

# Confidence Intervals for Means



Name: \_\_\_\_\_

Section Number: \_\_\_\_\_

## Background

This workbook is focused primarily on sample and population proportions. However, one can also compute confidence intervals for a population mean  $\mu$ , based on a sample mean  $\bar{x}$ . The formula for this computation is below:

$$\bar{x} \pm z^* \frac{s}{\sqrt{n}}$$

In this formula  $s$  is the standard deviation of the sample data,  $n$  is the sample size, and  $z^*$  is the confidence coefficient you first encountered when learning about proportions. While this is not the exact mathematical formula, it will be fine for our purposes. Your instructor may or may not choose to clarify the differences between  $t$ - and  $z$ -distributions at this point. The interpretation associated with this interval is just the same as it is for proportions, with the obvious change to “mean” language.

## EXHIBIT 1

### Inaugural Intervals

A random sample of 10 U.S. Presidents was taken and the age at inauguration recorded. See the table on the right.



TABLE 2.9 Inaugural Intervals

President	Age at Inauguration
James Madison	57 years, 353 days
Martin Van Buren	54 years, 89 days
Millard Fillmore	50 years, 183 days
Warren G. Harding	55 years, 122 days
William McKinley	54 years, 34 days
William Howard Taft	51 years, 170 days
George Washington	57 years, 67 days
Benjamin Harrison	55 years, 196 days
Franklin D. Roosevelt	51 years, 33 days
Ulysses S. Grant	46 years, 311 days

## Questions

1. Find the sample mean of these 10 Presidents' ages in days, at the time of their inauguration.

2. Find the sample standard deviation of these ten Presidents' ages in days.
  
  
  
  
  
  
  
  
  
  
3. What is  $z^*$  for a 90% confidence interval?
  
  
  
  
  
  
  
  
  
  
4. Compute a 90% confidence interval for the true average age (in days) of all U.S. Presidents, up to and including President Obama, at the time of inauguration.
  
  
  
  
  
  
  
  
  
  
5. Carefully interpret the interval you computed in Question 4.
  
  
  
  
  
  
  
  
  
  
6. Do some research on your own and determine the true average age of *all* 44 U.S. Presidents, up to and including President Obama.  
  
See if the interval you computed in Question 4 contains this true average. Whether it does or doesn't, explain the chances of that outcome happening.

Stat 1350, Ages of Presidents at Inauguration, Spring 2015

<b>George Washington</b>	<b>57 years, 67 days or 57.18356 years</b>
<b>John Adams</b>	61 years, 125 days or 61.3425 years
<b>Thomas Jefferson</b>	57 years, 325 days or 57.8904 years
<b>James Madison</b>	57 years, 353 days or 58.9671 years
<b>James Monroe</b>	58 years, 310 days or 58.8493 years
<b>John Quincy Adams</b>	57 years, 236 days or 57.6466 years
<b>Andrew Jackson</b>	61 years, 354 days or 61.9699 years
<b>Martin Van Buren</b>	54 year, 89 days or 54.2438 years
<b>William Henry Harrison</b>	68 years, 23 days or 68.0630 years
<b>John Tyler</b>	51 years, 6 days or 51.0164 years
<b>James K. Polk</b>	49 years, 122 days or 49.33.42 years
<b>Zachary Taylor</b>	64 years, 100 days or 64.2740 years
<b>Millard Fillmore</b>	50 years, 183 days or 50.5014 years
<b>Franklin Pierce</b>	48 years, 101 days or 48.2767 years
<b>James Buchanan</b>	65 years, 315 days or 65.8630 years
<b>Abraham Lincoln</b>	52 years, 20 days or 52.0548 years
<b>Andrew Johnson</b>	56 years, 107 days or 56.2932 years
<b>Ulysses S. Grant</b>	46 years, 311 days or 46.8521 years
<b>Rutherford B. Hayes</b>	54 years, 151 days or 54.4137 years
<b>James A. Garfield</b>	49 years, 105 days or 49.2877 years
<b>Chester A. Arthur</b>	51 years, 349 days or 51.9562 years
<b>Grover Cleveland</b>	47 years, 351 days or 47.9616 years
<b>Benjamin Harrison</b>	55 years, 196 days or 55.5370 years
<b>Grover Cleveland</b>	55 years, 351 days or 55.9562 years
<b>William McKinley</b>	54 years, 34 days or 54.0932 years
<b>Theodore Roosevelt</b>	42 years, 322 days or 42.8822 years
<b>William Howard Taft</b>	51 years, 170 days or 51.4658 years
<b>Woodrow Wilson</b>	56 years, 66 days or 56.1808 years
<b>Warren G. Harding</b>	55 years, 122 days or 55.3342 years
<b>Calvin Coolidge</b>	51 years, 29 days or 51.0795 years
<b>Herbert Hoover</b>	54 years, 206 days or 54.5644 years
<b>Franklin D. Roosevelt</b>	51 years, 33 days or 51.0904 years
<b>Harry S. Truman</b>	60 years, 339 days or 60.9288 years
<b>Dwight D. Eisenhower</b>	62 years, 98 days or 62.2685 years
<b>John F. Kennedy</b>	43 years, 236 days or 43.6466 years
<b>Lyndon B. Johnson</b>	55 years, 87 days or 55.2384 years
<b>Richard Nixon</b>	56 years, 11 days or 56.0301 years
<b>Gerald Ford</b>	61 years, 26 days or 61.0712 years
<b>Jimmy Carter</b>	52 years, 111 days or 52.3041 years
<b>Ronald Reagan</b>	69 years, 349 days or 69.9479 years
<b>George H. W. Bush</b>	64 years, 222 days or 64.6082 years
<b>Bill Clinton</b>	46 years, 154 days or 46.4219 years
<b>George W. Bush</b>	54 years, 198 days or 54.5425 years
<b>Barack Obama</b>	47 years, 169 days or 47.4630 years