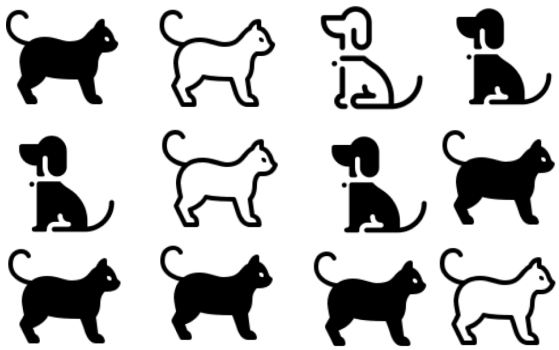
SDS 220 - Lecture 12 Handout

OI Section 3.2

1. **Pets in Northampton.** The 12 animals shown below are currently available for adoption at a local animal shelter. Your friend has decided that they want to adopt a pet. Your friend decided to select their new pet uniformly at random from this set because all of the 12 animals below are equally adorable.



   (a) What is the probability that the pet your friend selects has a black coat?

   (b) What is the probability that the pet your friend selects is a cat?

   (c) What is the probability that the pet your friend selects is a black cat?

   (d) Suppose your friend calls you up and tells you the the animal they adopted is a cat. Given this information, what is the probability that it has a black coat?

   (e) Suppose your friend actually said that the pet they adopted has a black coat. Given this information instead, what is the probability that it is a cat?

2. **Pets in MA.** Now consider all the adoptable cats and dogs with black coats or white coats in MA. To consolidate information, the frequencies are given below. Suppose a pet was adopted today at random. Find the associated probabilities.

Species\Coat	Black	White	Total
Dog	45	12	57
Cat	101	55	156
Total	146	67	213

   (a) What is the probability that the pet selected has a black coat?

   (b) What is the probability that the pet selected is a cat?

   (c) What is the probability that the pet selected is a black cat?

   (d) Suppose you learn that the the animal adopted is a cat. Given this information, what is the probability that it has a black coat?

   (e) Suppose you learn that the pet adopted has a black coat. Given this information instead, what is the probability that it is a cat?

3. **Pets in NY.** Now consider all the adoptable cats and dogs with black coats or white coats in the state of NY, but this time proportions are given instead of counts. Suppose a pet was adopted today at random. Find the associated probabilities.

Species\Coat	Black	White	Total
Dog	.45	.06	.51
Cat	.38	.11	.49
Total	.83	.17	1

   (a) What is the probability that the pet selected has a black coat?

   (b) What is the probability that the pet selected is a cat?

   (c) What is the probability that the pet selected is a black cat?

   (d) Suppose you learn that the the animal adopted is a cat. Given this information, what is the probability that it has a black coat?

   (e) Suppose you learn that the pet adopted has a black coat. Given this information instead, what is the probability that it is a cat?

4. In part (d) and (e) in the previous three questions you found a probability *after* you learned something about the situation. Can you describe how to calculate a probability like this that works generally?