

Margin of Error and Reliability of Data

Data reliability

- government data is usually considered reliable
- question the source - are they trying to sell a product or promote a point of view

Polls

- a survey conducted to determine public opinion about a variety of topics
- common during elections

Margin of error

- a measure of the reliability of data

The margin of error is calculated using the following formula:

$$\boxed{M.O.E. = \frac{1}{\sqrt{n}}} \quad n\text{-sample size}$$

Example 1: According to the latest MyPoll Mars, the Democratic Party of Mathville stands at 37%, Democratic League of Mathville stands at 32%, and Others at 5% in Mathville. The poll was conducted from March 7 to March 18, 2019 for 810 completes.

- Calculate the Margin of Error.
- Can the Democratic League beat the Democratic Party (assuming the sample size is 810)? Use estimated population intervals in your answer.
- A sample of the same size has a margin of error of 3.5%, 19 times out of 20. Explain what this statement means.

Ans: $n = 810$

$$\begin{aligned} \text{a) } M.O.E. &= \frac{1}{\sqrt{n}} \\ &= \frac{1}{\sqrt{810}} \\ &\approx 0.035 \\ &\approx 3.5\% \end{aligned}$$

\therefore The margin of error is $\pm 3.5\%$.

b) Democratic League

$$\begin{aligned} \text{Upper boundary} &= 32 + 3.5 \\ &= 35.5\% \\ \text{Lower boundary} &= 32 - 3.5 \\ &= 28.5\% \end{aligned}$$

Democratic Party

$$\begin{aligned} \text{Lower boundary} &= 37 - 3.5 \\ &= 33.5\% \\ \text{Upper boundary} &= 37 + 3.5 \\ &= 40.5\% \end{aligned}$$

\therefore The Democratic League can beat the Democratic Party since $35.5\% > 33.5\%$.

- "19 times out of 20" means that if you were to do this survey/poll 20 times, 19 times you would get the results MyPoll Mars is claiming.

Example 2: Two car salesmen are competing for a mid-year bonus. The owner of the dealership wants to assess the better competitor. Who is the better candidate?

Rahim	16	28	32	28	26	31
Johann	34	30	24	26	29	26

Ans:

Rahim

$$\text{mean} = \frac{16 + 28 + 32 + 28 + 26 + 31}{6}$$

$$= \frac{161}{6}$$

$$\approx 26.8$$

16 26 28 28 31 32

$$\text{median} = \frac{28 + 28}{2}$$

$$= 28$$

So, Rahim sells 27 cars per month on average and his median car sales is 28.

Johann

$$\text{mean} = \frac{34 + 30 + 24 + 26 + 29 + 26}{6}$$

$$= \frac{169}{6}$$

$$\approx 28.2$$

24 26 26 29 30 34

$$\text{median} = \frac{26 + 29}{2}$$

$$= 27.5$$

So, Johann sells 28 cars per month on average and his median car sales is 27.5.

∴ If the owner of the dealership looks at the average sales per month, then Johann is the better candidate to get the mid-year bonus. However, if the owner looks at the median sales, then Rahim is the better candidate to get the mid-year bonus since he is more likely to sell 28 cars per month.

Note: It would be reasonable to find the standard deviation in order to see whose sales are more consistent.

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Plus one from the table

2011 Federal Election	Two Day Track (Rolling Average)	Saturday April 30, 2011	Sunday May 1, 2011	Election Results May 2, 2011
	37.1%	33.8%	38.7%	39.6%
	31.6%	33.8%	30.5%	30.6%
	20.5%	19.9%	20.9%	18.9%
	5.7%	7.1%	5.0%	6.1%
	3.8%	4.0%	4.0%	3.9%
Number of Interviews (Decided Voters)	1,054	352	702	
Margin of Error (19 times out of 20)				

Can the Green beat the BLOC if elections were held on Sunday, May 1, 2011?