Estimating a mean when σ is known - Introduction

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- We are in section 8.1 of the textbook.

- The idea of this section is that we want to estimate the mean of a population using the mean of a sample.

- In this section, we will also assume we know the standard deviation of the population.

- The first thing we will look at are *centered regions* on a normal distribution. This is a region of the form $P(-c < z < c)$ for some c, which is called a **critical value**. Usually, we pick c so the region has 95% or 99% of the data. Sometimes we write z_c instead of c to remind ourselves that c is a z-value.

- To find the z values for a centered region, suppose we want the region to have area A. We compute
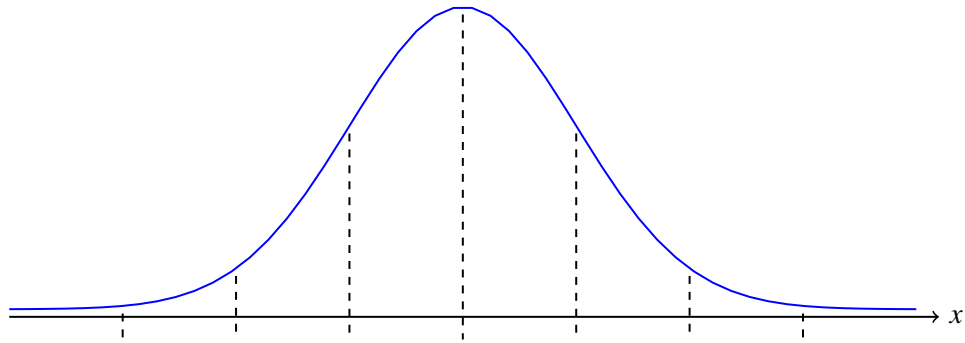$$\frac{(1-A)}{2}$$
and then find the z value that corresponds to this number. That will be $-c$.

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1. For each of these values of A, **sketch** and **find the boundaries** of a centered region with area A in an normal distribution.
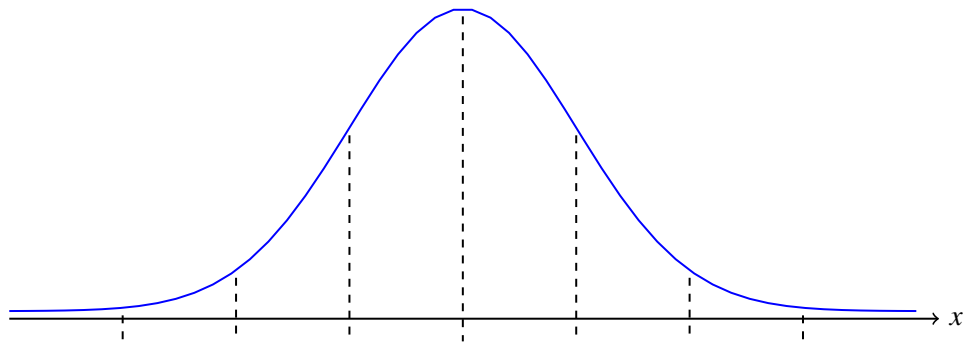
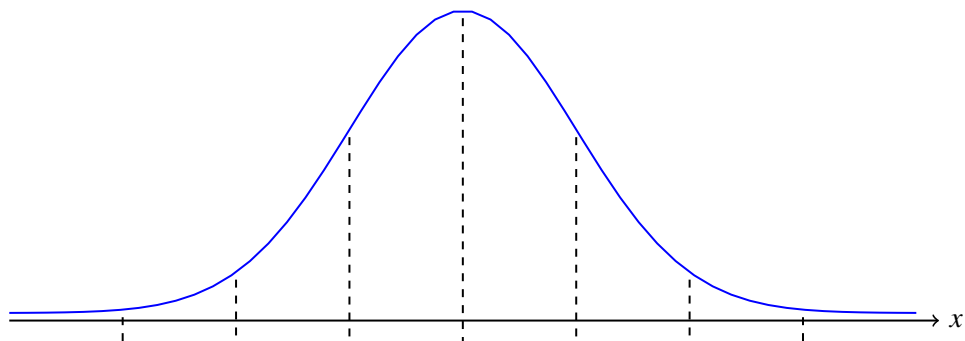   (a) $A = 99\%$
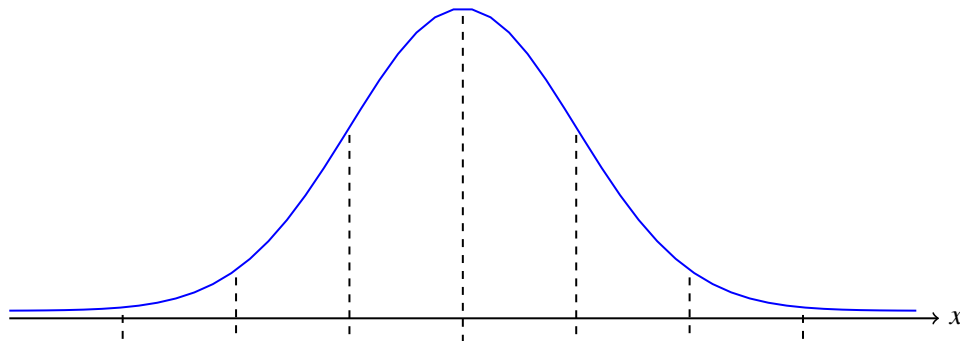
(b) $A = 95\%$

(c) 50%

(d) $A = 80\%$

2. We will work through this problem together. Suppose that we know a distribution is normal and has standard deviation 8. We take a sample of size 16, and our sample average is 35. What can we say about the actual mean, which we don't know?

   (a) We will estimate that the mean of the whole distribution is 35. This is called a **point estimate** because we're using our sample to directly estimate the mean.

   (b) What is the standard deviation of our sampling distribution? Use the formula $\dfrac{\sigma}{\sqrt{n}}$.

   (c) How far away from the mean are we likely to be? Let's pick a **confidence level** of 95%. What is the critical value for this confidence level? Remember this is a z-value.

   (d) What distance in x-values corresponds to the critical distance?

   (e) What is our confidence interval?

(f) What does our confidence interval mean?

Sampling distribution

x