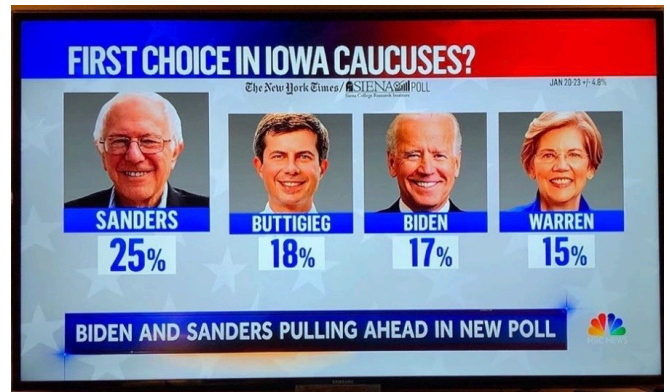Name: _____ Hour: _____ Date: _____

Who Will Win the Iowa Caucus?

During a news broadcast about one week before the 2020 Democratic Iowa caucus, NBC displayed these results which came from the New York Times poll. So who's going to win the Iowa Caucus?

FIRST CHOICE IN IOWA CAUCUSES?
The New York Times / SIENA POLL
JAN 20-23 +/- 4.8%

SANDERS 25% BUTTIGIEG 18% BIDEN 17% WARREN 15%

BIDEN AND SANDERS PULLING AHEAD IN NEW POLL

1. Explain what you think this report is showing. If you saw this on the news, what conclusion would you make and why?

   Sanders is going to win the Caucus.
   25% of the people are going to vote for Sanders.
   The next highest candidate only has 18% of the votes.

2. About 180,000 registered Democrats in Iowa usually vote in the Iowa Caucus. Do you think the pollsters asked every single one of these registered Democrats in Iowa who they were planning on voting for? Why or why not?

   No, that would take too long to ask everyone. They probably only asked some of the people.

3. The New York Times poll actually consisted of a sample of 584 people. The percentages given are the **results from that sample**. Do you think the percentage of people in this <u>sample</u> who are planning on voting for Bernie Sanders is exactly the same as the percentage of the <u>population</u> that are planning on voting for Sanders? Explain.

   margin of error accounts for sampling variability

   No, every sample gives slightly different results. The only way to get the exact percentage is to ask everyone in the population.

An important piece of information is hidden in the upper right corner. It says +/- 4.8%. This is called a **margin of error**. Since every random sample will produce a different estimate, we don't expect the estimate to be perfect. We expect the sample percentage could be off by as much as 4.8% in either direction.

Confidence Interval:
Sample Estimate ± margin of error

4. Use the margin of error to create an interval for where the true population percentage of people voting for Sanders might fall.

   Confidence Interval Interpretation:
   "We expect the true population results to be within ___ to ___."

   $25 - 4.8 = 20.2$
   $25 + 4.8 = 29.8$
   Between 20.2% and 29.8% of the population is voting for Sanders.

5. Use the margin of error to create an interval for where the true population percentage of people voting for Buttigieg might fall.

   $18 - 4.8 = 13.2$
   $18 + 4.8 = 22.8$
   Between 13.2% and 22.8% of the population is voting for Buttigieg.

6. Based on the results of this poll, are you certain that Sanders will win the Iowa Caucus? Explain.

   No. Sanders could get as low as 20.2% and Buttigieg could get as high as 22.8%. If that happens, Buttigieg would win.

   Reveal truth: Buttigieg won by 0.1%!

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Lesson 4.2: Margin of Error

Important Ideas:

LT#1 Confidence Intervals

Sample + margin
Estimate - of Error

"We expect the true population results to be within the interval from __ to __."

The confidence interval contains all plausible values for the true population results.

LT#2 Margin of Error

- margin of error accounts from variation due to sampling variability.

- margin of error does NOT account for problems due to bad sampling methods, bias, or researcher error.

LT#3 Sample size and margin of error.

Larger samples produce smaller margin of error.

Check Your Understanding:

A researcher wondered what the average SAT score is for all current students at the University of Michigan. Based on a random sample of 30 students, she reports that the average SAT score for all current students at the University of Michigan is 1222 with a margin of error of 30.

1. Is the average of 1222 reported by the student calculated from a sample or the whole population?

   Calculated from the sample.

2. Use the margin of error to give an interval of possible values for the true mean of the whole population.

   $1222 \pm 30 \rightarrow 1222 - 30 = 1192$

   $1222 + 30 = 1252$

   $(1192, 1252)$

3. Do we know that every current student at the University of Michigan has an SAT score within the interval you constructed in #2? Explain.

   No, not every student at U of M has an SAT in the interval. We expect the average is in the interval.

4. Why do we need to report a margin of error along with the estimate? Answer each item with a yes or no.

- Some students might have lied when asked about their SAT score. *No*

- The researcher may have recorded the wrong values for some of the SAT scores. *No*

- Due to sampling variability. Every random sample produces different estimates. *Yes*

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