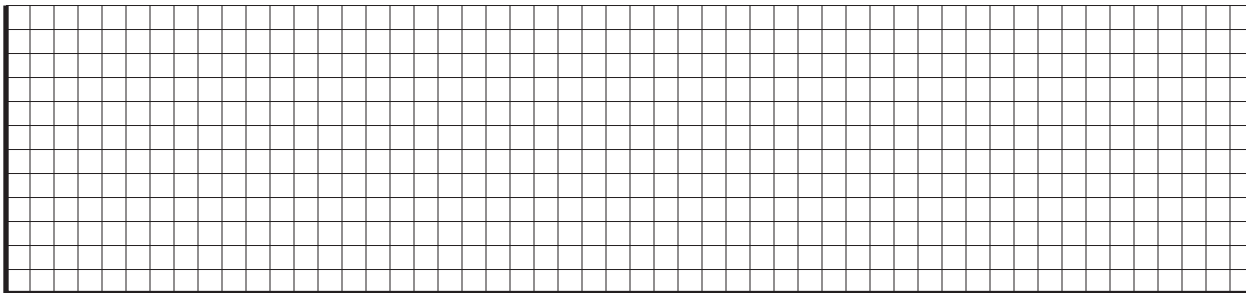
**ESTIMATIONS**

Color	Number	%
Red		
Brown		
Yellow		
Green		
Orange		
Blue		
<b>TOTALS</b>		

**ACTUAL DATA**

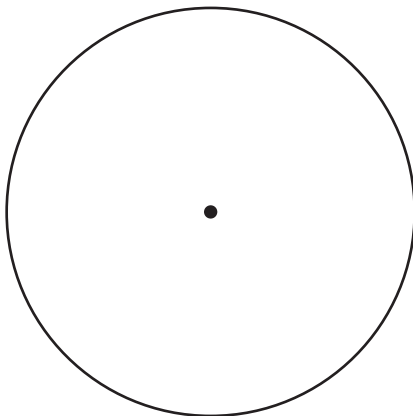
Color	Number	%
Red		
Brown		
Yellow		
Green		
Orange		
Blue		
<b>TOTALS</b>		

3. Make a bar graph showing your estimations and the actual count of each color.

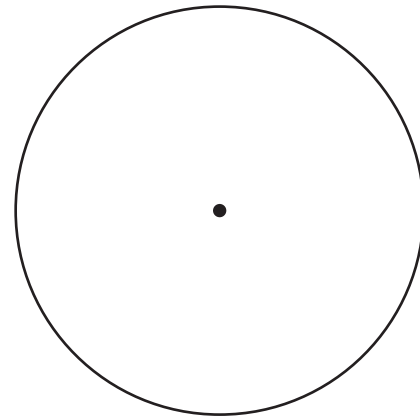


4. Make two pie charts, each representing the percentage of each color in the bag. The first pie chart will represent your estimations, the second is to represent the actual counts. Each sector of the pie chart should be proportional to the percentage it represents. For instance, if you are graphing 13% for yellow, then your yellow sector should measure 13% of 360 degrees.

**ESTIMATIONS**



**ACTUAL DATA**



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5. Characteristics of one m&m candy (show all calculations)
- Weight:
  - Diameter:
6. Unit Conversion & Area
- How many m&m's fit in an inch?  
... in a foot?  
... in a mile?
  - How many fit in a square inch?  
... in a square foot?  
... in a square mile?
  - How many would cover a football field?  
(The dimensions of a football field, not including the end zones, are 100 yards by 55 yards.)
  - How many bags of m&m's would it take to cover the field in one color?  
Group's assigned color:

7. Statistical Study

- a. Record the m&m data from all the groups in the class:

Group	Red	Brown	Yellow	Green	Orange	Blue
#1						
#2						
#3						
#4						
#5						
#6						
#7						
#8						
#9						
TOTALS						

- b. Calculate the mean, median, mode and range for each color.

	Red	Brown	Yellow	Green	Orange	Blue
Mean						
Median						
Mode						
Range						

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8. Proportions: Small Bag vs. Large Bag
- Using the figures from your group's small bag, estimate the quantity of each color and the total number of m&m's in the one-pound bag.
  - Using the figures from the class statistics, estimate the quantity of each color and the total number of m&m's in the one-pound bag. Be sure to designate which statistics your group chose to use.
  - As a class, open the one-pound bag and count the actual quantity of each color and the total.

Color	a) Est. from Group's Bag		b) Est. from Class's Stats		Actual Bag
	Small Bag	Large Bag	Class Stats	Large Bag	Large Bag
Red					
Brown					
Yellow					
Green					
Orange					
Blues					
TOTALS					

- Which provided a more accurate prediction, the data from the individual bag or the class statistics?

9. Probability
- Compute the probability of each of the following occurrences, if the first candy is replaced.
  - Compute the probability of each of the following occurrences, if the first candy is not replaced.

First Draw	Second Draw	a) Probability w/ Replacement	a) Probability w/o Replacement
Blue	Red		
Red	Yellow		
Brown	Brown		
Blue	Orange		
Yellow	Red		
Green	Green		

- Do your odds improve or diminish by not replacing the candy?
- Conduct an experiment to test one of the above. On another sheet of paper, describe your experiment and record the data, analyze and display the results.