Normal Distributions - Introduction

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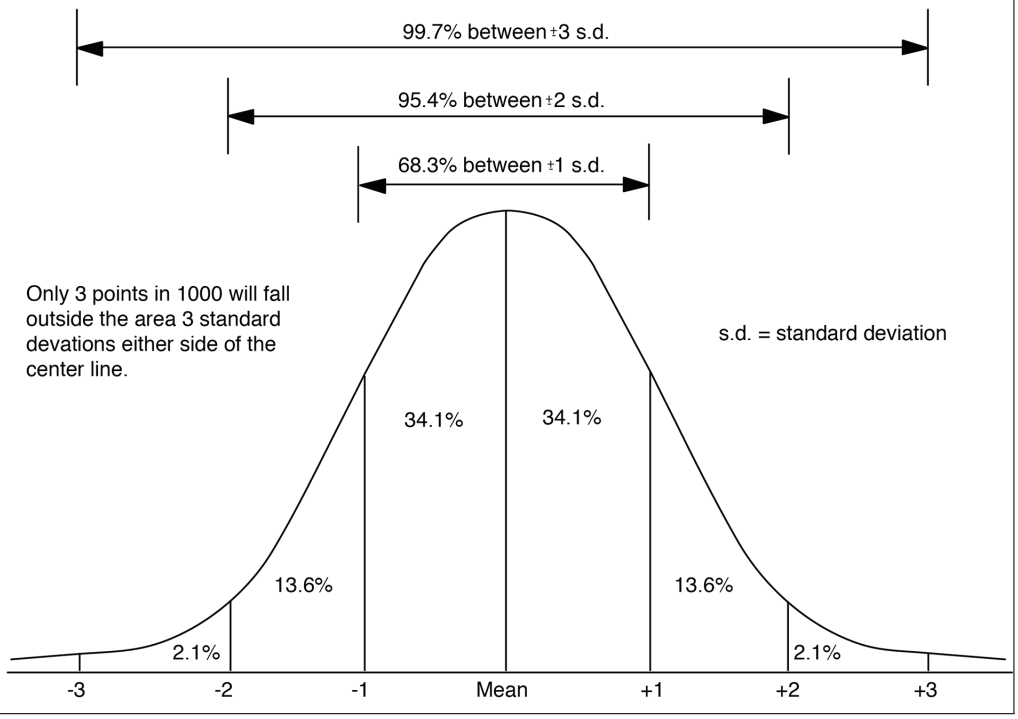
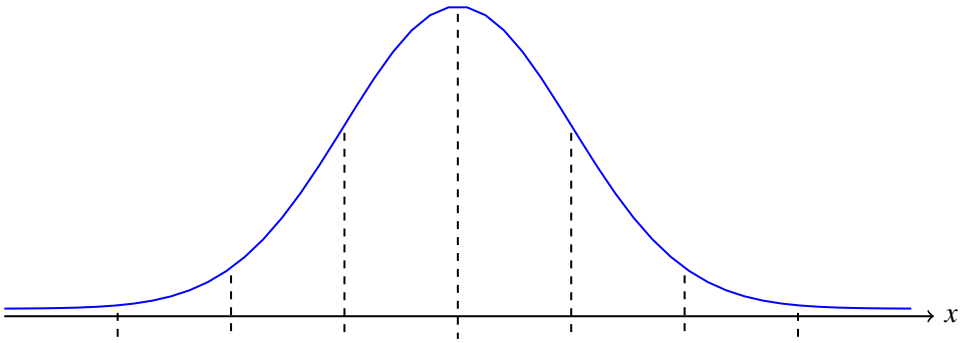
- We are in section 6.1 of the textbook
- A *continuous random variable* is a random process that can produce any decimal number in a given range.
  - Select a random animal from a population and record its weight
  - Select a random student and record their height in inches
- With continuous random variables, we don't talk about the probability of a single value. Instead, we talk about the probability that an outcome is in a given *interval* of values.
- The most common type of continuous random variable is called a *normal distribution*. These distributions appear very commonly in practice.
- All normal distributions look the same if we measure the x axis using standard deviations. We view the probability as the area of a certain region under the normal curve.



1. It is believed that trout fish in a certain lake have a mean length of 10.7 inches and a standard deviation of 1.7 inches. Assume that the lengths can be approximated by a normal distribution. Use the rule of thumb on the first page to answer the following questions.

   (a) Label the following diagram using the mean and standard deviation.

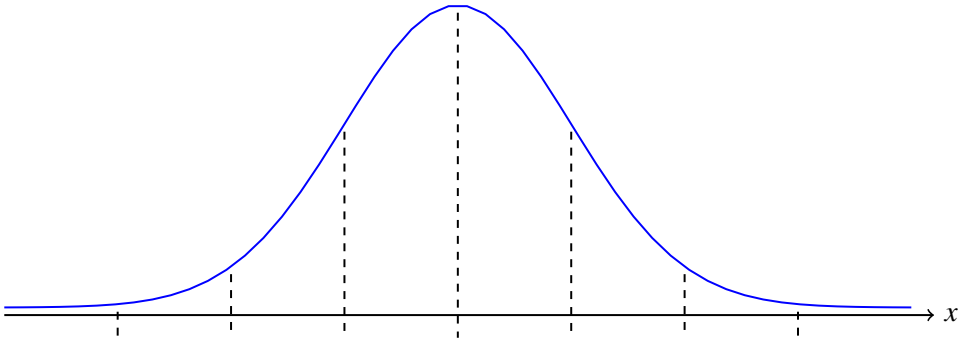


   (b) What percentage of trout in the lake have a length between 7.3 inches and 14.1 inches? Shade in the area above that corresponds to you answer.

   (c) What percentage of trout in the lake are longer than 12.4 inches?

2. The height of adult women in the United States can be treated as a normal distribution with a mean (average) of 65 inches and a standard deviation of 3.5 inches.

   (a) Label the normal curve below using standard deviations.



   (b) What percentage of women in the population will have a height of 65 inches or more?

   (c) What percentage will have a height of 68.5 inches or more?

   (d) What percentage will have a height less than 58 inches? Shade in this area in the diagram above.

   (e) What percentage will have a height between 58 inches and 72 inches?

(f) Suppose a woman in the population has a height of 6 feet and 3 inches. How many standard deviations is that height from the mean?

3. A teacher tells you that the first graders in a large school have an average height of 47.5 inches with a standard deviation of 1 inch.

   (a) If a first grader in the school has a height of 50 inches, how many standard deviations are they from the mean?

   (b) If you see five first graders come in, all of whom are 50 inches, would this make you skeptical of the teacher's claim?

   (c) If a first grader in the school has a height of 43.5 inches, how many standard deviations are they from the mean?

   (d) If you see three first graders come in, each of whom is 43.5 inches tall, would this make you skeptical of the teacher's claim?