Week 5 lecture notes - PSYC 3330

Sept 25-29, 2017

So far this semester, we have used statistics to **describe** data. Now, we will begin using statistics as an **inference tool**. To do this, we need to discuss **probability**.

Definition

Suppose we have a list of possible *outcomes*, labeled A, B, C, D, and so on. Then:

$$p(A) = \text{ "the probability of A" } = \frac{\text{number of outcomes classified as A}}{\text{total number of possible outcomes}}$$

Example: What is the probability of picking a king of spades from a standard deck of 52 cards?

Answer:

$$p(\text{king of spades}) = \frac{\text{of times king of spades appears}}{\text{number of cards in the deck}} = \frac{1}{52}$$

Example: What is the probability of picking a heart from a deck?

Answer:

$$p(\text{heart}) = \frac{\text{hearts in a deck}}{\text{number of cards in the deck}} = \frac{13}{52} = \frac{1}{4} = 0.25$$

The more common way we will encounter probability is as part of a *probability distribution.*

Example: Suppose we have 40 slips of paper, each labeled with one of the numbers 1,2,3,4,5. Specifically, assume they are labeled with the following frequencies:

X	f	p
5	2	0.05
4	10	0.25
3	16	0.40
2	8	0.20
1	4	0.10

Visually, this distribution looks like the following graph:
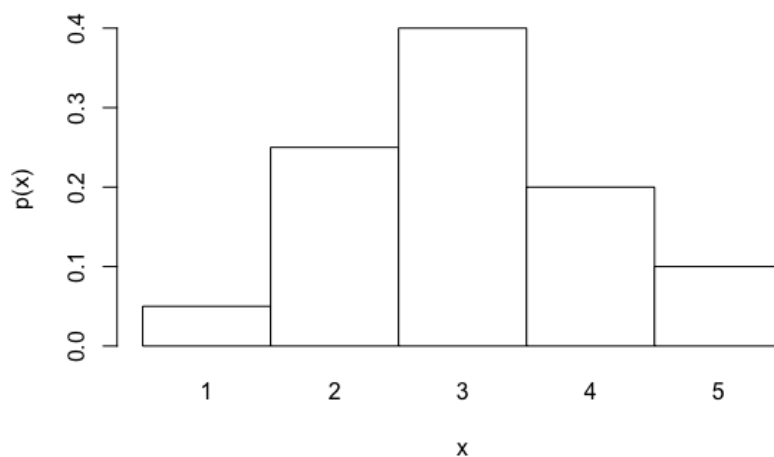
Now, suppose our task is to randomly select a slip of paper. We can then ask lots of questions, such as:

- What is the probability of selecting a 3?

    - Answer: $p(3) = 0.40$

- What is the probability of selecting a 5?

    - Answer: $p(5) = 0.05$

We can also ask more complex questions:

- What is the probability of selecting a slip of paper with a value greater than 2?

    - Answer: $p(x > 2) = 0.40 + 0.25 + 0.05 = 0.70$
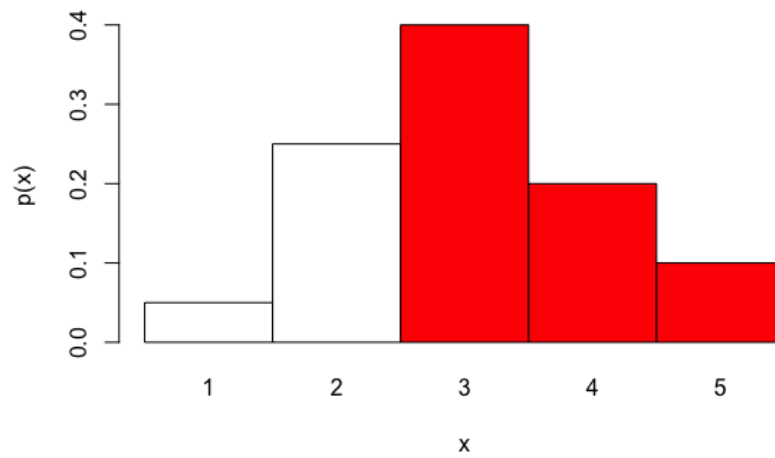
- What is the probability of selecting a slip of paper with a value less than 5?

    - Answer: $p(x < 5) = 0.10 + 0.20 + 0.40 + 0.25 = 0.95$

- What is the probability of selecting a value greater than 1 and less than 4?

– Answer: $p(1 < x < 4) = 0.20 + 0.40 = 0.60$