1. What does the probability of an event measure?

What does “the probability that a coin comes up heads is 1/2” mean?

Notation; \( P(E) \) is the probability of \( E \).

2. Binomial Model, a probability model
   (a) \( n \) trials
   (b) Two possible outcomes, “Success” and “Failure”
   (c) Probability of success on each trial \( \pi \)
   (d) The trials are independent

3. Examples of the binomial model: Fill in the following chart.

<table>
<thead>
<tr>
<th>Story</th>
<th>Success</th>
<th>( \pi )</th>
<th>Independent?</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 children select the helper or hinderer toy, null model</td>
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<tr>
<td>100 coins are tossed and heads are counted</td>
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<tr>
<td>25 students are asked to identify Tim out of two faces, null model</td>
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<tr>
<td>A student takes a 40 question multiple choice test and just guesses, each problem has five choices</td>
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<tr>
<td>5 dice are tossed and the number of 6’s showing are counted</td>
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<tr>
<td>A plant makes parts and hopes that at most 1% of the parts are defective. 1,000 parts are inspected.</td>
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</tbody>
</table>

If \( X \) counts the number of successes in a binomial process with parameters \( n \) and \( \pi \), \( R \) computes probabilities related to the number of successes:

- \( \text{dbinom}(x, \text{size}, \text{prob}) \) returns \( P(X = x) \), \( \text{size} = n \), \( \text{prob} = \pi \)
- \( \text{pbinom}(q, \text{size}, \text{prob}) \) returns \( P(X \leq q) \)
- \( \text{rbinom}(n, \text{size}, \text{prob}) \) makes \( n \) random draws of the random variable \( X \) and returns them in a vector.

4. Compute the following probabilities related to the stories above:

- Exactly 50 heads are thrown
- No more than 60 heads are thrown
- All 5 dice are sixes
- No more than two dice are sixes
- No defectives are found in the 1000 parts
- No more than 10 defectives are found
- The student gets none right!
- The student gets 10 or more right
- Exactly 10 children choose the helper
- At least 14 children choose the helper
- Exactly 20 out of 25 students choose Tim
- At least 20 students choose Tim