Dear Family,

The next unit in your child's mathematics class this year is ***What Do You Expect?: Probability and Expected Value***. This unit is about the concepts of probability and will help students understand common ideas that they read or hear about every day. They will explore long-range expectations in probability situations and learn how to make better predictions.

UNIT GOALS

Students will learn to find probabilities in two ways: by conducting trials and collecting experimental data, also by analyzing situations to determine theoretical probabilities. As they work, students will be using fractions, decimals, and percents to describe how likely events are.

HELPING WITH HOMEWORK

You can help with your child's homework and encourage sound mathematical habits as your child studies this unit by asking questions such as:

- What are the possible outcomes that can occur for the events in this situation?
- How could I determine the experimental probability of each of the outcomes?
- Is it possible to determine the theoretical probability of each of the outcomes?
- If so, what are these probabilities?
- How can I use the probabilities I have found to make decisions about this situation?

In your child's notebook, you can find worked-out examples from problems done in class, notes on the mathematics of the unit, and descriptions of the vocabulary words.

HAVING CONVERSATIONS ABOUT THE MATHEMATICS IN *WHAT DO YOU EXPECT?*

You can help your child with his or her work for this unit in several ways:

- Discuss examples of statements or situations in everyday experiences that relate to the likelihood of certain events. For example: What would a 50% chance of rain mean, and how might forecasters decide on this figure?
- Look at sports statistics with your child and ask questions such as how a batting average or a free-throw average can be used to predict the likelihood that the player will get a hit the next time at bat or make a basket the next time at the free-throw line.
- Look over your child's homework and make sure all questions are answered and that explanations are clear.

A few important mathematical ideas that your child will learn in *What Do You Expect?* are given on the back. As always, if you have any questions or concerns about this unit or your child's progress in class, please feel free to call.

Sincerely,

<table>
<tr><th>Important Concepts</th><th>Examples</th></tr>
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Probability
A number between 0 and 1 that describes the likelihood that an event will occur.

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If a bag contains a red marble, a white marble, and a blue marble, then the probability of drawing a red marble is 1 out of 3 or $\frac{1}{3}$. We would write: P(red) $= \frac{1}{3}$.

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Theoretical Probability
If all the **outcomes** are equally likely, you can find the theoretical probability of the event by first listing all the possible outcomes, then find the ratio of the number of outcomes of interest to the total number of outcomes.

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If a number cube has six sides with the possible outcomes of rolling: 1, 2, 3, 4, 5, or 6, the probability of rolling a "3" is 1 out of 6.

$P(\text{Rolling a 3}) = \frac{\text{number of equally likely favorable outcomes}}{\text{total number of equally likely outcomes}} = \frac{1 \text{ (there is 1 number 3 on the cube)}}{6 \text{ (there are 6 possible outcomes)}}$

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Experimental Probability
This probability is the relative frequency of the **event**. It is the ratio of the number of times the event occurred compared to the total number of **trials**.

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If you tossed a coin 50 times and heads occurred 23 times, the relative frequency of heads would be $\frac{23}{50}$.

$P(\text{heads}) = \frac{\text{number of times the event occured}}{\text{number of trials}} = \frac{\text{number of heads}}{\text{total number of tosses}} = \frac{23}{50}$

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Random Events
Outcomes that are uncertain when viewed individually, but which exhibit a predictable pattern over many trials are random.

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Rolling a fair number cube is random because although you have no way of knowing what the next roll will be, you do know that, over the long run, you will roll each number on the cube about the same number of times.

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Tree Diagram
This is a diagram used to determine the number of possible outcomes. The number of final branches is equal to the number of possible outcomes.

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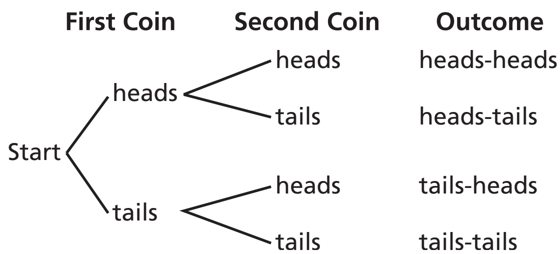

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Area Model
This is a diagram in which fractions of the area correspond to probabilities in a situation.

Area models are particularly helpful when there are 2 events to track and the outcomes of each event are not equally likely.

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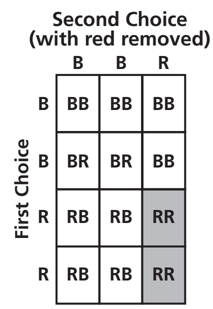
The area model here shows the probability of getting two red blocks if there are 2 red blocks and 2 blue blocks and one is drawn at a time without replacing it. The probability is $\frac{2}{12}$ or $\frac{1}{6}$.



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Expected Value or Long-term Average
The average result over many trials is the expected value.

A player's average score per shot in a 1–and–1 free throw situation is an expected value. A player's average winning per lottery ticket is also an expected value.

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A game is played with two number cubes. You score 2 points when a sum of 6 is rolled, 1 point for a sum of 3, and 0 points for anything else. If you roll the cubes 36 times, you could expect to get a sum of 6 about five times and a sum of 3 twice. You could expect to score $(5 \times 2) + (2 \times 1) = 12$ points for 36 rolls, an average of $\frac{12}{36} = \frac{1}{3}$ point per roll. This is the expected value of one roll.

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Law of Large Numbers
Experimental data gathered over many trials should produce probabilities that are close to the theoretical probabilities.

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For 1 million flips, exactly 50% heads is improbable, but it would be extremely unlikely for the percent heads to be very different from 50%.

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On the **CMP Parent Web Site,** you can learn more about the mathematical goals of each unit, see an illustrated vocabulary list, and examine solutions of selected ACE problems.
http://PHSchool.com/cmp2parents