NCEA Level 3 · AS 91584: Evaluating Statistical Reports

Name: _____ Date: _____

Reports turn a sample into a claim about a population. This sheet practises the 1/√n rules of thumb, then asks you to judge how far a claim can be trusted. All contexts are invented. Write every interval in full and interpret it in context.

Revision summary

- One proportion: margin of error ≈ 1/√n.
- Difference within one group or poll: margin of error ≈ 2 × 1/√n.
- Difference between two independent groups: margin of error ≈ 1.5 × the average of the two margins.
- The rules suit random samples with proportions from about 30% to 70%.
- A margin of error covers sampling variation only. It does not cover bias, non-response or question wording.
- Compare groups with one interval for the difference, not by checking whether two intervals overlap.
- An interval all above or all below zero supports a claim of a difference. Zero inside it means no claim either way.
- Interpret first: name the population, the variable and the parameter. Make any claim separately.
- A claim about cause needs a randomised experiment.

Key skills

1. A random poll surveys 1600 voters. Find the margin of error.

2. A random poll of 400 people finds 46% support a policy. Form the interval.

3. A cycling club emails its members to ask whether the town wants a new cycleway. Name the main problem with this sample.

4. Name two things a margin of error does not cover.

Achieved

5. A random sample of 900 residents finds 54% support a new library. Form the interval.

6. Interpret the interval from question 5.

7. In the same poll, 54% prefer site A and 38% prefer site B. Find an interval for the difference.

8. A headline says, "Coffee drinkers live longer", based on a survey of adults' habits. Why can it not show that coffee causes longer life?

Merit

9. Town A: n = 625, 52% support a plan. Town B: n = 400, 44% support it. Find an interval for the difference and make a claim.

10. A student says the Town A and Town B intervals overlap, so the towns cannot differ. Explain the error.

11. In a study, 200 students are randomly allocated to use a revision app or to revise as usual. Why does random allocation matter, and why is the second group needed?

Excellence

12. A random sample of 1000 finds 4% of people own an electric bike. Can the $1/\sqrt{n}$ rule be used? Explain.

13. A website poll gets 10 000 votes, with 62% in favour, and reports a margin of error of 1%. Critique this.

14. A random poll of 2500 finds Party A on 48% and Party B on 44%. The report says Party A leads. Evaluate the claim.

Answer key (for parents and tutors)

1. A random poll surveys 1600 voters. Find the margin of error.
   $1/\sqrt{1600} = 1/40 = 0.025$, so about 2.5%.
2. A random poll of 400 people finds 46% support a policy. Form the interval.
   $1/\sqrt{400} = 1/20 = 5\%$. $46 - 5 = 41$ and $46 + 5 = 51$, so 41% to 51%.
3. A cycling club emails its members to ask whether the town wants a new cycleway. Name the main problem with this sample.
   Selection bias: club members are not representative of the town, and are more likely to want a cycleway.
4. Name two things a margin of error does not cover.
   Any two of: bias in how the sample was chosen, non-response, poorly worded questions, people not answering truthfully.
5. A random sample of 900 residents finds 54% support a new library. Form the interval.
   $1/\sqrt{900} = 1/30 = 3.3\%$. $54 - 3.3 = 50.7$ and $54 + 3.3 = 57.3$, so 50.7% to 57.3%.
6. Interpret the interval from question 5.
   I am fairly sure that the proportion of all residents who support a new library is between 50.7% and 57.3%.
7. In the same poll, 54% prefer site A and 38% prefer site B. Find an interval for the difference.
   Same poll: margin $\approx 2/\sqrt{900} = 2/30 = 6.7\%$. Difference $54 - 38 = 16$ points. $16 - 6.7 = 9.3$ and $16 + 6.7 = 22.7$, so 9.3 to 22.7 points.
8. A headline says, "Coffee drinkers live longer", based on a survey of adults' habits. Why can it not show that coffee causes longer life?
   It is observational. Coffee drinkers may differ in other ways, such as income or exercise, and these confounding variables could explain the link. A causal claim needs a randomised experiment.
9. Town A: $n = 625$, 52% support a plan. Town B: $n = 400$, 44% support it. Find an interval for the difference and make a claim.
   Margins: $1/\sqrt{625} = 4\%$ and $1/\sqrt{400} = 5\%$. Average 4.5%, so margin $\approx 1.5 \times 4.5 = 6.75\%$. Difference 8 points: 1.25 to 14.75 points. The whole interval is above zero, so support for the plan is higher in Town A.
10. A student says the Town A and Town B intervals overlap, so the towns cannot differ. Explain the error.
    Overlap is not the right test. The comparison needs one interval for the difference. That interval, 1.25 to 14.75 points, does not include zero, so a difference can be claimed.
11. In a study, 200 students are randomly allocated to use a revision app or to revise as usual. Why does random allocation matter, and why is the second group needed?
    Random allocation balances other variables across the groups, so a difference can be linked to the app. The second group is a comparison: without it, improvement could be due to practice or time rather than the app.
12. A random sample of 1000 finds 4% of people own an electric bike. Can the $1/\sqrt{n}$ rule be used? Explain.
    Not reliably. 4% is outside the range of about 30% to 70%, and the rule would overstate the margin: $1/\sqrt{1000}$ is about 3.2%, which is large compared with 4%.
13. A website poll gets 10 000 votes, with 62% in favour, and reports a margin of error of 1%. Critique this.
    Voters chose to take part, so the sample is self-selected and not random. The 1% margin assumes a random sample and covers sampling variation only. The large sample does not remove bias, so 62% cannot be trusted as an estimate for the population.
14. A random poll of 2500 finds Party A on 48% and Party B on 44%. The report says Party A leads. Evaluate the claim.
    Same poll: margin $\approx 2/\sqrt{2500} = 2/50 = 4\%$. Difference 4 points: 0 to 8 points. Zero is at the edge of the interval, so the data do not show that Party A leads. The report's claim goes further than the evidence.