## BEYOND THE NUMBERS 2.24 | LEARNING OUTCOME 4 TO 7

# **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  $\overline{x}$ . The formula for this computation is below:

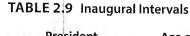
$$\overline{x} \pm z^* \frac{s}{\sqrt{n}}$$

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.



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
Ulvsses 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 stand	lard deviation of these ten Presidents' ages	in days.
		W	× =
3.	What is z* for a 90% o	onfidence interval?	
		500 E	¥
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4.	compute a 90% confidup to and including Pr	lence interval for the true average age (in desident Obama, at the time of inauguration	ays) of all U.S. Presidents,
5.	Carefully interpret the	interval you computed in Question 4.	
		T T	
6.	Do some research on y up to and including Pre	our own and determine the true average ag sident Obama.	ge of <i>all</i> 44 U.S. Presidents,
	computed in Question the chances of that out	4 contains this true average. Whether it doe	See if the interval you es or doesn't, explain
		3	
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Stat 1350, Ages of Presidents at Inauguration, Spring 2015

otat 1000, Ages of Freshaents at maugi	aration, 5pring 2015		
George Washington	57 years, 67 days or 57.18356 years		
John Adams	61 years, 125 days or 61.3425 years		
Thomas Jefferson	57 years, 325 days or 57.8904 years		
James Madison	57 years, 353 days or 58.9671 years		
James Monroe	58 years, 310 days or 58.8493 years		
John Quincy Adams	57 years, 236 days or 57.6466 years		
Andrew Jackson	61 years, 354 days or 61.9699 years		
Martin Van Buren	54 year, 89 days or 54.2438 years		
William Henry Harrison	68 years, 23 days or 68.0630 years		
John Tyler	51 years, 6 days or 51.0164 years		
James K. Polk	49 years, 122 days or 49.33.42 years		
Zachary Taylor	64 years, 100 days or 64.2740 years		
Millard Fill more	50 years, 183 days or 50.5014 years		
Franklin Pierce	48 years, 101 days or 48.2767 years		
James Buchanan	65 years, 315 days or 65.8630 years		
Abraham Lincoln	52 years, 20 days or 52.0548 years		
Andrew Johnson	56 years, 107 days or 56.2932 years		
Ulysses S. Grant	46 years, 311 days or 46.8521 years		
Rutherford B. Hayes	54 years, 151 days or 54.4137 years		
James A. Garfield	49 years, 105 days or 49.2877 years		
Chester A. Arthur	51 years, 349 days or 51.9562 years		
Grover Cleveland	47 years, 351 days or 47.9616 years		
Benjamin Harrison	55 years, 196 days or 55.5370 years		
Grover Cleveland	55 years, 351 days or 55.9562 years		
William McKinley	54 years, 34 days or 54.0932 years		
Theodore Roosevelt	42 years, 322 days or 42.8822 years		
William Howard Taft	51 years, 170 days or 51.4658 years		
Woodrow Wilson	56 years, 66 days or 56.1808 years		
Warren G. Harding	55 years, 122 days or 55.3342 years		
lvin Coolidge 51 years, 29 days or 51.0795 years			
Herbert Hoover	54 years, 206 days or 54.5644 years		
Franklin D. Roosevelt	51 years, 33 days or 51.0904 years		
Harry S. Truman	60 years, 339 days or 60.9288 years		
Dwight D. Eisenhower	62 years, 98 days or 62.2685 years		
John F. Kennedy	43 years, 236 days or 43.6466 years		
Lyndon B. Johnson	55 years, 87 days or 55.2384 years		
Richard Nixon	56 years, 11 days or 56.0301 years		
Gerald Ford	61 years, 26 days or 61.0712 years		
Jimmy Carter	52 years, 111 days or 52.3041 years		
Ronald Reagan	69 years, 349 days or 69.9479 years		
George H. W. Bush	64 years, 222 days or 64.6082 years		
Bill Clinton	46 years, 154 days or 46.4219 years		
George W. Bush	54 years, 198 days or 54.5425 years		
Barack Obama	47 years, 169 days or 47.4630 years		