

The Mean Of 50 Observations Was 250. Later It Was Found That The Number 152 Was Wrongly Copied As 102

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Introduction

In statistical analysis, accuracy in data collection and recording is paramount. Even minor errors can significantly impact the results, leading to incorrect conclusions. One common issue faced by statisticians and data analysts is the misrecording of data points. This article explores a real-world scenario where the mean of 50 observations was initially calculated as 250, but later it was discovered that one of the data points was incorrectly recorded. Specifically, the number 152 was mistakenly copied as 102. We will examine the implications of this error, how to identify and correct such mistakes, and the effect on the overall mean. Through detailed calculations and explanations, this guide aims to highlight the importance of data accuracy and the methods to rectify errors in statistical data.

Understanding the Initial Data and Mean Calculation

The Initial Data Set and Its Mean

Given:

- Number of observations, $(n = 50)$
- Initial mean, $(\bar{x} = 250)$

From the mean formula:

$$\text{Sum of observations} = \text{Mean} \times \text{Number of observations}$$

Calculating:

$$\text{Sum of observations} = 250 \times 50 = 12,500$$

This sum represents the total of all 50 data points, including the incorrectly recorded number.

The Error in Data Recording

- The actual number should have been 152.
- It was mistakenly recorded as 102.

This discrepancy affects the total sum of the observations, which in turn affects the calculated mean.

Impact of the Error on the Sum and Mean

Calculating the Corrected Sum

The difference caused by the misrecorded number is:

$$\begin{aligned} & \text{Incorrectly recorded value} - \text{Actual value} = 102 - 152 = -50 \end{aligned}$$

This indicates that the sum was underestimated by 50 due to the error.

The corrected sum of observations should be:

$$\begin{aligned} & \text{Original sum} + (\text{Actual value} - \text{Incorrect value}) = 12,500 \\ & + (152 - 102) = 12,500 + 50 = 12,550 \end{aligned}$$

Calculating the Corrected Mean

Using the corrected sum:

$$\begin{aligned} & \text{Corrected mean} = \frac{\text{Corrected sum}}{\text{Number of observations}} = \frac{12,550}{50} = 251 \end{aligned}$$

Thus, the corrected mean of the 50 observations is 251.

Step-by-Step Solution to Correct the Data

Step 1: Identify the Error

- Recognize that one data point is wrongly recorded.
- Confirm the actual value (152) and the erroneous value (102).

Step 2: Calculate the Original Sum of Data

$$\begin{aligned} & \text{Original sum} = \text{Initial mean} \times \text{Number of observations} \\ & = 250 \times 50 = 12,500 \end{aligned}$$

Step 3: Adjust the Sum for the Error

Since the data point was recorded as 102 instead of 152:

\[
\text{Adjusted sum} = 12,500 + (152 - 102) = 12,550
\]

Step 4: Compute the Corrected Mean

\[
\text{Corrected mean} = \frac{12,550}{50} = 251
\]

Summary of the correction:

Item	Calculation	Result
Original total sum	(250×50)	12,500
Difference caused by error	$(152 - 102)$	50
Corrected total sum	$12,500 + 50$	12,550
Corrected mean	$(12,550 / 50)$	251

Significance of Data Accuracy in Statistical Analysis

Why Accurate Data Matters

- Integrity of Results: Accurate data ensures the validity of statistical measures.
- Decision Making: Business, scientific, and policy decisions rely on correct data.
- Error Prevention: Early identification prevents cascading errors in analysis.

Common Data Errors and Their Impact

- Transcription errors (like the one discussed).
- Missing data points.
- Incorrect units or measurement errors.
- Duplicate entries.

Impact of Errors:

- Skewed averages.
- Misleading trends.
- Incorrect inferences.

Methods to Detect and Correct Data Entry Errors

1. Data Validation Techniques

- Range checks: Ensuring data points fall within expected ranges.
- Consistency checks: Verifying data against known constraints.
- Automated validation: Using software to flag anomalies.

2. Statistical Methods

- Outlier detection: Identifying data points that deviate significantly.
- Cross-verification: Comparing with original data sources.
- Recalculation of summary statistics: Checking if the mean, median, or mode aligns with expectations.

3. Manual Review

- Spot-checking data entries.
- Cross-referencing with original records.

4. Data Cleaning Tools

- Use of data cleaning software like Excel, R, Python libraries, or dedicated data cleaning platforms.

Best Practices for Maintaining Data Integrity

- Double Data Entry: Have a second person verify data entries.
- Use of Data Validation Rules: Implement constraints during data entry.
- Regular Data Audits: Periodically review datasets for inconsistencies.
- Training: Educate personnel on proper data recording procedures.
- Documentation: Keep detailed records of data sources and changes.

Practical Applications and Examples

Example 1: Correcting a Single Data Point

Suppose an initial dataset with 50 observations has an average of 250, but an error is found in one data point. The correction process involves:

- Calculating the total sum based on the initial mean.
- Adjusting the total sum for the identified error.
- Recomputing the mean for accurate analysis.

Example 2: Impact on Business Decisions

A company uses average sales figures to plan inventory. An incorrect data point can lead to overstocking or stockouts. Correcting data ensures inventory decisions are based on accurate information.

Example 3: Scientific Research Data

In research, misrecorded data can invalidate results. Correcting errors ensures the integrity of findings and reproducibility.

Conclusion

Data accuracy plays a crucial role in statistical analysis, influencing the reliability of results and subsequent decisions. The scenario where the mean of 50 observations was initially calculated as 250, but later corrected due to a misrecorded value, highlights the importance of meticulous data recording and validation. Identifying that the number 152 was mistakenly recorded as 102 allowed for a straightforward correction, increasing the mean from 250 to 251.

Key takeaways include:

- Always verify data entries carefully.
- Use validation and cross-checking methods to detect errors.
- Understand how individual data points influence overall statistics.
- Maintain rigorous data management practices to prevent errors.

By adhering to proper data handling procedures, statisticians and data analysts can ensure the accuracy and integrity of their analyses, ultimately leading to more reliable insights and informed decisions.

Frequently Asked Questions (FAQs)

Q1: How does an error in a single data point affect the mean?

A1: The impact depends on the difference between the correct and incorrect value. If the discrepancy is large, it can significantly alter the mean. Correcting the error adjusts the total sum and thus the mean.

Q2: What are some common signs of data entry errors?

A2: Unusual outliers, inconsistent data points, values outside expected ranges, and discrepancies when cross-verifying with original records.

Q3: Can small errors like this impact large datasets significantly?

A3: Yes, especially if the data point is an outlier or if multiple errors exist. It underscores the importance of data validation.

Q4: What tools can help prevent data entry errors?

A4: Data validation features in Excel, Python or R scripts for automated

checking, and specialized data cleaning software.

Q5: How often should datasets be audited for errors?

A5: Regularly, depending on the size and importance of the data, but at least after initial entry and before critical analysis.

Keywords: Mean, Data Error, Data Correction, Statistical Analysis, Data Validation, Data Accuracy, Correcting Mean, Data Entry Error, Impact on Data Analysis

Frequently Asked Questions

What was the original mean of the 50 observations?

The original mean of the 50 observations was 250.

How does the incorrect copying of the number 152 as 102 affect the total sum of observations?

The incorrect copying reduces the total sum by 50 ($152 - 102 = 50$).

What is the corrected total sum of the observations after identifying the error?

The corrected total sum increases by 50, so it is (original sum) + 50.

What is the original total sum of the observations before correction?

Since the mean was 250 for 50 observations, the total sum was $250 \times 50 = 12,500$.

What is the corrected total sum after fixing the error in the copied number?

The corrected total sum is $12,500 + 50 = 12,550$.

What is the new mean of the observations after correcting the error?

The new mean is 12,550 divided by 50, which equals 251.

What does this problem illustrate about data accuracy in statistical calculations?

It highlights that even a single data entry error can significantly impact the calculated mean and emphasizes the importance of data verification.

Additional Resources

Statistical Accuracy: Correcting the Mean of 50 Observations and Its Implications

Introduction: The Significance of Data Accuracy in Statistical Analysis

In the realm of data analysis and statistical inference, accuracy is paramount. Even a single erroneous data point can significantly distort results, leading to misinterpretations and flawed decisions. This article delves into a specific scenario involving a dataset of 50 observations, where the initially calculated mean was 250, but later, an error in data transcription was discovered—specifically, the number 152 was mistakenly recorded as 102. We will explore the impact of this error, demonstrate how correcting it alters the mean, and discuss broader lessons about ensuring data integrity.

Understanding the Original Data and Its Mean

The Initial Dataset and Calculation

Suppose we have a collection of 50 observations, each representing some measured quantity—be it test scores, production outputs, or survey responses. The initial calculation indicates that the mean (average) of these observations is 250, which suggests a certain central tendency.

Mathematically, the mean ($\bar{x}$) is calculated as:

$$\bar{x} = \frac{\text{Sum of all observations}}{\text{Number of observations}}$$

\]

Given:

\[
\bar{x} = 250 \quad \text{and} \quad n = 50
\]

we have:

\[
\text{Sum of observations} = 250 \times 50 = 12,500
\]

This total sum, 12,500, represents the combined value of all 50 observations as initially recorded.

Implication: The data appears consistent with the large mean, but the critical question is whether all data points were accurately recorded.

The Data Error: Misrecorded Number

Discovery of the Error

Later, during a data verification process—perhaps an audit or manual review—the team discovers that the value 152 was incorrectly entered as 102.

This misrecording constitutes a significant error because:

- The difference between the correct and incorrect values is 50.
- The incorrect entry (102) is 50 less than the true value (152).
- Such an error can substantially affect the overall sum and, consequently, the calculated mean.

Why Does This Matter? Because the mean is sensitive to individual data points, especially when the data set is relatively small ($n=50$). Correcting this mistake is crucial for an accurate representation of the data.

Recalculating the Corrected Sum and Mean

Step 1: Adjust the Total Sum

Initially, the sum was calculated based on the recorded data, which included the erroneous value of 102 instead of the true 152.

- Original sum: 12,500
- Recorded value: 102
- Actual value: 152
- Difference: $152 - 102 = 50$

To obtain the correct total sum, we need to:

```
\[
\text{Corrected sum} = \text{Original sum} + (\text{Actual value} -
\text{Recorded value}) = 12,500 + 50 = 12,550
\]
```

This correction increases the total sum from 12,500 to 12,550.

Step 2: Calculate the Corrected Mean

With the corrected sum, the new mean becomes:

```
\[
\bar{x}_{\text{corrected}} = \frac{12,550}{50} = 251
\]
```

Thus, the corrected mean is 251, which is 1 unit higher than the initially reported 250.

Implications of the Error and Its Correction

Impact on Data Interpretation

The shift from 250 to 251 might seem marginal—just one unit—but in statistical and practical terms, this correction has several important consequences:

- Enhanced Accuracy: The corrected mean more accurately reflects the true dataset.
- Decision Making: If decisions depend on the average, such as quality control thresholds or performance benchmarks, even small changes can

influence outcomes.

- Data Integrity: Highlighting the importance of meticulous data entry and verification processes to prevent such errors.

Effect on Variance and Standard Deviation

While the mean is directly affected by the correction, other statistical measures such as variance and standard deviation are also influenced, albeit to varying degrees. Since only one data point has changed, the impact on these measures depends on the original distribution.

- Variance (σ^2) measures how data points spread around the mean.
- Standard deviation (σ) is the square root of variance.

Given the correction:

- The position of the data point changes slightly relative to the mean, possibly reducing the variance if the original value was an outlier or increasing it if the original value was closer to the mean.

Calculating these precisely would require access to all individual data points, but the key takeaway is that data accuracy influences the entire statistical profile.

Lessons Learned and Broader Implications

1. The Critical Role of Data Verification

This scenario underscores the importance of rigorous data validation processes:

- Cross-check data entries against original sources.
- Use double data entry or automated data capture tools.
- Implement validation rules to flag anomalous entries.

2. Sensitivity of Statistical Measures

Small errors can lead to noticeable shifts in statistical parameters, especially in datasets with limited observations. This emphasizes the need for:

- Regular audits.
- Sensitivity analysis to understand how data errors impact results.
- Transparency in reporting data corrections.

3. Impact on Stakeholders

In practical applications, such as manufacturing quality control, academic research, or financial analysis, incorrect data can:

- Lead to misguided strategies.
- Undermine credibility.
- Result in financial losses or quality issues.

Therefore, maintaining high data integrity standards is essential for trustworthy analysis.

Conclusion: The Power of Precision in Data Analysis

In conclusion, correcting the transcription error from 102 to 152 in a dataset of 50 observations shifted the mean from 250 to 251. While this may seem minor numerically, it exemplifies the profound impact that a single data point can have on statistical summaries. This case study reinforces that accuracy at every data entry stage is vital, as even small errors can ripple through analyses, potentially leading to significant misinterpretations.

The scenario serves as a reminder for data analysts, researchers, and decision-makers alike: diligence in data collection and verification is not just best practice—it's essential for deriving truthful, reliable insights. As data continues to be the backbone of informed decision-making, the adage "garbage in, garbage out" remains ever relevant, emphasizing that quality data is the foundation of quality analysis.

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