Math 20-2

KEY

L43 – Confidence Intervals

Part 1 – Terminology

Margin of Error: The possible difference between the estimate of the value you're trying to determine, as determined from a random sample, and the true value for the population; the margin of error is generally expressed as a plus or minus percent, such as ±5%.

Confidence Interval: The interval in which the true value you're trying to determine is estimated to lie, with a stated degree of probability; the confidence interval may be expressed using ± notation, such as 54.0% ± 3.5%, or ranging from 50.5% to 57.5%.

Confidence Level: The likelihood that the result for the "true" population lies within the range of the confidence interval; surveys and other studies usually use a confidence level of 95%, although 90% or 99% is sometimes used.

Part 2 – Introduction using the 2020 U.S. Election Polling Results by CNN

Use the following information to answer Q1-Q4:

From http://cdn.cnn.com/cnn/2020/images/10/28/rel15.pdf

The study was conducted for CNN via telephone by SSRS, an independent research company. Interviews were conducted from October 23 - 26, 2020 among a sample of 1,005 respondents. The margin of sampling error for total respondents is +/- 3.6 at the 95% confidence level.

P1. Suppose that the presidential election were being held today and you had to choose between Joe Biden and Kamala Harris as the Democratic Party's candidates, and Donald Trump and Mike Pence as the Republican Party's candidates. Who would you be more likely to vote for? P1a. As of today, do you lean more toward...

Likely Voters	Joe Biden and Kamala Harris, the Democrats	Donald Trump and Mike Pence, the Republicans	Other (vol.)	Neither (vol.)	No opinion
October 23-26, 2020	54%	42%	1%	1%	2%

Q1: What is the ***Confidence Interval*** and ***Confidence Level*** regarding the number of Votes that Joe Biden will receive?

Joe Biden will receive 54% ± 3.6% votes,
so between 50.4% and 57.6% of the popular vote.

This will be true 95 times out of 100.

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Use the following additional information to answer Q2:

From http://cdn.cnn.com/cnn/2020/images/10/28/rel15.pdf

The study was conducted for CNN via telephone by SSRS, an independent research company. Interviews were conducted from October 23 - 26, 2020 among a sample of 1,005 respondents. The margin of sampling error for total respondents is +/- 3.6 at the 95% confidence level.

(Respondents who are registered to vote and would vote for Biden, N=493) P2B. Is that more a vote FOR Joe Biden or more a vote AGAINST Donald Trump?

Likely Voters	Vote for Biden	Vote against Trump	No opinion
October 23-26, 2020	48%	48%	5%

Q2: Explain these results, using Confidence Intervals and Confidence Levels.

Of people voting for Biden...

- 48% ± 3.6% (44.4% to 51.6%) are voting FOR their candidate.
- 48% ± 3.6% (44.4% to 51.6%) are voting AGAINST the other candidate

This is true 95 times out of 100.

Use the following additional information to answer Q3:

From http://cdn.cnn.com/cnn/2020/images/10/28/rel15.pdf

The study was conducted for CNN via telephone by SSRS, an independent research company. Interviews were conducted from October 23 - 26, 2020 among a sample of 1,005 respondents. The margin of sampling error for total respondents is +/- 3.6 at the 95% confidence level.

(Respondents who are registered to vote and would vote for Trump, N=394) P2T. Is that more a vote FOR Donald Trump or more a vote AGAINST Joe Biden?

Likely Voters	Vote for Trump	Vote against Biden	No opinion
October 23-26, 2020	79%	17%	4%

Q3: Explain these results, using Confidence Intervals and Confidence Levels.

Of people voting for Trump...

- 79% ± 3.6% (75.4% to 82.6%) are voting FOR their candidate.
- 17% ± 3.6% (13.4% to 20.6%) are voting AGAINST the other candidate.

This is true 95 times out of 100.

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From your Grade 9 Mathematics lesson on "Population versus Sample":

Sampling Methods

Convenient Sampling - Just ask whoever is around.

Example: A television journalist stops you on the street and asks you a question.

Bias: Opinion limited to individuals present.

Voluntary Response Sampling - Individuals choose to be involved. They are really public opinion polls.

Example: Answering a poll conducted by a radio talk show.

Bias: Not considered valid or scientific.

Television / Online Survey - Limited to the people who watch a particular show, or look up a certain website.

Example: Filling out a questionnaire online

Bias: Very opinionated, and usually does not reflect the general public.

Random Samples - Made of randomly selected individuals. Every person in the population has the same chance of being in the sample. The larger the sample, the closer the random sample is to representing the population.

Unbias: Sampling randomly gets rid of bias.

Q4: What type of sampling was used by SSRS (on behalf of CNN) to collect this survey data?

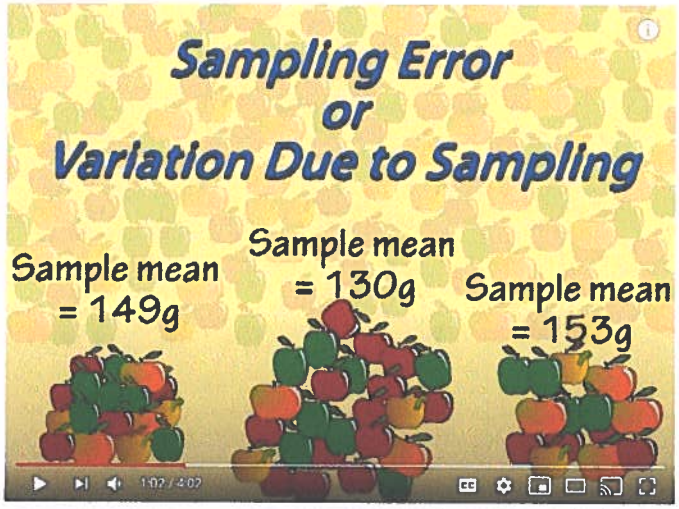
Voluntary Response since most people will just hang up.

Q5: Determine how many people were in each category:

Voting for Biden (n = 493)		Voting for Trump (n = 394)	
Vote ***for*** Biden 48%	Vote ***against*** Trump 48%	Vote ***for*** Trump 79%	Vote ***against*** Biden 17%
493 × 0.48 = 237 people	493 × 0.48 = 237 people	394 × 0.79 = 311 people	67 people

Part 3 – Why do Confidence Intervals Exist?

https://www.youtube.com/watch?v=tFWsuO9f74o



Understanding Confidence Intervals: Statistics Help

Discussion regarding video.

Discussion regarding Sample Size affecting Confidence Interval.

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Part 4 – Additional Data for Discussion

Data regarding opinions of the Democratic Opinion:

FV1. We'd like to get your overall opinion of some people in the news. As I read each name, please say if you have a favorable or unfavorable opinion of these people - or if you have never heard of them.

(DP) The Democratic Party	Favorable opinion	Unfavorable opinion	Never heard of (vol.)	No opinion
October 23-26, 2020	46%	45%	1%	8%
October 17-20, 2019	45%	48%	1%	7%
December 06-09, 2018	46%	43%	1%	10%
October 04-07, 2018	46%	45%	1%	8%
May 02-05, 2018	44%	45%	*	10%
December 14-17, 2017	46%	48%	*	7%
November 02-05, 2017	37%	54%	1%	8%
September 17-20, 2017	41%	51%	*	5%
March 01-04, 2017	44%	51%	*	5%
November 17-20, 2016	39%	54%	1%	6%
October 20-23, 2016	45%	45%	1%	9%
July 29-31, 2016	43%	47%	2%	8%
July 13-16, 2016	46%	42%	1%	11%
June 16-19, 2016	44%	48%	1%	7%
March 17-20, 2016	50%	45%	*	4%
January 21-24, 2016	45%	46%	1%	8%
August 13-16, 2015	47%	48%	*	5%
May 29-31, 2015	47%	45%	1%	7%
November 21-23, 2014	44%	50%	1%	5%
October 18-20, 2013	43%	51%	1%	6%
September 27-29, 2013	43%	52%	*	5%
May 17-18, 2013	52%	43%	2%	4%
March 15-17, 2013	46%	48%	1%	5%
Nov. 16-18, 2012	51%	41%	1%	7%
Nov. 2-4, 2012 (RV)	52%	43%	*	4%
Sept. 7-9, 2012 (RV)	52%	43%	*	5%
August 22-23, 2012 (RV)	49%	45%	*	6%
April 13-15, 2012	46%	46%	1%	7%
March 24-25, 2012	48%	45%	1%	6%
September 23-25, 2011	44%	48%	1%	6%
August 5-7, 2011	47%	47%	*	6%
July 18-20, 2011	45%	49%	1%	5%
March 11-13, 2011	46%	48%	*	7%
December 17-19, 2010	47%	47%	1%	6%
November 11-14, 2010	46%	48%	1%	5%
October 27-30, 2010	46%	47%	*	7%
September 1-2, 2010	44%	49%	1%	6%
April 9-11, 2010	49%	46%	1%	5%
January 22-24, 2010	46%	46%	*	8%
October 16-18, 2009	53%	41%	*	6%
July 31-Aug. 3, 2009	52%	39%	1%	8%
April 23-26, 2009	51%	44%	*	4%
February 18-19, 2009	58%	36%	*	5%
December 1-2, 2008	60%	34%	*	5%
November 6-9, 2008	62%	31%	1%	6%
October 17-19, 2008 (RV)	53%	42%	*	5%
Sept. 05-07, 2008 (RV)	51%	40%	1%	8%
Aug. 29-31, 2008 (RV)	59%	36%	*	4%
Aug. 23-24, 2008 (RV)	52%	40%	1%	7%
April 28-30, 2008	56%	35%	1%	8%
January 9-10, 2008	55%	34%	2%	8%
June 22-24, 2007	51%	38%	1%	9%
March 9-11, 2007	51%	34%	1%	13%
November 3-5, 2006	53%	35%	*	11%
September 22-24, 2006	56%	39%	*	5%

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Data regarding opinions of the Republican Opinion:

FV1. We'd like to get your overall opinion of some people in the news. As I read each name, please say if you have a favorable or unfavorable opinion of these people - or if you have never heard of them.

(RP) The Republican Party	Favorable opinion	Unfavorable opinion	Never heard of (vol.)	No opinion
October 23-26, 2020	41%	50%	1%	8%
October 17-20, 2019	38%	55%	1%	6%
December 06-09, 2018	38%	51%	1%	10%
October 04-07, 2018	40%	52%	1%	8%
May 02-05, 2018	39%	52%	*	9%
December 14-17, 2017	34%	59%	*	7%
November 02-05, 2017	30%	61%	1%	8%
September 17-20, 2017	29%	62%	1%	5%
March 01-04, 2017	42%	53%	1%	5%
November 17-20, 2016	41%	52%	1%	6%
October 20-23, 2016	36%	53%	1%	10%
July 29-31, 2016	36%	53%	1%	10%
July 13-16, 2016	40%	49%	1%	11%
June 16-19, 2016	34%	60%	1%	6%
March 17-20, 2016	34%	61%	1%	4%
January 21-24, 2016	40%	50%	1%	9%
August 13-16, 2015	41%	54%	*	5%
May 29-31, 2015	41%	49%	1%	9%
November 21-23, 2014	41%	52%	1%	5%
October 18-20, 2013	30%	64%	*	6%
September 27-29, 2013	32%	62%	*	5%
May 17-18, 2013	35%	59%	2%	4%
March 15-17, 2013	38%	54%	1%	7%
Nov. 16-18, 2012	38%	53%	*	9%
Nov. 2-4, 2012 (RV)	45%	49%	*	7%
Sept. 7-9, 2012 (RV)	38%	55%	*	7%
Aug 22-23, 2012 (RV)	41%	52%	*	7%
April 13-15, 2012	41%	51%	*	8%
March 24-25, 2012	35%	58%	1%	6%
September 23-25, 2011	39%	54%	1%	6%
August 5-7, 2011	33%	59%	1%	7%
July 18-20, 2011	41%	55%	1%	3%
March 11-13, 2011	44%	48%	*	7%
December 17-19, 2010	42%	50%	*	8%
November 11-14, 2010	43%	48%	1%	8%
October 27-30, 2010	44%	43%	1%	12%
September 1-2, 2010	45%	49%	1%	6%
April 9-11, 2010	47%	47%	*	6%
January 22-24, 2010	44%	45%	1%	10%
October 16-18, 2009	36%	54%	1%	8%
July 31-Aug. 3, 2009	41%	50%	1%	8%
April 23-26, 2009	39%	55%	*	6%
February 18-19, 2009	39%	54%	*	7%
December 1-2, 2008	41%	52%	*	6%
November 6-9, 2008	38%	54%	1%	8%
Oct 17-19, 2008 (RV)	43%	51%	*	6%
Sept. 05-07, 2008 (RV)	48%	45%	*	6%
Aug. 29-31, 2008 (RV)	43%	50%	*	6%
Aug. 23-24, 2008 (RV)	48%	46%	*	6%
April 28-30, 2008	38%	53%	1%	7%
January 9-10, 2008	41%	48%	2%	10%
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