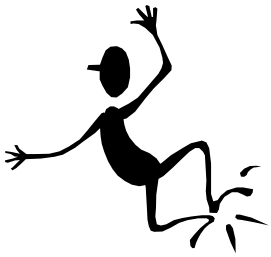
Probability with M&Ms

In this activity, you will be drawing M&Ms from a bag to determine what the probability is of getting each color of M&M. You will record your results in a table.



Major Super Duper Important Things:

- DO NOT EAT the M&Ms until the activity is over. Yes, you will get to eat in class – but only when you are done with your experiment. ☺
- REPLACE each M&M that you draw before drawing the next one. This makes your probability calculations easier.
- SHAKE the bag after you replace each M&M. This will help your draws be more "random" so that your data will be a good representation.

Procedures:

1) **Draw** one M&M. **Record** the color in the table by marking a tally mark in the first row of the table.
2) **Replace** the M&M. **Shake** the bag.
3) **Repeat** steps 1 and 2 **twenty-five times**.

	Brown	Blue	Red	Orange	Yellow	Green
Tally Marks:						
Total:						
Probability (as a fraction):						
Probability (as a decimal):						

4) In the second row of the table, write down the **total number of tally marks** from each color.

5) **Calculate the probability** of drawing each color, based on the number of times you drew M&Ms (25) and the number of times you drew each color. Write these probabilities down in **fraction form** in the third row of the table and in **decimal form** in the last row of the table.

6) In the table below, **record the actual number of each color** of M&M.

	Brown	Blue	Red	Orange	Yellow	Green
Actual Number:						
Probability (as a fraction):						
Probability (as a decimal):						

7) Write down the **total number of M&Ms** in the bag: _____

8) Now you may eat your M&Ms, but <u>you have to calculate some stuff</u> as you do. **Calculate the probability** of drawing each color, based on the total number of M&Ms in the bag and the actual number of each color. Write these probabilities down in **fraction form** in the second row of the table above, and then in **decimal form** in the last row.

9) Are your probabilities in the first table similar to your probabilities in the second table?

10) Do you think your probabilities in the first table *should be* similar to your probabilities in the second table? Why or why not?

11) One of these tables represents "experimental probability" and one represents "theoretical probability." Which one do you think is which? What do you think "experimental probability" means? What do you think "theoretical probability" means?

12) One of these tables involves finding probability from a "sample" and one involves finding probability from a "population." Which one do you think is which? What do you think a "sample" is? What do you think a "population" is?

13) What changes could you make to the experiment in numbers 1-3 to produce more accurate results (results that are more similar to your theoretical probability)?

Theoretical Probability

Questions for Basic Concepts of Probability. Determine the probability of the event described in each exercise. Unless stated otherwise, assume all items of chance (dice, coins, cards, spinners, etc.) are fair.

1. Roll an even number on one roll of a die.
2. Roll an odd number on one roll of a die.
3. Roll a prime number on one roll of a die.
4. Roll an odd prime number on one roll of a die.
5. Roll an odd prime number greater than 4 on one roll of a die.
6. Roll an even prime number greater than 4 on one roll of a die.
7. Roll an odd prime number or a multiple of 2 on one roll of a die.
8. Roll an odd prime number and a multiple of 2 on one roll of a die.

9. Roll a total of 8 on one roll of 2 dice.
10. Roll a total of 18 on one roll of 2 dice.
11. Roll a total that is a prime number on one roll of two dice.
12. Roll a total that is a prime number or a multiple of 5 on one roll of two dice.

13. Toss heads on one flip of a coin.
14. Toss heads or tails on one flip of a coin.
15. Toss 3 heads on three flips of a coin.
16. Toss 3 heads on five flips of a coin.
17. Toss at least 3 heads on five flips of a coin.
18. Toss less than 1 tail on eight flips of a coin.
19. Toss no more than 1 tail on eight flips of a coin.
20. Toss at most 1 tail on eight flips of a coin.
21. Toss no less than 1 tail on eight flips of a coin.
22. Toss more than 1 tail on eight flips of a coin.

23. Draw a red card from a standard deck of playing cards.
24. Draw a red face card from a standard deck of playing cards.
25. Draw a black prime number from a standard deck of playing cards.
26. Draw a diamond from a standard deck of playing cards.
27. Draw the ace of spades from a standard deck of playing cards.
28. Draw any card other than a club from a standard deck of playing cards.
29. Draw a card used to make a royal flush from a standard deck of playing cards.
30. Draw a red card or a black card from a standard deck of playing cards.
31. Draw a red card or a card less than 7 from a standard deck of playing cards.
32. Draw a heart greater than 8 that is not a face card from a standard deck of playing cards.

33. Spin an even number on a 1-to-8 spinner.
34. Spin a prime number less than 7 on a 1-to-10 spinner.
35. Spin an odd prime number less than 7 on a 1-to-12 spinner.
36. Spin a positive integer on a 1-to-6 spinner.

Questions for More Complex Concepts in Probability. Determine the probability of the event described in each exercise. Unless stated otherwise, assume all items of chance (dice, coins, cards, spinners, etc.) are fair.

Problem 1

In a survey, 100 students were asked "do you prefer to play Minecraft or play Super Mario?" Of the 46 boys in the survey, 33 said they would choose Minecraft, while 29 girls made this choice. A student is selected at random, find the probability that

(i) the student selected at random prefers to play Minecraft;

(ii) the student prefers to play Super Mario given that the student is a boy.

Problem 2

Two fair dice are thrown and the number showing on each is noted. The sum of these two numbers is S. Find the probability that

(a)S is less than 8

(b) at least one die shows a 3;

(c) at least one die shows a 3, given that S is less than 8.

(d) at least one die shows a 4, given that S is an even number.

Problem 3

In the Grade 10 class of 100 kids, there are two sports commonly played, soccer and basketball. 76 students do only one of the sports, 14 students don't do any sport and 46 students play basketball. What is the probability when a student is selected that they play soccer?

Problem 4

Three friends decide to meet up at High Street one day during the school week, but have not decided which day. Given that the phone lines are all dead, internet is not working and school is on holiday, what is the probability that all three girls meet at High Street on the same day?

Problem 5

The probability that a person has a deadly virus is 5 in one thousand. A medical test will CORRECTLY diagnose the disease 95% of the time, but INCORRECTLY diagnose the disease 20% of the time. Find the probability of this test giving a correct diagnosis.

Problem 6

A bag of MM's contains 6 red, 4 green and 2 brown candies. Mario takes one MM and then offers another one to his friend Sponge Bob. What is the probability that they both have the same color MM's.