

Worksheet 2-3: Experimental Probability vs. Theoretical Probability

Real-life situations can be simulated by probability experiments.

The theoretical probability and experimental probability of an event are **not necessarily the same**. As the number of trials increases, the experimental probability usually gets closer to the theoretical probability.

1. Suppose a couple would like to have three children.

(a) Determine the theoretical probability of having two girls and one boy.

(b) Explain how your answer in part (a) can help determine the theoretical probability of having two boys and one girl.

(c) Determine the theoretical probability of having at least one girl.



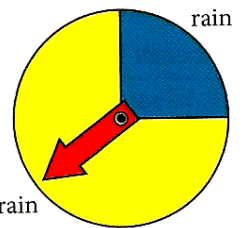
2. You toss a coin 10 times. It turns up heads 8 times.

(a) What is the experimental probability of turning up heads?

(b) What is the theoretical probability of turning up heads?

(c) If you tossed the coin several more times, would you expect the experimental probability to increase or decrease? Explain.

3. Consider the spinner shown.



(a) What is the theoretical probability of the spinner landing on rain?

(b) If the spinner lands on no rain 13 times in 15 trials, what would be the experimental probability of a day having no rain?

4. A random number generator is used to simulate the results of rolling a die 30 times. The results are shown in the table.

Outcome	1	2	3	4	5	6
Frequency	4	6	7	5	6	2

(a) Determine the probability of each outcome.

(i) rolling a 1 (ii) rolling a 2 (iii) rolling a 3

(iv) rolling a 4 (v) rolling a 5 (vi) rolling a 6

(b) Is each probability in part (a) theoretical or experimental? Explain your reasoning.

5. A die was rolled 6 times. The number 3 was rolled twice, and the number 2 was rolled 4 times.

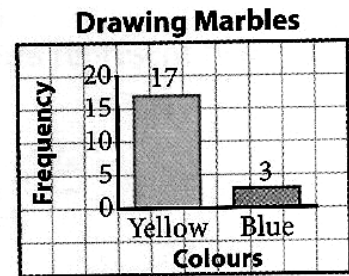
(a) Find the experimental probability of the following:

(i) rolling a 3 (ii) rolling a 2 (iii) rolling a 6

(b) What is wrong with this experiment as a predictor of experimental probability?

6. During the month of April 2006, at least some rainfall was recorded on 12 different days at the Sarnia Airport weather station. Suppose one day in April 2006 is selected at random. What is the probability of choosing a day on which it rained as a percent?

7. In a bag, there are 14 yellow marbles and 6 blue marbles. A marble is removed, the colour is recorded, and then it is put back into the bag. This is repeated for a total of 20 times. The results are displayed on the bar graph.



(a) What is the experimental probability of drawing a yellow marble?
 Express your answer as a percent.

(b) What is the theoretical probability of drawing a yellow marble?
 Express your answer as a percent.

Answers: 1. (a) $\frac{3}{8}$, (b) both theoretical probabilities would be the same; (c) $\frac{7}{8}$; 2. (a) $\frac{4}{5}$, (b) $\frac{1}{2}$, (c) decrease since the theoretical probability is $\frac{1}{2}$, we would expect the experimental probability to approach that value for additional trials; 3. (a) $\frac{1}{4}$, (b) $\frac{13}{15}$; 4. (a) (i) $\frac{2}{15}$, (ii) $\frac{1}{5}$, (iii) $\frac{7}{30}$, (iv) $\frac{1}{6}$, (v) $\frac{1}{5}$, (vi) $\frac{1}{15}$, (b) Each probability is experimental since the results come from a number of trials; 5. (a) (i) $\frac{1}{3}$, (ii) $\frac{2}{3}$, (iii) 0, (b) there are too few trials to give a reasonably accurate experimental probability; 6. 40%; 7. (a) 85%, (b) 70%.