

Lecture 6: Calculating probabilities

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Quantitative Political Methodology

Lecture 6: Calculating probabilities

IPA

Let's try this

```
install.packages("swirl")  
library("swirl")
```

```
install_course_github("jmontgomery", "QPMSwirl")  
swirl()
```

Roadmap

Last time:

- ▶ Understanding the concept of a sampling distribution
- ▶ Understand the concept of a standard error
- ▶ See how the CLT allows us to know the distribution of certain sample statistics

This time:

- ▶ How to find probabilities from a binomial table
- ▶ How to find probabilities using a Z-distribution table
- ▶ How to find “critical values.”
- ▶ Extend this logic to the t-distribution (online only)

Motivation

Castaneda v. Partida

- ▶ The true number of Mexican-Americans was 79.1% of the population.
- ▶ Individuals were selected for jury participation using the “key man” system.
- ▶ 45.5% of the members of the grand jury were Mexican-American.

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- ▶ The true number of Mexican-Americans was 79.1% of the population.
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How likely was this to happen by chance if the jury was of size $n = 60$?

Question 1

Which fraction represents the probability of obtaining exactly eight heads in ten tosses of a fair coin?

Question 2

For a normal distribution with $\mu = 50$ and $\sigma = 3$, find the probability that an observation falls:

1. At or below the value of 56
2. Between the values of 45 and 56

Question 3

Suppose that for exam grades $\mu = 75$ and $\sigma = 15$.

1. What is the probability of receiving an exam grade of 90 or better?
2. What about a 60 or worse?
3. If the probability of doing better than you is .05, then what is your score?

Question 4 (not on your form)

If you have a t-distributed variable with 21 degrees of freedom.

- ▶ What is the probability of a value above 1.721?
- ▶ .05% of the distribution is greater than what critical value?