

Construct The Cumulative Frequency Distribution For The Given Data. Daily Low (deg. F) 35-39 3 40-44

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Understanding how to construct a cumulative frequency distribution is fundamental in descriptive statistics. It provides a comprehensive way to analyze the distribution of data points across various classes or intervals. In this article, we will explore the step-by-step process to construct a cumulative frequency distribution using the provided data on daily low temperatures, specifically the intervals 35-39°F and 40-44°F, along with their corresponding frequencies. This detailed guide aims to enhance your grasp of statistical data analysis, whether you're a student, researcher, or data enthusiast.

What Is a Cumulative Frequency Distribution?

A cumulative frequency distribution is a way of summarizing data by showing the total number of observations that fall below or within a certain class or interval. It transforms the frequency distribution into a cumulative form, which makes it easier to understand the overall pattern of data, identify medians, quartiles, and other percentiles, and visualize the distribution's shape.

Key points about cumulative frequency distribution:

- It accumulates frequencies from the lowest class upward.
- It can be expressed as a simple cumulative frequency or as a relative cumulative frequency (percentages).
- It helps in constructing ogives, which are graphical representations of cumulative data.

Understanding The Given Data

Before constructing the distribution, it's crucial to understand the data provided:

Temperature Interval (°F)	Frequency (Number of Days)
35-39	3
40-44	?

Note: The data snippet shows the class intervals 35-39 and 40-44, but the frequency for 40-44 is missing in the provided snippet. To proceed with the construction, let's assume the frequency for

40-44 is provided (say, 7 days), or you can replace it with the actual frequency once known.

Assumption:

- 35-39: 3 days
- 40-44: 7 days (hypothetical for illustration)

Once you have your actual data, replace the assumed values accordingly.

Step-by-Step Process to Construct the Cumulative Frequency Distribution

Constructing a cumulative frequency distribution involves several key steps:

1. Organize Your Data in Class Intervals

Start by listing all class intervals in order, from the lowest to the highest:

- 35-39
- 40-44
- 45-49 (if applicable)
- ... and so on.

In our case, focus on the provided intervals.

2. Record the Frequencies

Next, note the frequency of each class:

- 35-39: 3
- 40-44: 7 (assumed)

Ensure all class frequencies are accurate and complete.

3. Calculate the Cumulative Frequencies

Begin with the lowest class:

- The cumulative frequency for the first class is the same as its frequency.
- For subsequent classes, add the current class's frequency to the cumulative total of all previous

classes.

Example:

Class Interval	Frequency	Cumulative Frequency
35-39	3	3
40-44	7	3 + 7 = 10

If more classes exist, continue this process.

4. Create the Cumulative Frequency Table

Organize your data into a table that clearly indicates class intervals, their individual frequencies, and the cumulative frequencies. This table forms the basis for further analysis or graphical representation.

Sample cumulative frequency table:

Class Interval	Frequency	Cumulative Frequency
35-39	3	3
40-44	7	10

Constructing The Cumulative Frequency Distribution Graph (Ogive)

Once the table is complete, you can plot an ogive, which visually represents the cumulative frequencies.

Steps to Plot an Ogive:

1. Plot the upper boundary of each class interval on the x-axis. For example, for 35-39, the upper boundary is 39; for 40-44, it is 44.
2. Plot the corresponding cumulative frequency on the y-axis.
3. Mark the points for each class's upper boundary and the cumulative frequency.
4. Connect the points with a smooth line or straight segments.

Note: For the first class, you can start at the lower boundary with a cumulative frequency of zero if plotting a less-than ogive, or at the upper boundary with the cumulative frequency.

Interpreting The Cumulative Frequency Distribution

The cumulative frequency distribution provides valuable insights:

- Median Temperature: The temperature at which 50% of the data falls below can be estimated from the ogive.
- Percentiles: Percentiles such as the 25th or 75th can be identified.
- Distribution Shape: It reveals whether data is skewed or symmetric.
- Data Range: The difference between the maximum class limit and the minimum class limit.

Practical Applications of Cumulative Frequency Distributions

Understanding and constructing cumulative frequency distributions has many practical applications across various fields:

- **Weather Data Analysis:** To analyze temperature patterns over time.
- **Quality Control:** To determine the proportion of items below certain defect thresholds.
- **Education:** To assess student score distributions.
- **Market Research:** To evaluate customer preferences or satisfaction levels.

Tips for Accurate Construction

To ensure your cumulative frequency distribution is correct and effective:

1. Verify the accuracy of your frequency data before proceeding.
2. Use consistent class intervals to facilitate comparison.

3. Include all relevant classes and their frequencies to avoid misinterpretation.
4. Double-check your cumulative calculations for correctness.
5. When plotting, label axes clearly and choose appropriate scales.

Conclusion

Constructing a cumulative frequency distribution from given data is a vital skill in statistical analysis. It transforms raw frequency data into an insightful cumulative form, enabling better understanding of the data's overall distribution and tendencies. Whether analyzing temperature data, test scores, or production quality, this process enhances decision-making and data interpretation.

In this guide, we've outlined the step-by-step procedure to build a cumulative frequency distribution, illustrated how to create an ogive, and discussed the practical utility of such distributions. Remember, accurate data collection and careful calculations are key to meaningful analysis. With practice, constructing and interpreting cumulative frequency distributions will become an intuitive part of your statistical toolkit.

Keywords: Cumulative Frequency Distribution, Data Analysis, Temperature Data, Ogive, Statistical Distribution, Frequency Table, Data Visualization, Descriptive Statistics

Frequently Asked Questions

What is the first step in constructing a cumulative frequency distribution for the given data?

The first step is to organize the data into class intervals and then tally the frequency of data points within each interval.

How do you calculate the cumulative frequency for each class in the distribution?

You add the frequency of the current class to the total of all previous class frequencies, progressing from the lowest to the highest class interval.

What is the cumulative frequency for the class 35-39 if the

frequency is 3, and for 40-44 if the frequency is 5?

The cumulative frequency for 35-39 is 3, and for 40-44 it is 3 (previous total) + 5 = 8.

Why is constructing a cumulative frequency distribution useful in data analysis?

It helps to understand the distribution of data, identify medians, percentiles, and the overall pattern of the data set.

Can you provide the complete cumulative frequency distribution for the data: 35-39 (3), 40-44 (5)?

Yes. For 35-39, cumulative frequency is 3; for 40-44, it is 8. This means 8 data points fall within 35-44 degrees Fahrenheit.

Additional Resources

Cumulative Frequency Distribution: A Comprehensive Guide to Analyzing Temperature Data

Understanding the distribution of data points within a dataset is fundamental for making informed decisions, whether you're a researcher, a data analyst, or simply someone interested in weather patterns. One of the most insightful tools for summarizing frequency data is the Cumulative Frequency Distribution (CFD). In this article, we will explore how to construct a CFD using a specific example: daily low temperatures recorded over a period, categorized into class intervals.

Introduction to Cumulative Frequency Distribution

A Cumulative Frequency Distribution provides a running total of frequencies up to the upper boundary of each class interval. Unlike simple frequency tables, which only tell you how many data points fall within each class, the CFD reveals the cumulative count of data points that are less than or equal to a certain value. This helps in understanding the distribution's shape, identifying medians, quartiles, and other percentiles, and making comparisons across different datasets.

Why Use a CFD?

- Identify medians and percentiles: Find the median or other quartiles easily.
- Understand data distribution: Visualize whether data is skewed, symmetric, or has outliers.
- Compare datasets: When multiple data sets are plotted with their CFs, differences become more apparent.

Understanding the Data: Daily Low Temperatures

Let's consider a sample dataset involving daily low temperatures, categorized into class intervals:

Class Interval (°F)	Frequency (Number of Days)
35-39	3
40-44	(to be determined)

Suppose the dataset contains the following number of days in each class:

- 35-39°F: 3 days
- 40-44°F: 8 days
- 45-49°F: 12 days
- 50-54°F: 15 days
- 55-59°F: 10 days
- 60-64°F: 7 days
- 65-69°F: 5 days

Note: For simplicity, we are assuming these frequencies for the entire dataset, which allows us to demonstrate the process of constructing a CFD.

Step-by-Step Construction of the Cumulative Frequency Distribution

Creating a CFD involves several systematic steps. Let's walk through them thoroughly.

Step 1: Prepare the Frequency Table

Start with your frequency distribution table, listing class intervals and their corresponding frequencies.

Class Interval	Frequency (f)
35-39	3
40-44	8
45-49	12
50-54	15
55-59	10
60-64	7
65-69	5

Total number of observations, N, can be calculated as:

$$N = 3 + 8 + 12 + 15 + 10 + 7 + 5 = 60 \text{ days}$$

Step 2: Calculate the Cumulative Frequencies

Cumulative frequency (CF) for each class is obtained by adding the current class's frequency to the sum of all previous class frequencies.

Class Interval	Frequency (f)	Cumulative Frequency (CF)
35-39	3	3
40-44	8	$3 + 8 = 11$
45-49	12	$11 + 12 = 23$
50-54	15	$23 + 15 = 38$
55-59	10	$38 + 10 = 48$
60-64	7	$48 + 7 = 55$
65-69	5	$55 + 5 = 60$

This cumulative frequency table now shows, for each class interval, how many days had a low temperature less than or equal to the upper limit of that class.

Step 3: Determine the Upper Bound Values

To plot or interpret the CFD graphically, identify the upper boundary of each class interval:

Class Interval	Upper Boundary (U)
35-39	39
40-44	44
45-49	49
50-54	54
55-59	59
60-64	64
65-69	69

Step 4: Plot the Cumulative Frequency Curve (Ogive)

Once the data points are established, you can plot the CFD (also called an ogive):

- X-axis: Upper boundary of the class intervals

- Y-axis: Corresponding cumulative frequency

The points for plotting are:

Upper Boundary (X)	Cumulative Frequency (Y)
39	3
44	11
49	23
54	38
59	48
64	55
69	60

Connecting these points smoothly gives the ogive, which visually shows the cumulative count of days with low temperatures up to each temperature threshold.

Interpreting the Cumulative Frequency Distribution

The CFD offers rich insights into the temperature data:

1. Median Temperature

- The median corresponds to the temperature below which 50% of the observations fall.
- Since total observations $N=60$, median position = $N/2 = 30$.
- Find the class where the CF just exceeds or equals 30:
- CF values: 3, 11, 23, 38, ...
- The CF jumps from 23 to 38 between 49°F and 54°F.
- Therefore, the median lies within the class 50-54°F.

2. Estimating the Median Class

- The median class is 50-54°F.
- Using linear interpolation within this class:

$$\text{Median} = L + \left(\frac{\frac{N}{2} - CF_{\text{previous}}}{f_{\text{median}}} \right) \times h$$

Where:

- L = lower boundary of median class = 50°F
- CF_{previous} = cumulative frequency before the median class = 23
- f_{median} = frequency of median class = 15
- h = class width = 5°F

Calculating:

$$\text{Median} = 50 + \left(\frac{30 - 23}{15} \right) \times 5 = 50 + \left(\frac{7}{15} \right) \times 5 \approx 50 + 2.33 \approx 52.33^{\circ}\text{F}$$

3. Other Percentiles

Similarly, you can estimate quartiles or percentiles by locating the corresponding cumulative frequency positions within the CFD.

Applications and Benefits of Constructing a CFD

Constructing a CFD provides multiple practical benefits:

- Data Summarization: Offers a quick overview of how data is distributed across ranges.
- Median and Quartiles: Facilitates easy estimation of central tendency and spread.
- Skewness Detection: The shape of the ogive indicates whether data is skewed left or right.
- Comparative Analysis: Multiple datasets can be compared by overlaying their CF curves.
- Decision Making: Helps meteorologists, researchers, and policymakers understand temperature patterns for planning and analysis.

Practical Tips for Accurate CFD Construction

- Use consistent class intervals: Equal widths simplify interpretation.
- Accurate cumulative calculations: Double-check addition for each class.
- Clear plotting: Mark points precisely to ensure the ogive's correctness.
- Interpret with context: Remember that CF curves are tools for analysis, not definitive statements.

Conclusion

Constructing a Cumulative Frequency Distribution is an essential skill in statistical analysis, especially when working with grouped data such as temperature readings. It transforms raw frequency data into a powerful tool that reveals the underlying distribution, central tendencies, and variability. Whether you're analyzing weather data, test scores, or any other grouped dataset, mastering the CFD process enables you to extract meaningful insights that drive informed decisions.

By systematically organizing your data, calculating cumulative frequencies, and interpreting the resulting ogive, you gain a comprehensive understanding of the dataset's characteristics. As

demonstrated with the daily low temperature data, this approach not only simplifies complex data but also facilitates advanced statistical analysis and reporting.

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