

Find The Five-number Summary And Draw The Box-and-Whisker Plot. 2 (a) 39, 36, 30, 27, 26, 24, 28, 35,

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Understanding data distribution is crucial for analyzing information effectively. One of the fundamental tools in descriptive statistics is the five-number summary, which provides a quick overview of the data set's distribution, spread, and central tendency. Coupled with the box-and-whisker plot, this summary visually represents the data's key features, making it easier to interpret and communicate insights. In this article, we will explore the process of finding the five-number summary for the data set 39, 36, 30, 27, 26, 24, 28, 35, and how to draw the corresponding box-and-whisker plot.

Understanding the Five-Number Summary

What Is the Five-Number Summary?

The five-number summary is a concise way to describe a data set using five key statistics:

- Minimum: The smallest data point
- First quartile (Q1): The median of the lower half of the data
- Median (Q2): The middle value of the data set
- Third quartile (Q3): The median of the upper half of the data
- Maximum: The largest data point

This summary helps identify the overall range, the median position, and the spread of the middle 50% of the data.

Importance of the Five-Number Summary

- Provides a quick snapshot of data distribution
- Highlights potential outliers or skewness
- Serves as the basis for creating box-and-whisker plots
- Useful in comparing multiple data sets

Step-by-Step Guide to Finding the Five-Number Summary

Step 1: Organize the Data

Start by arranging the data points in ascending order:

- Original data: 39, 36, 30, 27, 26, 24, 28, 35
- Sorted data: 24, 26, 27, 28, 30, 35, 36, 39

Step 2: Identify the Minimum and Maximum

- Minimum: 24
- Maximum: 39

Step 3: Find the Median (Q2)

Since there are 8 data points (even number), the median is the average of the 4th and 5th values:

- 4th value: 28
- 5th value: 30
- Median (Q2): $(28 + 30) / 2 = 29$

Step 4: Find the First Quartile (Q1)

Q1 is the median of the lower half of the data (values before the overall median):

- Lower half: 24, 26, 27, 28
- Median of lower half: $(26 + 27) / 2 = 26.5$

Step 5: Find the Third Quartile (Q3)

Q3 is the median of the upper half of the data (values after the overall median):

- Upper half: 30, 35, 36, 39
- Median of upper half: $(35 + 36) / 2 = 35.5$

Summary of the Five-Number Summary

Statistic	Value
Minimum	24
First Quartile (Q1)	26.5
Median (Q2)	29
Third Quartile (Q3)	35.5
Maximum	39

Drawing the Box-and-Whisker Plot

What Is a Box-and-Whisker Plot?

A box-and-whisker plot, or box plot, is a graphical representation of the five-number summary. It visually displays the spread, central tendency, and potential outliers of the data set.

Steps to Draw a Box-and-Whisker Plot

1. Draw a number line that covers the range of your data.
2. Plot the five key points:
 - Mark the minimum (24)
 - Mark Q1 (26.5)
 - Mark the median (29)
 - Mark Q3 (35.5)
 - Mark the maximum (39)
3. Create a box from Q1 to Q3, representing the interquartile range (IQR).
4. Draw a line inside the box at the median.
5. Extend "whiskers" from the box to the minimum and maximum values.
6. Identify outliers if any data points fall outside the whiskers (not applicable here as all points are within the range).

Example of the Box-and-Whisker Plot

- The box spans from 26.5 to 35.5.
- The median line is at 29.
- Whiskers extend from 24 to 26.5 and from 35.5 to 39.

Interpreting the Box-and-Whisker Plot

What Can You Learn?

- The spread of the middle 50% of the data is from 26.5 to 35.5.
- The median is closer to the lower quartile, indicating a slight skewness.
- The overall range is from 24 to 39.
- The plot helps identify outliers or gaps in data distribution (none in this case).

Applications in Real Life

- Comparing test scores across different classes
- Analyzing sales data
- Monitoring process variations in manufacturing

Additional Tips for Working With Box Plots

Handling Outliers

Outliers are data points that fall outside 1.5 times the interquartile range (IQR) from Q1 or Q3. To check:

- Calculate IQR: $Q3 - Q1 = 35.5 - 26.5 = 9$
- Determine outlier boundaries:
- Lower bound: $Q1 - 1.5 \text{ IQR} = 26.5 - 13.5 = 13$
- Upper bound: $Q3 + 1.5 \text{ IQR} = 35.5 + 13.5 = 49$
- Since all data points are between 24 and 39, no outliers are present.

Benefits of Visualizing Data with Box Plots

- Easy comparison between data sets
- Quick identification of skewness and dispersion
- Effective communication of statistical summaries

Conclusion

Understanding how to find the five-number summary and draw the corresponding box-and-whisker plot is essential for anyone working with data. These tools simplify complex data sets, revealing key insights about distribution, spread, and central tendency. For the data set 39, 36, 30, 27, 26, 24, 28, 35, we've identified the minimum (24), first quartile (26.5), median (29), third quartile (35.5), and maximum (39). Visualizing these points through a box plot facilitates a clearer understanding of data characteristics. Mastering these techniques enhances your ability to analyze, interpret, and communicate data effectively across various fields, from education to business analytics.

Keywords: Five-number summary, box-and-whisker plot, data analysis, descriptive statistics, quartiles, median, data visualization, outliers

Frequently Asked Questions

What are the steps to find the five-number summary for the data set 39, 36, 30, 27, 26, 24, 28, 35?

The steps are: first, order the data from smallest to largest; then identify the minimum, first quartile (Q1), median (Q2), third quartile (Q3), and maximum values.

What is the ordered data set for 39, 36, 30, 27, 26, 24, 28, 35?

The ordered data set is 24, 26, 27, 28, 30, 35, 36, 39.

What is the minimum and maximum in the data set 24, 26, 27, 28, 30, 35, 36, 39?

The minimum is 24 and the maximum is 39.

How do you find the median (Q2) of the data set 24, 26, 27, 28, 30, 35, 36, 39?

Since there are 8 data points, the median is the average of the 4th and 5th values: $(28 + 30) / 2 = 29$.

How do you determine Q1 and Q3 for this data set?

Q1 is the median of the lower half (24, 26, 27, 28), which is $(26 + 27) / 2 = 26.5$. Q3 is the median of the upper half (30, 35, 36, 39), which is $(35 + 36) / 2 = 35.5$.

What are the five numbers in the summary for the data set 24, 26, 27, 28, 30, 35, 36, 39?

The five-number summary is: Minimum = 24, Q1 = 26.5, Median = 29, Q3 = 35.5, Maximum = 39.

How do you draw a box-and-whisker plot based on this five-number summary?

Plot a number line, draw a box from Q1 (26.5) to Q3 (35.5), draw a line at the median (29), and extend 'whiskers' from the box to the minimum (24) and maximum (39).

Why is the box-and-whisker plot useful for this data set?

It visually summarizes the distribution, spread, and skewness of the data, making it easier to interpret the data's overall pattern.

What insights can be gained from the box-and-whisker plot of the data 24, 26, 27, 28, 30, 35, 36, 39?

The plot shows the spread of the data, highlights the median, and reveals any potential skewness or outliers, aiding in understanding the data's distribution.

Additional Resources

Find The Five-number Summary And Draw The Box-and-Whisker Plot. 2 (a) 39, 36, 30, 27, 26, 24, 28, 35

Understanding how to find the five-number summary and draw the box-and-whisker plot is a fundamental skill in descriptive statistics. This process allows us to summarize a data set succinctly and visualize its distribution, highlighting key features such as spread, center, and potential outliers. In this article, we will walk through the step-by-step method to analyze the data set: 39, 36, 30, 27,

26, 24, 28, 35, and how to create an informative box-and-whisker plot based on this summary.

What Is the Five-Number Summary?

Before diving into calculations, it's essential to understand what the five-number summary includes. It comprises five key statistics:

- Minimum: The smallest data point.
- First Quartile (Q1): The median of the lower half of the data.
- Median (Q2): The middle value of the data set.
- Third Quartile (Q3): The median of the upper half of the data.
- Maximum: The largest data point.

The five-number summary provides a quick snapshot of the data's range and distribution, highlighting central tendency and dispersion.

Step-by-Step Guide to Find the Five-Number Summary

Let's analyze the data set: 39, 36, 30, 27, 26, 24, 28, 35. Notice that the data is unordered; sorting it is the first step.

1. Organize the Data in Ascending Order

Sort the data from smallest to largest:

24, 26, 27, 28, 30, 35, 36, 39

2. Identify the Minimum and Maximum

- Minimum (Min): The smallest value in the ordered data set — 24
- Maximum (Max): The largest value — 39

3. Find the Median (Q2)

The median is the middle value of the ordered data. Since there are 8 data points (even number), the median is the average of the 4th and 5th values:

- 4th value: 28
- 5th value: 30

Calculate:

$$\text{Median} = (28 + 30) / 2 = 58 / 2 = 29$$

4. Find the First Quartile (Q1)

Q1 is the median of the lower half of the data (the first four numbers):

Lower half: 24, 26, 27, 28

Since there are 4 data points, Q1 is the average of the 2nd and 3rd values:

$$Q1 = (26 + 27) / 2 = 53 / 2 = 26.5$$

5. Find the Third Quartile (Q3)

Q3 is the median of the upper half of the data (the last four numbers):

Upper half: 30, 35, 36, 39

Again, with 4 data points, Q3 is the average of the 2nd and 3rd values:

$$Q3 = (35 + 36) / 2 = 71 / 2 = 35.5$$

Summary of the Five-Number Summary

Statistic	Value
Minimum	24
Q1	26.5
Median (Q2)	29
Q3	35.5
Maximum	39

This concise set of statistics encapsulates the data's key features and will serve as the foundation for the box-and-whisker plot.

Drawing the Box-and-Whisker Plot

With the five-number summary calculated, the next step is to create the box-and-whisker plot, a visual tool that illustrates data distribution effectively.

Step 1: Draw a Number Line

Start by drawing a horizontal line that spans at least the range from the minimum (24) to the maximum (39). Mark these points clearly.

Step 2: Plot the Five-Number Summary

On the number line, mark the values for 24, 26.5, 29, 35.5, and 39:

- Place a dot or a small vertical line at each value.
- Label each point for clarity.

Step 3: Construct the Box

Create a rectangular box from Q1 (26.5) to Q3 (35.5):

- Draw a rectangle with its left edge at 26.5.
- Draw the right edge at 35.5.
- Inside the box, draw a line at the median (29).

This box represents the interquartile range (IQR), which contains the middle 50% of the data.

Step 4: Draw the Whiskers

Extend lines (whiskers) from the box to the minimum and maximum values:

- From the left side of the box at 26.5, draw a line to the minimum (24).
- From the right side at 35.5, draw a line to the maximum (39).

Step 5: Interpret the Plot

Your completed box-and-whisker plot visually summarizes the data set's distribution, central tendency, and variability. The length of the box indicates the interquartile range, while the whiskers show the overall spread.

Key Insights from the Box-and-Whisker Plot

- The data is spread from 24 to 39, with the middle 50% of values between 26.5 and 35.5.
- The median (29) is closer to the lower quartile (26.5), suggesting a slight skewness toward higher values.
- The range (spread) is 15 (39 - 24), indicating the extent of variability.

Additional Tips for Creating Effective Box-and-Whisker Plots

- Always double-check your calculations of quartiles to avoid misrepresentations.
- Use consistent scales on your number line for accurate visualization.
- Label your plot clearly, including all key points (minimum, Q1, median, Q3, maximum).
- Consider plotting individual outliers if they exist; in this data set, all points are within the expected range.

Conclusion

Mastering the process of finding the five-number summary and drawing the box-and-whisker plot allows you to analyze data sets effectively, providing insights into their distribution and variability. The step-by-step approach outlined here using the data set 39, 36, 30, 27, 26, 24, 28, 35 illustrates how to organize data, perform calculations, and create a visual representation that communicates key statistical features clearly. Whether used in academic settings, professional data analysis, or everyday decision-making, these skills are foundational tools in understanding and interpreting data.

Final Thoughts

Practicing these steps with different data sets will enhance your ability to quickly analyze and visualize data. Remember, clarity and accuracy in calculations lead to more meaningful insights, and a well-constructed box-and-whisker plot makes those insights accessible at a glance. Keep exploring and applying these techniques to become proficient in descriptive statistics!

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