Theoretical and Experimental Probability

**Theoretical probability** is used to show what should happen in an experiment. **Experimental probability** is what happens in a real life experiment.

Stevie tossed a coin. What is the probability that she tossed a tails?

\[ P(\text{tails}) = \frac{\text{favorable outcomes}}{\text{total outcomes}} = \frac{1}{2} \]

Stevie tossed a coin 100 times. By theoretical probability, she should get tails \( \frac{1}{2} (100) = 50 \) times. In her experiment, Stevie got heads 48 times and tails 52 times.

Experimental probability (tails) = \( \frac{52}{100} = \frac{13}{25} \).

In this case, the experimental probability of tossing tails is slightly greater than the theoretical probability of tossing tails.

\( \frac{13}{25} > \frac{1}{2} \)

Dan wanted to test the probability of tossing a number greater than 4 using a number cube numbered 1-6. He tossed the cube 100 times. The table shows the results.

<table>
<thead>
<tr>
<th>Number tossed</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of times tossed</td>
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<td>15</td>
<td>17</td>
<td>12</td>
<td>17</td>
<td>23</td>
</tr>
</tbody>
</table>

1. Find the theoretical probability of tossing a number greater than 4.

2. Find the experimental probability of tossing a number greater than 4.

3. If you flip a coin 1,000 times, about how many times would you expect to get heads? tails?

4. About how many times might you expect to get a number less than 3 when you toss a 1-6 number cube 600 times?

5. **Number Sense** Why does the experimental probability of an experiment differ from the theoretical probability?
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1. Find the theoretical probability of tossing a number greater than 4.

1:3

2. Find the experimental probability of tossing a number greater than 4.

\[ \frac{40}{100} = \frac{2}{5} \]

3. If you flip a coin 1,000 times, about how many times would you expect to get heads? tails?

**Heads: 500 times; tails: 500 times**

4. About how many times might you expect to get a number less than 3 when you toss a 1-6 number cube 600 times?

200 times

5. **Number Sense** Why does the experimental probability of an experiment differ from the theoretical probability?

The theoretical probability just shows what is likely to happen. The experimental probability shows what really did happen.