

## Sample Questions: Independence

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1. A jar contains 5 red balls and 15 black balls. Draw 2 balls randomly with replacement.

(a) What is the probability that the first ball is red and the second is black? The answer is a number.

(b) What is the probability of one red and one black in any order? The answer is a number.

2. Roll a fair die  $n$  times.

(a) What is the probability of observing at least one 4?

(b) How many times must you roll the die for the probability of at least one 4 to be 0.90 or more? The answer is a number.

3. A biased coin has  $P(\text{Head}) = p$ . Toss it three times.
- (a) List the elements of the sample space, along with their probabilities.
  
  
  
  
  
  
  
  
  
  
  - (b) What is  $P(\text{Two Heads})$ ?
4. It is clear from the last problem that the probability of a string with  $k$  heads is the same, regardless of their placement. Suppose we toss the biased coin  $n$  times. What is the probability of  $k$  heads (for  $k = 0, \dots, n$ )?

5. Again, a biased coin has  $P(\text{Head}) = p$ . Toss it until the first head occurs, and then stop.

(a) What is the probability that the first head appears on the fifth toss?

(b) What is the probability that a head eventually occurs (on toss 1 or 2 or ...)?

- (c) What is the probability that the first head occurs on an even numbered toss (toss 2 or 4 or ...)?

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<http://www.utstat.toronto.edu/~brunner/oldclass/256f18>