

**Problem 1.** A coin is flipped 5 times. What is the likelihood of getting four consecutive heads?

- (a) How many length five sequences of heads and tails are there?
  
  
  
  
  
  
  
  
  
  
- (b) How many length five sequences of heads and tails containing four consecutive heads are there?
  
  
  
  
  
  
  
  
  
  
- (c) Find the probability of getting four consecutive heads.

**Problem 2.** Ogg the Slow had three 6-sided dice. One was red, one was white, and one was blue. His favorite game was to roll the dice and record the number on each cube, according to its color.

An outcome in this case is the sequence of numbers recorded for each roll; first the red, then the white, then the blue. We model an outcome as an ordered triple of integers between one and six. The number which appears on the top of each die when it is rolled is called its *value*.

Eve the Wise wished to find the probability that the recorded values added up to five.

- (a) Find the number of possible outcomes.  
(This is the cardinality of the sample space.)
  
  
  
  
  
  
  
  
  
  
- (b) Find the number of possible outcomes for which the sum of the values is five.  
(This is the cardinality of the event.)
  
  
  
  
  
  
  
  
  
  
- (c) Find the probability of the event.  
(This is the cardinality of the event divided by the cardinality of the sample space.)

**Problem 3.** Frodo has a tetrahedral die, a cubic die, and an octahedral die. Samwise bet that if he rolled the dice, the sum would be less than or equal to 5.

- (a) Find the number of possible outcomes.  
(This is the cardinality of the sample space.)
  
  
  
  
  
  
  
  
  
  
- (b) Find the number of possible outcomes for which the sum of the values is less than or equal to five.  
(This is the cardinality of the event.)
  
  
  
  
  
  
  
  
  
  
- (c) Find the probability of the event.  
(This is the cardinality of the event divided by the cardinality of the sample space.)

**Problem 4.** Bartholomew has 3 red marbles, 4 white marbles, and 5 blue marbles. He cleverly swallows 3 randomly selected marbles throws the rest down the toilet. His mother wishes to know the probability that he swallowed only red marbles.

- (a) How many ways are there to choose three marbles from a set of  $3 + 4 + 5$  marbles?  
(This is the cardinality of the sample space.)
  
  
  
  
  
  
  
  
  
  
- (b) How many ways are there to pick three red marbles from a set of three red marbles?  
(This is the cardinality of the event.)
  
  
  
  
  
  
  
  
  
  
- (c) What is the probability of that Bartholomew swallowed exactly three red marbles?  
(This is the cardinality of the event divided by the cardinality of the sample space.)