

### 7-3: Understand Experimental Probability

1. Sample answer: Theoretical probability is calculated based on knowing all possible equally likely outcomes of an event. Experimental probability depends on the results of an actual experiment. The more times the experiment is carried out, the more likely it is that the experimental probability will be closer to the theoretical probability. They can both be used to estimate or make predictions.
2. Sample answer: Predictions can be made using experimental probability in the same way predictions are made using theoretical probability. Use proportional reasoning to write and solve a proportion with the experimental probability ratio.
3. No; Sample answer: Experimental probability is based on an experiment, so it may or may not be close to theoretical probability. As the number of trials increases, the experimental probability tends to become closer to the theoretical probability. Even after many trials of an experiment, the experimental probability will usually not be exactly equal to the theoretical probability.
4. 50%
5. 55%
6. Greater
7.  $\frac{18}{80} = 22.5\%$
8. 50%  
40%  
Greater
9. Sample answer: More trials are needed. After she conducts more trials, the experimental probability should approach the theoretical probability of Jess's event.
10.  $\frac{8}{100} = 8\%$
11. Sample answer: The theoretical probability is much greater at about 81%, while the experimental probability is 60%. The experimental probability may be less because the distribution of letters in words is not random. There are more vowels than consonants on a page.
12. The theoretical probability for choosing Grace's stick is  $\frac{1}{7} \approx 14\%$ , while the experimental probability is  $\frac{23}{100}$ , or 23%; Sample answer: The person choosing sticks may not be mixing the sticks before drawing them from the cup. The selection may not be random if the person can see the names written on each stick.
13. a. Angel:  $P(\text{tails}) = \frac{20}{36} \approx 56\%$   
Michael:  $P(\text{tails}) = \frac{17}{36} \approx 47\%$   
Fernanda:  $P(\text{tails}) = \frac{23}{36} \approx 36\%$   
  
b. Michael; Sample answer: The relative frequency for Michael is 47%, which is closer to the theoretical probability of 50% than anyone else's relative frequency.

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14. Sample answer: The theoretical probability of choosing a card with the number 1 is  $\frac{1}{5}$ , or 20%. The experimental probability of choosing a card with the number 1 is  $\frac{15}{125}$ , or 12%. The theoretical probability is greater than the experimental probability.
15. Sample answer: The expected frequency is  $150 \cdot 0.65 = 98$ . The observed frequency is greater than the expected. The player might have learned a new technique for throwing that improved her accuracy.