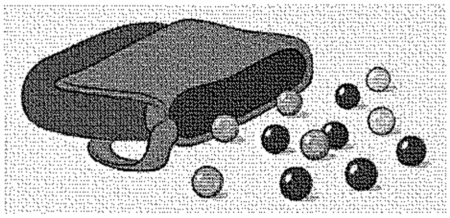
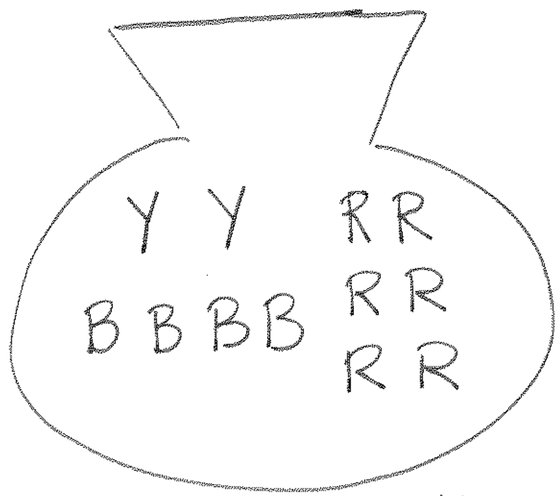
Unit 6: What Do You Expect?
Investigation 2.2 – Choosing Marbles

Name Key



Sammy collects marbles. He asks his teacher if the class could experiment with marbles instead of blocks. The teacher says, "What really matters is whether we can predict the probabilities in a situation using marbles. Let's try a bag with marbles of different colors.

A. A bag contains two yellow marbles, four blue marbles, and six red marbles. You choose a marble from the bag at random. Answer the following questions and explain your reasoning.




12 total marbles

1. What is the probability the marble you choose is yellow?

   $P(yellow) = \frac{2}{12} = \frac{1}{6}$

   What is the probability the marble you choose is blue?

   $P(blue) = \frac{4}{12} = \frac{1}{3}$

   What is the probability the marble you choose is red?

   $P(red) = \frac{6}{12} = \frac{1}{2}$

2. What is the sum of the probabilities from part (1)?

   $\frac{2}{12} + \frac{4}{12} + \frac{6}{12} = \frac{12}{12} = 1$

3. What color is the selected marble most likely to be?

   Red is most likely to occur.

4. What is the probability the marble is NOT blue?

   $P(\text{not blue}) = \frac{8}{12} = \frac{2}{3}$ $\quad P(\text{Red}) + P(\text{yellow}) = P(\text{not blue})$

5. What is the probability the marble is either red or yellow?

   $P(\text{red or yellow}) = \frac{6}{12} + \frac{2}{12} = \frac{8}{12} = \frac{2}{3}$

6. What is the probability the marble is white?

   $\frac{0}{12} = 0$ There are not any white marbles.

7. Jakayla says the probability the marble is blue is $\frac{12}{4}$. Adsila says $\frac{12}{4}$ is impossible. Which girl is correct and why?

   Adsila is correct. $\frac{12}{4}$ is impossible because the # of favorable events can never be greater than the total # of events. It should be $\frac{4}{12}$ or $\frac{1}{3}$.

B. Suppose a new bag has twice as many marbles of each color. This bag of 24 marbles contains 4 yellow marbles, 8 blue marbles and 12 red marbles.

$P(yellow) = \frac{4}{24} = \frac{1}{6}$ $P(blue) = \frac{8}{24} = \frac{1}{3}$ $P(red) = \frac{12}{24} = \frac{1}{2}$

1. Do the probabilities change compared to part A? Explain.

The probabilities do not change.
There are just twice as many marbles of each color.

2. If you could choose the amount of each color, how many blue would have to be in this bag for the probability of choosing a blue marble equal to $\frac{1}{2}$?

You would need 8 more blue marbles to give you a total of 16 blue.
Then there would be 32 marbles all together so $\frac{16}{32} = \frac{1}{2}$

C. There is a different bag that contains several marbles. You do not know exactly how many marbles are in there but you do know that the marbles are red, white and blue. You also know that the probability of choosing a red marble is $\frac{1}{3}$, and the probability of choosing a white marble is $\frac{1}{6}$.

1. What is the probability of choosing a blue marble? Explain.
(Hint: we added the sum of the probabilities before and found a pattern)

red + white + blue = 1
$\frac{1}{3} + \frac{1}{6} + \frac{1}{2}$
$\frac{2}{6} + \frac{1}{6} + \frac{3}{6} = \frac{6}{6}$

The probability of choosing a blue would have to be $\frac{1}{2}$.

2. What is the least number of marbles that can be in the bag? Then tell me how many of each color would be in that bag. You could have 6 marbles in the bag

\# of Red Marbles= 2 # of White Marbles= 1 # of Blue Marbles= 3

3. Suppose the bag contains 8 red marbles, and 4 white marbles. How many blue marbles does it contain?

The bag would have a total of 48 marbles.

16 red $= \frac{16}{48} = \frac{1}{3}$ 8 white $= \frac{8}{48} = \frac{1}{6}$ 24 blue $= \frac{24}{48} = \frac{1}{2}$

D. Do you think the experimental probabilities would be different with blocks instead of marbles? Would the theoretical probabilities be different if we used blocks?

There should not be a difference if you use marbles or blocks.
The more trials you conduct, the closer the experimental probability gets to the theoretical.