

The page is decorated with various biological illustrations. In the top left and bottom left corners, there are green and white flowers with long, pointed petals. In the top right corner, there is a similar flower. On the left side, there is a white butterfly with black markings on its wings. The background is a light green color with a subtle pattern of leaves and flowers.

Class: 9th

Subject: Biology

Chapter 11: Biostatistics

Exercise MCQs:

1. What is the primary purpose of biostatistics?

- a) To analyse financial data
- b) To apply statistical methods to biological sciences
- c) To design engineering models
- d) To study historical events

2. In biostatistics, which method is used to predict future outcomes based on current data?

- a) Designing experiments
- b) Drawing charts
- c) Taking average

d) Analysing data

3. Which of the following best describes the mean of data set?

a) The most frequently occurring value

b) The middle value when data is ordered

c) The sum of all values divided by the number of values

d) The difference between the highest and lowest values

4. If the data set is 5, 8, 12, 15, 20, what is the median?

a) 8

b) 12

c) 15

d) 20

5. What is the mean of the data set: 7, 8, 9, 10, 11?

a) 7

b) 8

c) 9

d) 10

6. When the number of values in a data set is even, how is the median calculated?

a) By choosing the middle value

b) By taking the average of the two middle values



c) By selecting the most frequent value

d) By adding all values and dividing by the total number of values

7. In a data set with values 3, 3, 6, 7, 8, 9, 9, what is the mode?

a) 3

b) 6

c) 7

d) Both 3 and 9

8. If a data set has no repeated values, what is the mode?

a) The highest value



b) The average of the data set

c) There is no mode

d) The median value

9. In a bar chart, what does the height or length of each bar represent?



a) The total number of categories

b) The value of the corresponding category

c) The average of all values

d) The difference between the highest and lowest values

10. When constructing a bar chart, which axis usually represents the categories?

a) Vertical axis (y-axis)

b) Horizontal axis (x-axis)

c) Both axes equally represent the categories

d) Neither axis represents the categories



The page features decorative illustrations of white flowers with green leaves in the corners and a butterfly on the left side. A yellow highlight is placed behind the text 'Important MCQs:'.

Important MCQs:

1. Which of the following is the branch that applies statistical methods to biological sciences?

- (a) Chemistry
- (b) Geology
- (c) Biostatistics
- (d) Anatomy

2. Biostatistics is mainly used for:

- (a) Drawing biological diagrams
- (b) Designing experiments
- (c) Writing research papers
- (d) Collecting fossils


3. In clinical trials, biostatistics helps in determining:

- (a) Cost of medicine
- (b) Number of doctors
- (c) Sample size
- (d) Hospital location



4. Biostatistics helps in:

- (a) Reading novels
- (b) Making perfumes
- (c) Analyzing biological data
- (d) Teaching grammar



5. Predicting the spread of a disease in a population is a function of:

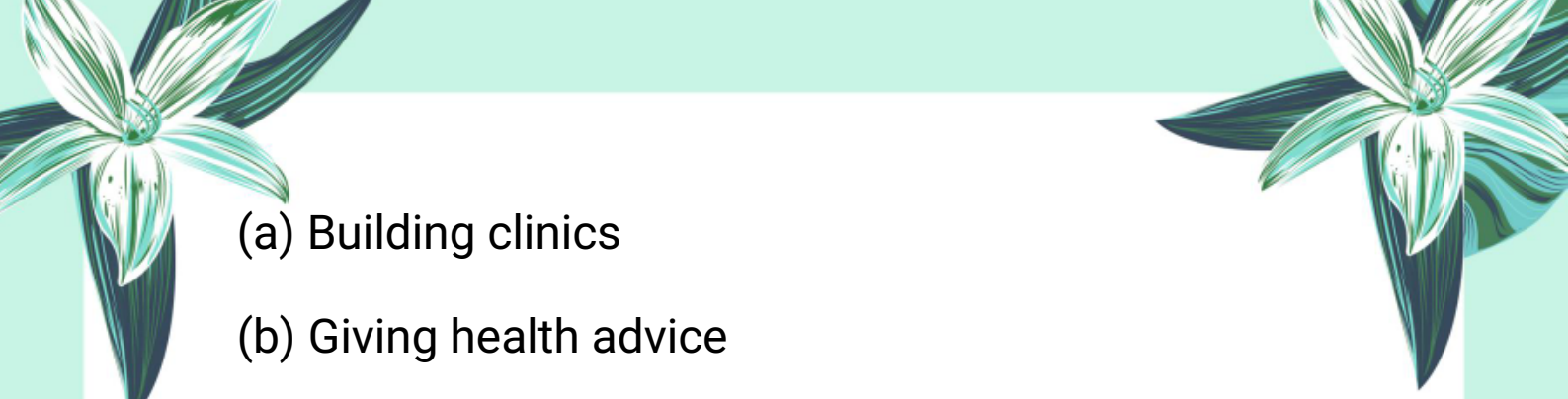
- (a) Geography
- (b) Biostatistics
- (c) Botany
- (d) Architecture

6. Which of the following is an example of interpreting results in biostatistics?

- (a) Measuring rainfall
- (b) Testing soil type
- (c) Analyzing disease survey
- (d) Mixing chemicals

7. Biostatistics supports public health by:



- 
- (a) Building clinics
 - (b) Giving health advice
 - (c) Guiding policies through data
 - (d) Treating patients directly



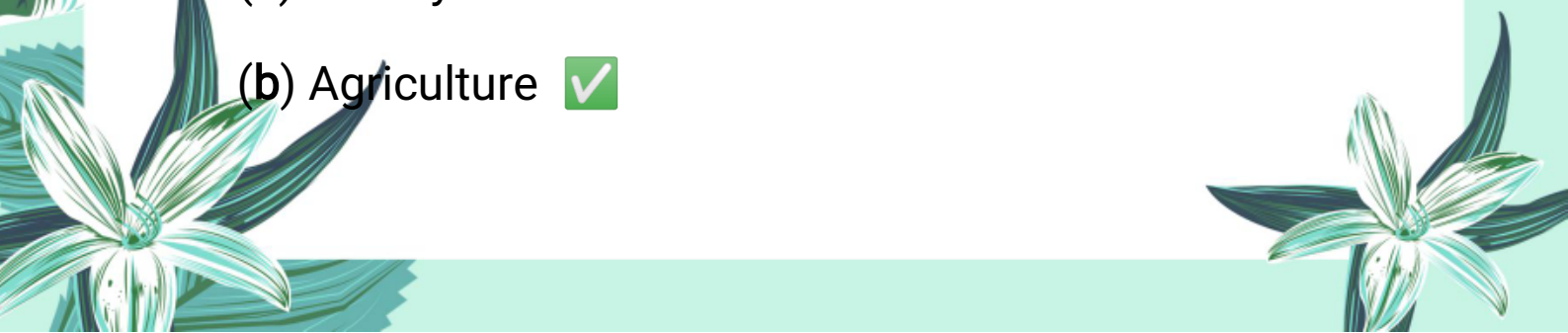
8. Epidemiologists use biostatistics to study:

- (a) Skin types
- (b) Hair colour
- (c) Disease distribution
- (d) Climate change

9. In genetics, biostatistics is used to:

- (a) Develop vaccines
- (b) Analyze genetic inheritance
- (c) Measure blood pressure
- (d) Study weather patterns

10. Which of the following uses biostatistics to compare wheat yield?

- (a) Botany
 - (b) Agriculture
- 



(c) Zoology

(d) Astronomy

11. Clinical trials use biostatistics to:

(a) Diagnose diseases

(b) Provide ambulance services

(c) Test new drugs and treatments

(d) Print medicine labels

12. The measure that gives an average of a data set is called:

(a) Median

(b) Mode

(c) Mean

(d) Range


13. What is the formula for mean?


(a) Highest \div Lowest

(b) Total values \div Number of values

(c) Most repeated value


(d) Largest value – Smallest value





14. What is the mean of the following data set: 150, 160, 165, 155, 170?

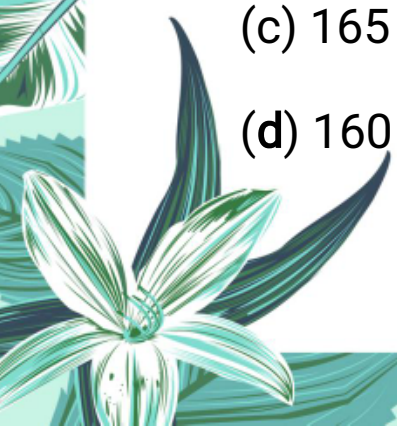
- (a) 155
- (b) 165
- (c) 160
- (d) 150



15. Which of the following identifies the most frequent value in a data set?

- (a) Mean
- (b) Median
- (c) Mode
- (d) Average


16. What is the median of the data set: 150, 160, 165, 155, 170?

- (a) 155
 - (b) 160
 - (c) 165
 - (d) 160
- 



17. Which step is performed first to calculate the median?

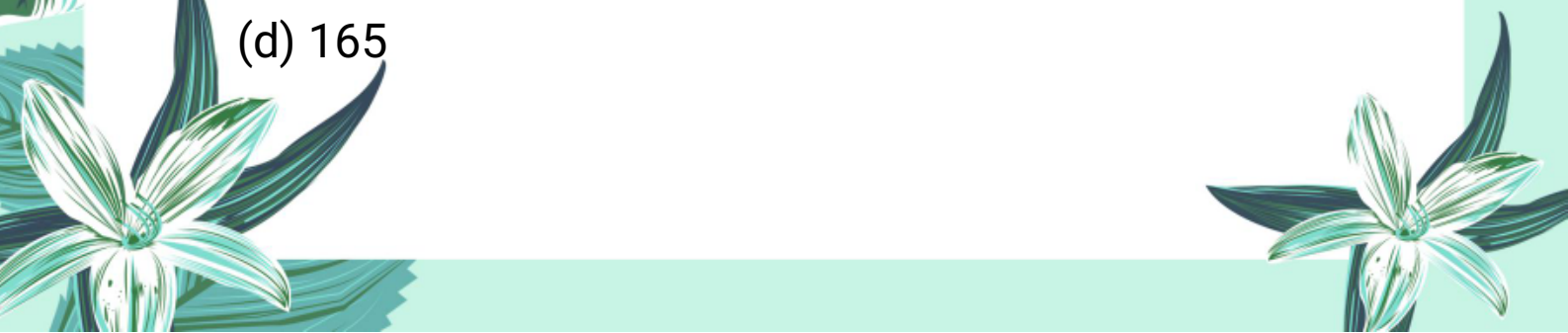
- (a) Find mean
- (b) Create a graph
- (c) Arrange data in ascending order
- (d) Count mode



18. If a data set has an even number of values, the median is:

- (a) The middle value
- (b) The average of two middle values
- (c) The highest value
- (d) The mode

19. What is the median of the data set: 150, 155, 160, 165?

- (a) 155
 - (b) 157.5
 - (c) 160
 - (d) 165
- 



20. What is the mode of the data set: 150, 160, 165, 155, 160?

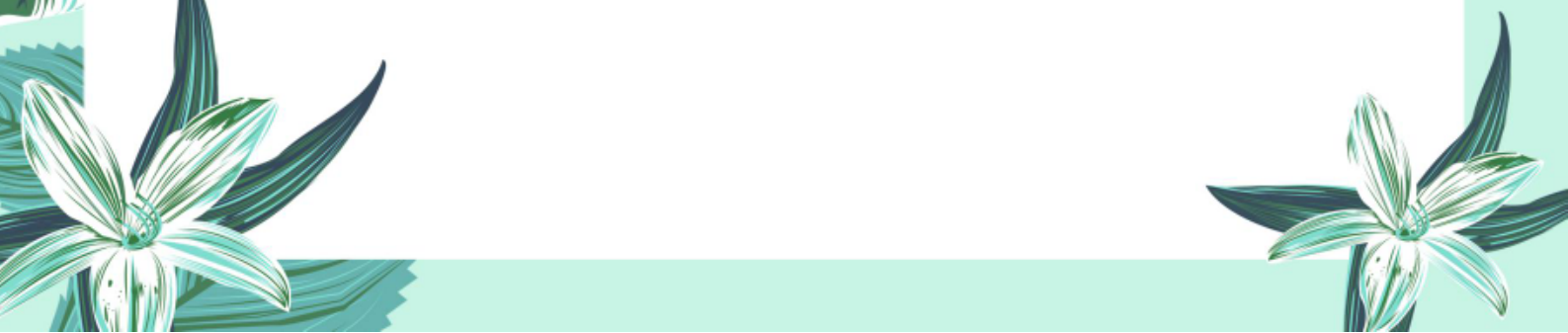
- (a) 150
- (b) 155
- (c) 160
- (d) 165



21. A data set is said to be bimodal if:

- (a) All values are equal
- (b) It has two modes
- (c) It has no mode
- (d) Median and mean are equal

22. What is the mode of the data set: 150, 160, 160, 155, 155?

- (a) No mode
 - (b) 160 only
 - (c) 155 only
 - (d) 160 and 155
- 



23. If all values in a data set occur only once, the mode is:



- (a) The smallest value
- (b) The largest value
- (c) The average
- (d) No mode



24. A bar chart represents data using:

- (a) Circles
- (b) Lines
- (c) Bars
- (d) Arrows

25. In a bar chart, the x-axis usually represents:

- (a) Quantities
 - (b) Categories
 - (c) Frequencies
 - (d) Time
- 
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Exercise Short Questions:

1. Define biostatistics:

Biostatistics is the application of statistical methods to biological and health-related studies.

2. What is the median of a data set?

The median is the middle value of a data set when the values are arranged in ascending or descending order.

3. How is the mean calculated?

The mean is calculated by dividing the sum of all values by the total number of values.

4. What does the height of a bar in a bar chart represent?

The height of a bar represents the value or frequency of the corresponding category.

5. What is the mode of a data set?

The mode is the value that appears most frequently in a data set.



Important Short Questions:

1. What is biostatistics?

Biostatistics is a branch of statistics that applies statistical methods to biological sciences.

2. How does biostatistics help in designing experiments?

It helps in planning and structuring experiments to ensure the data collected is relevant and sufficient.

3. What is the role of biostatistics in analyzing biological data?

Biostatistics helps in finding trends, patterns, and correlations in biological data.

4. How does biostatistics assist in interpreting results?

It helps to make sense of analyzed data to guide scientific and public health decisions.

5. How is biostatistics used to predict outcomes?

By using statistical models, it predicts future events based on current data.



6. What is the importance of biostatistics in public health?

It provides evidence-based insights for making health policies and guidelines.



7. How do epidemiologists use biostatistics?

They use it to study disease patterns, distribution, and control in populations.

8. What is the application of biostatistics in genetics?

It is used to analyze the inheritance of traits and identify disease-related genetic markers.

9. How is biostatistics useful in agriculture?


It helps in analyzing crop yields and the effects of fertilizers or pest resistance.

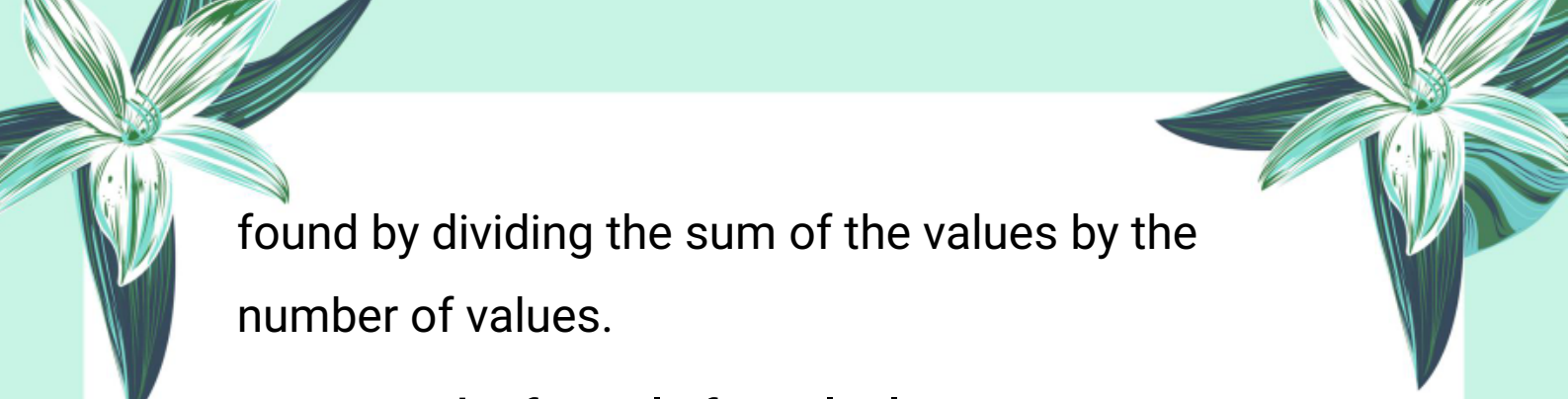
10. What is the role of biostatistics in clinical trials?

It is used to design and analyze trials to test the effectiveness and safety of new treatments.

11. What is the mean in biostatistics?

Mean is the average of all values in a data set,





found by dividing the sum of the values by the number of values.

12. Write the formula for calculating mean.

Mean = Sum of all data points / Number of data points



13. What is the median?

Median is the middle value in an ordered data set. If the number of values is even, it is the average of the two middle values.

14. How do you calculate the median when the number of values is odd?

Arrange the data in order and pick the value at the position $(n + 1)/2$.

15. How do you calculate the median when the number of values is even?

Find the average of the values at positions $n/2$ and $(n/2 + 1)$ after arranging in order.

16. What is the mode in a data set?

Mode is the value that appears most frequently in a





data set.

17. Can a data set have more than one mode? Give an example.

Yes, for example, in the data 150, 160, 160, 155, 155 – both 160 and 155 are modes (bimodal).

18. What is a bar chart?

A bar chart is a graphical representation of data using bars of different heights to compare categories.

19. What are the main steps to create a bar chart?

Collect data, organize it, draw axes, label them, decide the scale, draw bars, and label each bar.

20. Why are bar charts useful in biostatistics?

Bar charts help visually compare different categories and understand data distribution clearly.

Exercise Long Questions:

Q1: Explain the importance of biostatistics in the field of public health. Provide examples of how it is



used to inform public health decisions.

Answer:

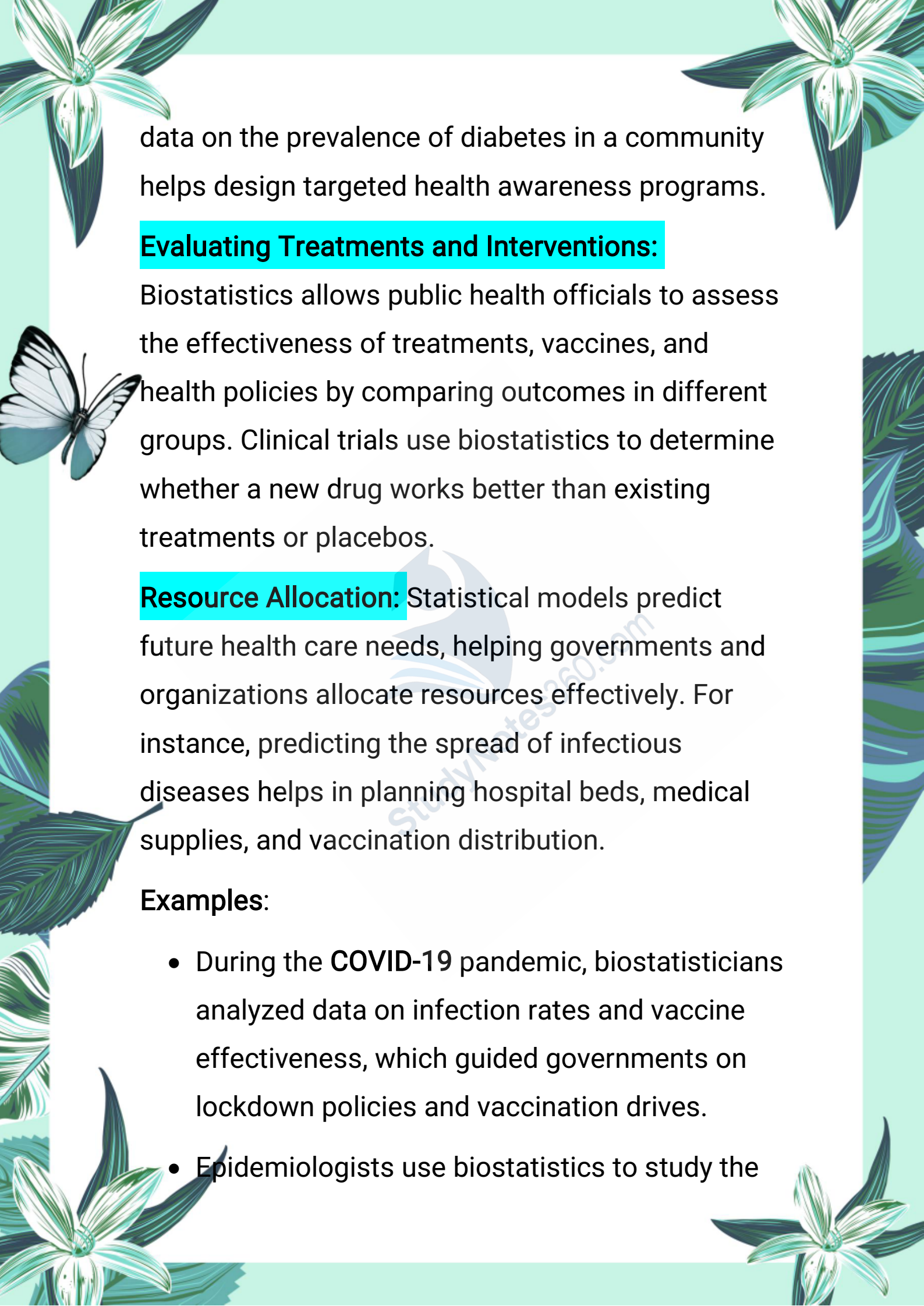
Biostatistics plays a crucial role in public health by providing tools and methods to collect, analyze, and interpret biological and health data. It helps public health professionals understand health trends, disease outbreaks, and the effectiveness of health interventions, which is essential for making informed decisions.

Importance of Biostatistics in Public Health:

Disease Surveillance and Control: Biostatistics helps track the spread of diseases in populations.

For example, during an epidemic like **COVID-19**, biostatistical methods are used to analyze infection rates, recovery rates, and mortality rates to monitor the disease progression and evaluate the impact of control measures.

Designing Health Programs: By analyzing data on risk factors and disease prevalence, biostatistics aids in planning vaccination campaigns, screening programs, and preventive strategies. **For example,**

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data on the prevalence of diabetes in a community helps design targeted health awareness programs.

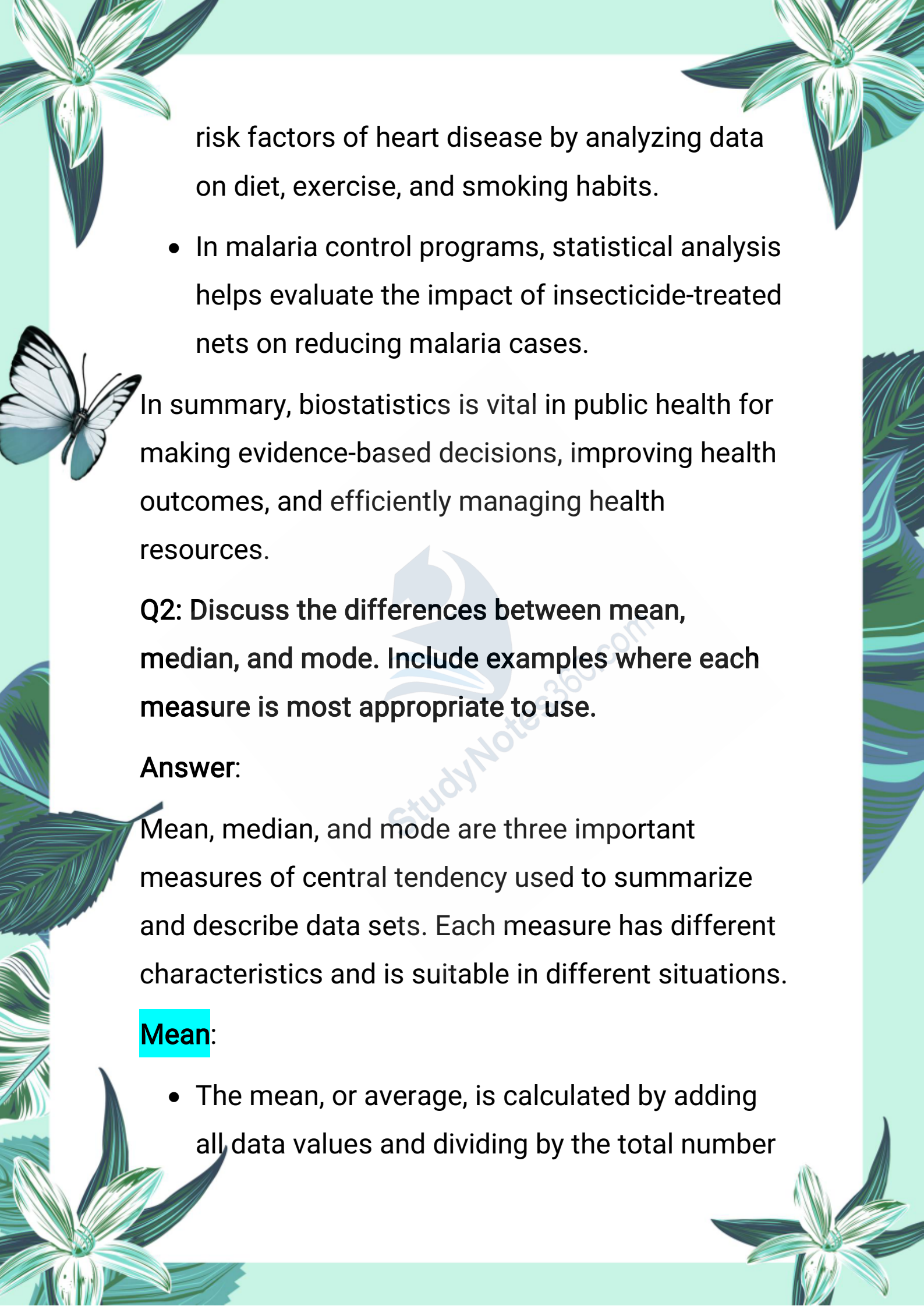
Evaluating Treatments and Interventions:

Biostatistics allows public health officials to assess the effectiveness of treatments, vaccines, and health policies by comparing outcomes in different groups. Clinical trials use biostatistics to determine whether a new drug works better than existing treatments or placebos.

Resource Allocation: Statistical models predict future health care needs, helping governments and organizations allocate resources effectively. For instance, predicting the spread of infectious diseases helps in planning hospital beds, medical supplies, and vaccination distribution.

Examples:

- During the **COVID-19** pandemic, biostatisticians analyzed data on infection rates and vaccine effectiveness, which guided governments on lockdown policies and vaccination drives.
- Epidemiologists use biostatistics to study the



risk factors of heart disease by analyzing data on diet, exercise, and smoking habits.

- In malaria control programs, statistical analysis helps evaluate the impact of insecticide-treated nets on reducing malaria cases.

In summary, biostatistics is vital in public health for making evidence-based decisions, improving health outcomes, and efficiently managing health resources.

Q2: Discuss the differences between mean, median, and mode. Include examples where each measure is most appropriate to use.

Answer:

Mean, median, and mode are three important measures of central tendency used to summarize and describe data sets. Each measure has different characteristics and is suitable in different situations.

Mean:

- The mean, or average, is calculated by adding all data values and dividing by the total number

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of values.

- It represents the overall average of the data.
- **Example:** The average height of students in a class can be found using the mean.
- **When to use:** The mean is best used when data are evenly distributed without extreme outliers, as it is sensitive to very high or low values.

Median:

- The median is the middle value when the data are arranged in ascending or descending order.
- If there is an odd number of values, the median is the middle one; if even, it is the average of the two middle values.
- **Example:** In income data where some people have extremely high earnings, the median income gives a better idea of the "typical" income than the mean.
- **When to use:** The median is useful when data contain outliers or skewed distributions, as it is not affected by extreme values.



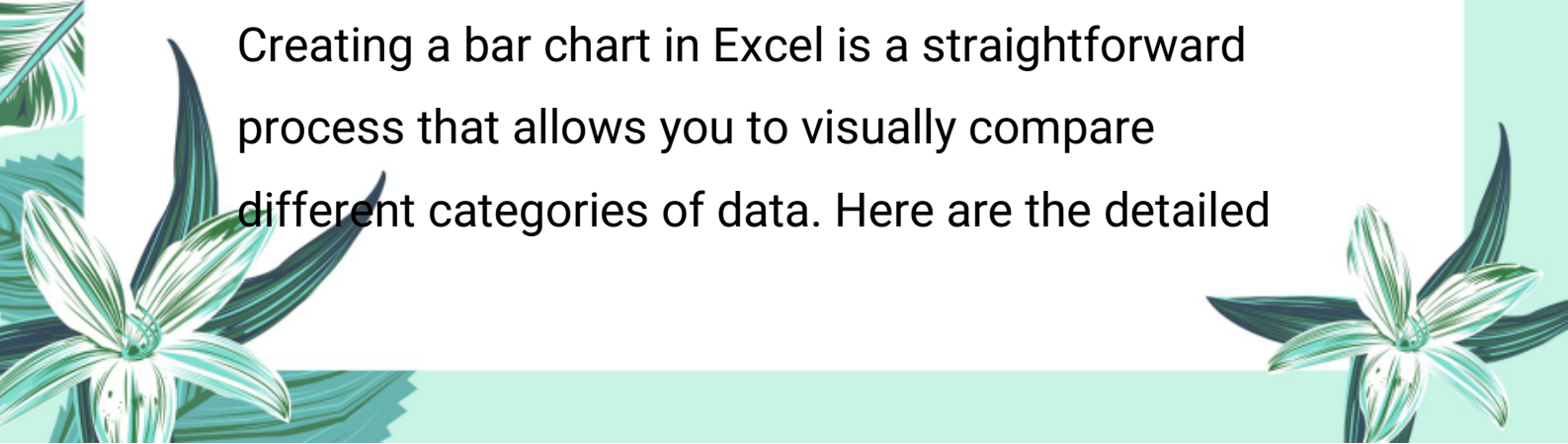
Mode:

- The mode is the value that appears most frequently in the data set.
- There can be one mode (unimodal), more than one mode (bimodal or multimodal), or no mode if all values are unique.
- **Example:** In a survey of favorite fruits, the mode would be the fruit chosen by the most people.
- **When to use:** The mode is suitable for categorical data or when identifying the most common item or category in a data set.

Q3: Describe the steps involved in creating a bar chart using Excel. Include a discussion on how to customize the chart for better visualization and interpretation of data.

Answer:

Creating a bar chart in Excel is a straightforward process that allows you to visually compare different categories of data. Here are the detailed





steps and tips for customization:

Steps to Create a Bar Chart:

1. Prepare Data:

Organize your data in columns or rows. For example, list categories (e.g., species or product names) in one column and corresponding values (e.g., quantity or sales) in the adjacent column.

2. Select Data:

Highlight the data range that you want to include in the bar chart, including category labels and values.

3. Insert Bar Chart:

Go to the Insert tab in Excel's ribbon menu.

Click on Insert Column or Bar Chart icon.

Choose the type of bar chart you want (e.g., clustered bar, stacked bar).

4. Chart Creation:

Excel will generate a bar chart based on the selected data and insert it into the worksheet.

Customization for Better Visualization:



Add Titles:

Add a chart title and axis titles to make the chart understandable. Use the Chart Tools > Design > Add Chart Element > Chart Title.



Adjust Axis Labels:

Ensure the x-axis (categories) and y-axis (values) are clearly labeled. You can format the axis labels for better readability.

Change Colors:

Use different colors for bars to distinguish categories clearly. Right-click on bars and choose Format Data Series to change colors.

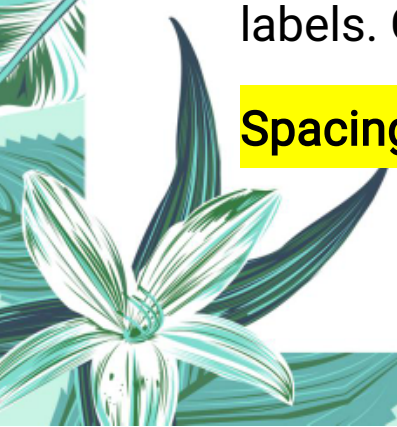
Modify Scale:

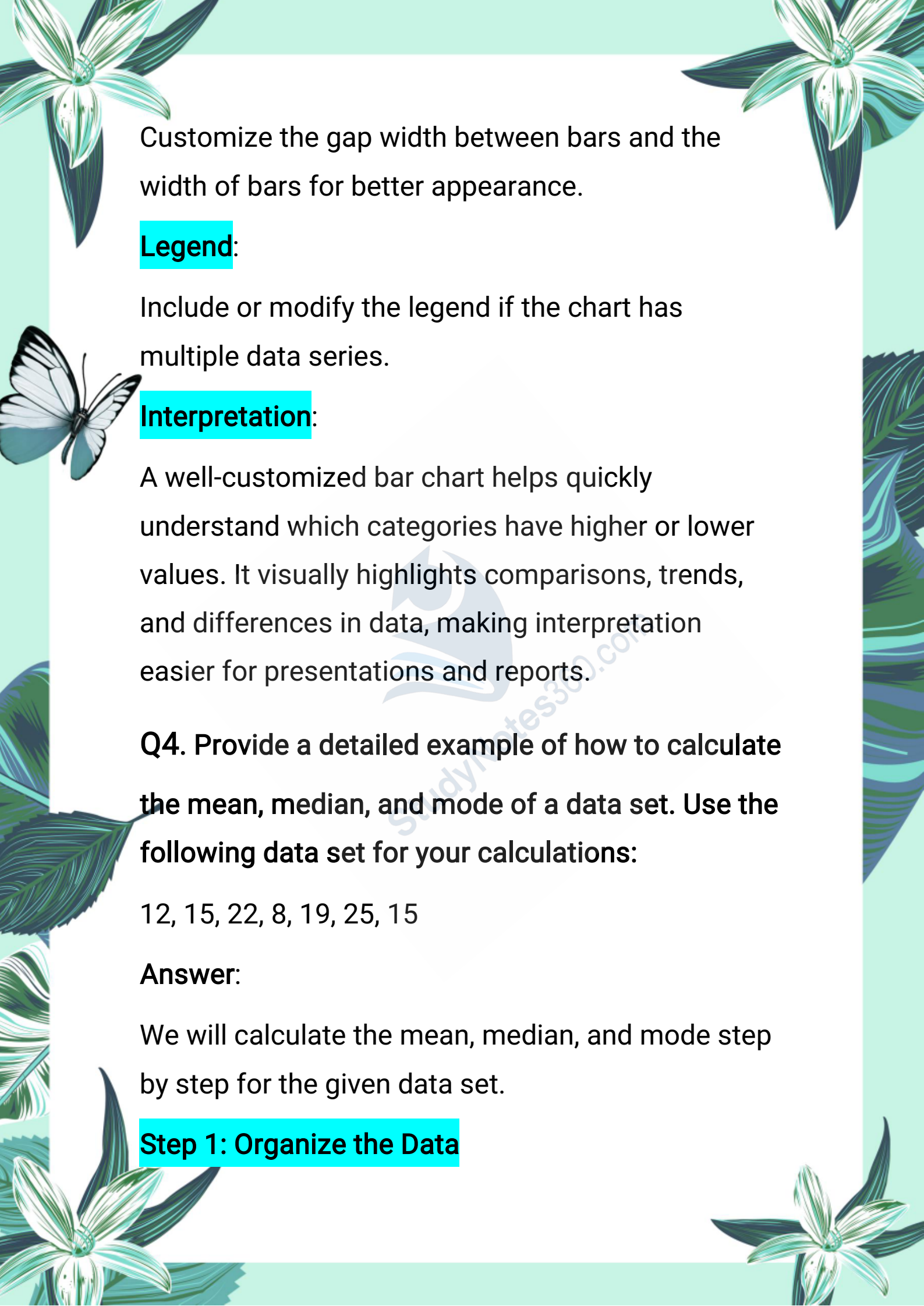
Adjust the y-axis scale to fit the data range properly. This helps in better comparison.

Add Data Labels:

Show exact values on the bars by enabling data labels. Go to Chart Tools > Layout > Data Labels.

Spacing and Bar Width:





Customize the gap width between bars and the width of bars for better appearance.

Legend:

Include or modify the legend if the chart has multiple data series.

Interpretation:

A well-customized bar chart helps quickly understand which categories have higher or lower values. It visually highlights comparisons, trends, and differences in data, making interpretation easier for presentations and reports.

Q4. Provide a detailed example of how to calculate the mean, median, and mode of a data set. Use the following data set for your calculations:

12, 15, 22, 8, 19, 25, 15

Answer:

We will calculate the mean, median, and mode step by step for the given data set.

Step 1: Organize the Data

- Given data set:
- 12, 15, 22, 8, 19, 25, 15
- Arrange the data in ascending order for easier calculation of median:
- 8, 12, 15, 15, 19, 22, 25

Step 2: Calculate the Mean

Mean is the average value of the data set. It is calculated by adding all the numbers and dividing by the total number of values.

$$\text{Mean} = \frac{\text{Sum of all values}}{\text{Number of values}}$$

$$\text{Sum of values} = 8 + 12 + 15 + 15 + 19 + 22 + 25 = 116$$

$$\text{Number of values} = 7$$

So,

$$\text{Mean} = \frac{116}{7} = 16.57 \text{ (approx.)}$$

Step 3: Calculate the Median

- Median is the middle value of the data when it

is arranged in ascending order.

- Since there are 7 values (an odd number), the median is the value at position $7+1/2= 4$.

Counting the values in order:

1st: 8

2nd: 12

3rd: 15

4th: 15 IJ Median

5th: 19

6th: 22

7th: 25

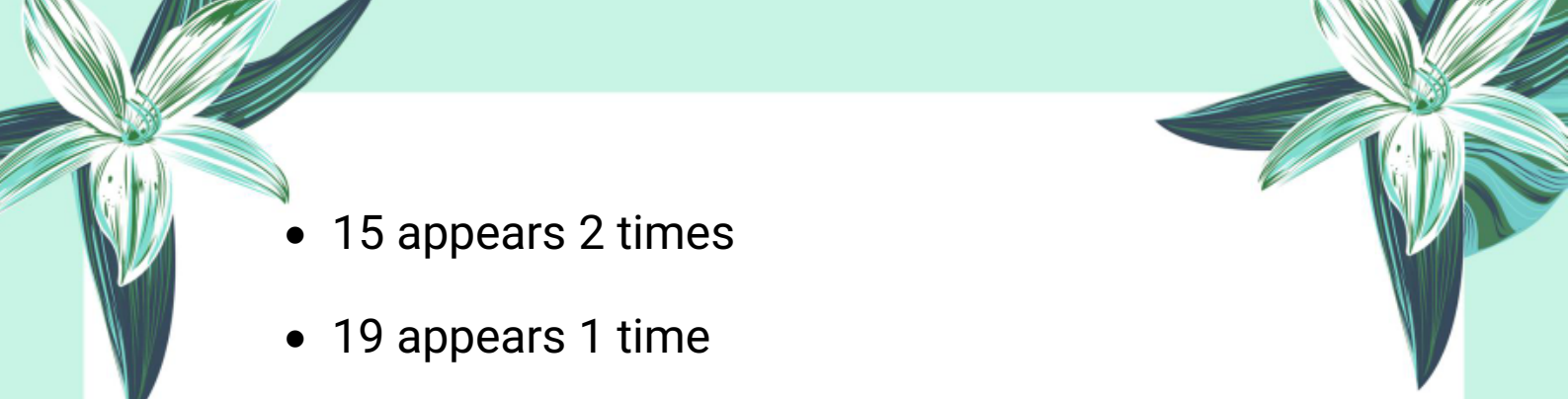
So, the median is 15.


Step 4: Calculate the Mode

Mode is the value that appears most frequently in the data set.

Count the frequency of each value:

- 8 appears 1 time
- 12 appears 1 time

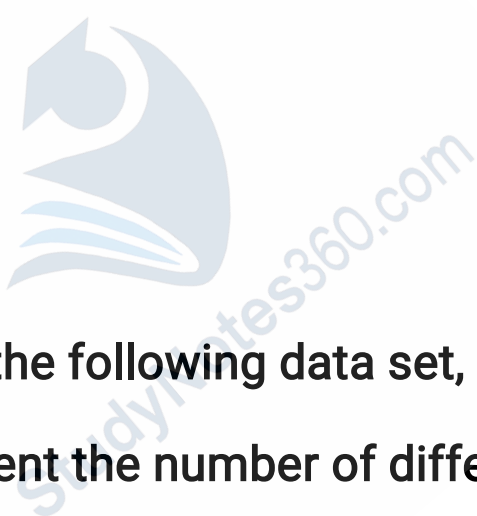
- 
- 15 appears 2 times
 - 19 appears 1 time
 - 22 appears 1 time
 - 25 appears 1 time



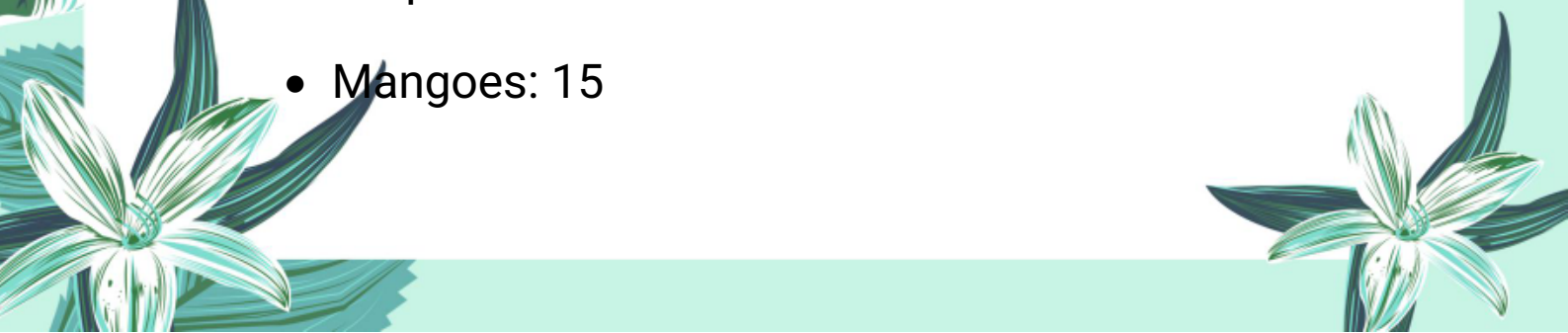
Since 15 appears twice and all other values appear only once, the mode is 15.

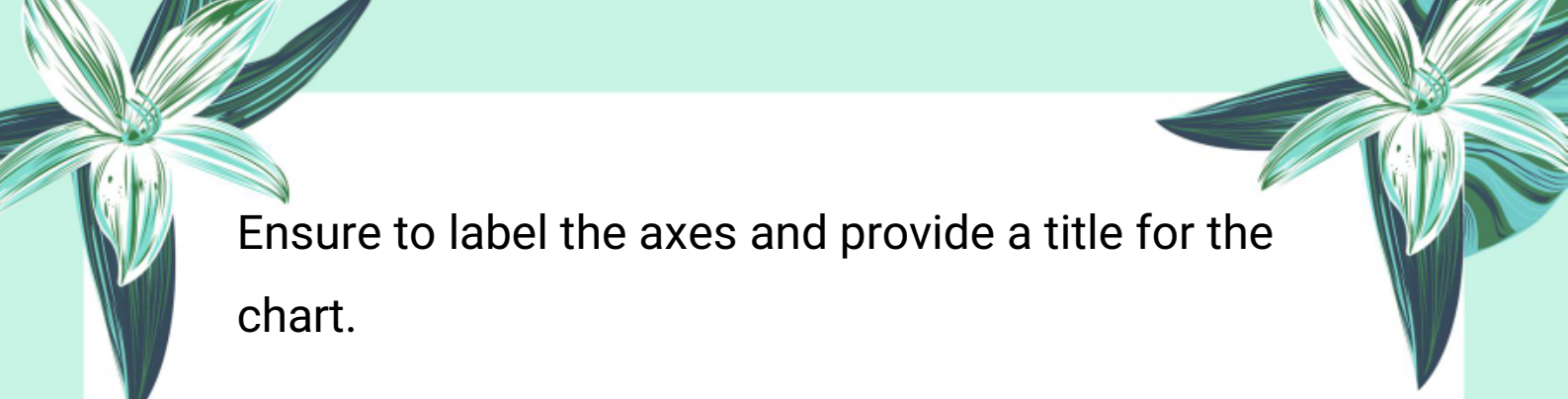
Summary:

- Mean = 16.57
- Median = 15
- Mode = 15




Q5: You are given the following data set, create a bar chart to represent the number of different types of fruits sold at a market in one week:

- Apples: 30
 - Bananas: 45
 - Oranges: 20
 - Grapes: 25
 - Mangoes: 15
- 



Ensure to label the axes and provide a title for the chart.


Answer:



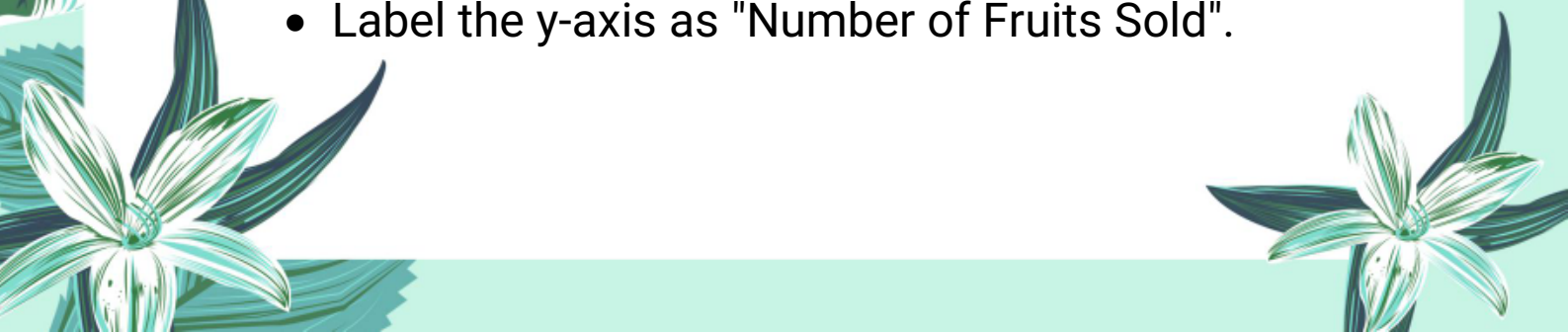
Since I cannot draw the chart here directly, I will explain how to create the bar chart step by step and how it would look.


Step 1: Prepare the Data

Fruit Number Sold

- Apples 30
 - Bananas 45
 - Oranges 20
 - Grapes 25
 - Mangoes 15
- 

Step 2: Draw the Axes

- Draw a horizontal axis (x-axis) and a vertical axis (y-axis).
 - Label the x-axis as "Types of Fruits".
 - Label the y-axis as "Number of Fruits Sold".
- 



Step 3: Determine the Scale of Y-Axis

- The highest value is 45 (Bananas).
- Choose a scale that can cover values from 0 to at least 50, using intervals of 5 or 10 for clarity.



Step 4: Draw Bars

- For each fruit, draw a vertical bar above its name on the x-axis.
- The height of the bar corresponds to the number of fruits sold.

For example:

- Apples: bar height to 30
- Bananas: bar height to 45
- Oranges: bar height to 20
- Grapes: bar height to 25
- Mangoes: bar height to 15

Step 5: Title the Chart

Add a title at the top such as:

"Number of Different Types of Fruits Sold at Market"





in One Week"

Result Interpretation:

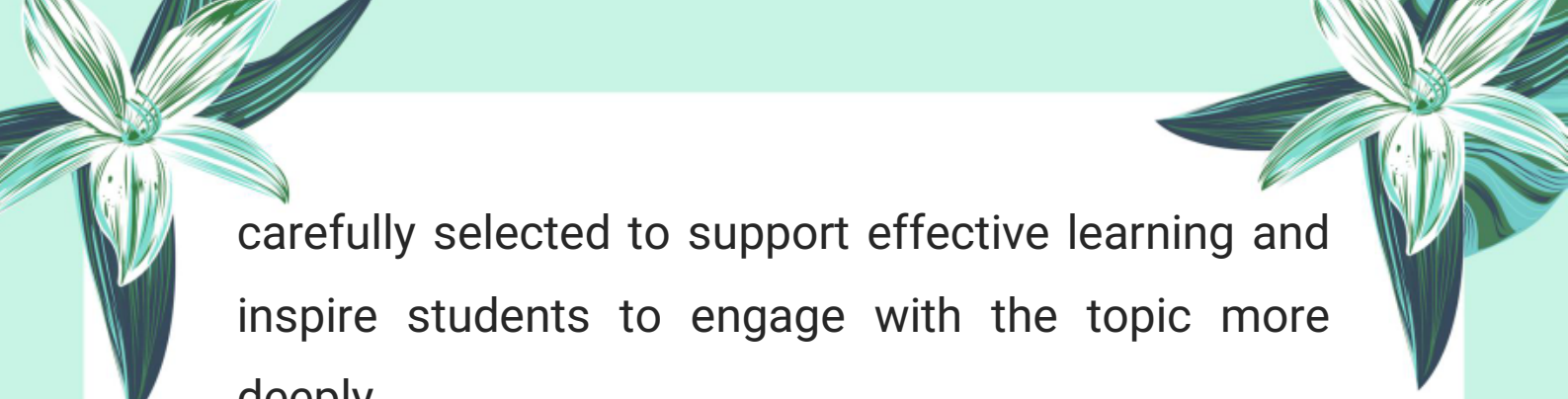
- The tallest bar will be for Bananas, indicating it is the most sold fruit.
- Mangoes will have the shortest bar.
- The bar heights visually show the comparison of quantities sold.



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Note:

This chapter is designed to provide a solid foundation of knowledge, with the goal of deepening understanding and encouraging further exploration of the subject. The content has been



carefully selected to support effective learning and inspire students to engage with the topic more deeply.

Author: Muhammad Asghar



Purpose: To contribute to education by offering insightful, valuable content that enhances learning and understanding.

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