Number Crunching

Video Overview

Number Crunching discusses mathematical relationships between statistical data including averages, means, modes, medians, and how they are calculated. The video focuses on how each of these mathematical tools can be used to make predictions about future data.

A case study follows Students for a Better Earth as they sample air pollution levels in their community.

In the process of conducting the study, the volunteers in Students for a Better Earth:

- Solve problems from statistics shown on a graph.
- Analyze data to find the range, mean, median, and mode.
- Analyze data to find the standard deviation.

The following key concepts are presented in the video.

- One common distribution of data on a histogram is the normal or bell curve.
- The most common representative value is the measure of the center of the data distribution on a histogram. This is the average.
- The average is the most common occurrence in a total population.
- In statistical applications there are three commonly used averages: mode, mean, and median.
- The mode is the tallest category on a histogram (or bar chart).
- Where there are two modes on a chart, you have a bimodal distribution.
- There are three versions of mean: arithmetic, geometric, and harmonic.
- The arithmetic mean is the average typically used in mathematical applications. You calculate the arithmetic mean by adding up the values and dividing the sum by the total number of values.
- The arithmetic mean is often referred to in formulas by the letter "m" or by X bar. In more advanced statistical applications the Greek letter "mu" is used.
- The assumed or false mean is an estimate of what the average might be.
- The median is the measure of the center of a distribution on a histogram.
- The size of the distribution of data is the spread.
- The deviation on both sides of the median is the range. The range is the difference between the smallest and the largest measurements.
- Standard deviation is a mathematical tool for finding the deviation or distance from the mean for each value in your data collection.

Discussion Questions

Before viewing the video, set the scene by asking your class the following questions. After soliciting some answers, distribute the answer sheets.

Question 1 - What is the normal or bell curve?

Answer - It is a data distribution pattern that looks like a wave with the tallest section in the center of the chart.

Question 2 - On a bar chart or histogram, what is the highest bar, the top and center of a bell curve called?

Answer - The average.

Question 3 - How do you calculate the arithmetic mean?

Answer - You add a list of numbers and divide the sum by the total number of values.

Question 4 - The total distribution of data from smallest to largest value is called what?

Answer - The range

Math Problems

After you are finished watching the video, complete the following math problems to assist Students for a Better Earth in their statistical study.

Problem 1:
Rubber bands break faster under poor air quality conditions. The students hung rubber bands stretched on clothes hangers both inside and outside of their homes. The following data was reported by the students.

Team	Interior Breaking Time	Exterior Breaking Time
A	1102 Hours	527 Hours
B	1215 Hours	612 Hours
C	902 Hours	550 Hours
D	955 Hours	602 Hours

A. Using both interior and exterior breaking times, what is the average breaking time?

_____

B. Using both interior and exterior breaking times, what is the range?

_____

C. What is the average breaking time for interior rubber bands?

_____

D. What is the average breaking time for exterior rubber bands?

_____

E. What is the standard deviation of breaking times for both interior and exterior rubber bands?

_____

Problem 2:
Create a bar chart (histogram) to see a distribution of breaking times for both interior and exterior rubber bands. Use a separate color or shading for interior times than you use for exterior times.

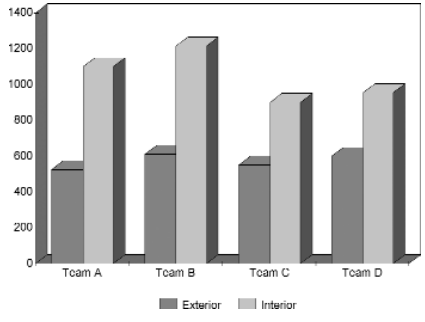
Number Crunching – Answer Key

* Math Activity *

Problem 1:
Rubber bands break faster under poor air quality conditions. The students hung rubber bands stretched on clothes hangers both inside and outside of their homes.

A. Using both interior and exterior breaking times, what is the average breaking time? **808 hours**
B. Using both interior and exterior breaking times, what is the range? **688**
C. What is the average breaking time for interior rubber bands? **572**
D. What is the average breaking time for exterior rubber bands? **1044**
E. What is the standard deviation of breaking times for both interior and exterior rubber bands? **252.2**

Problem 2:
Create a bar chart (histogram) to see a distribution of breaking times for both interior and exterior rubber bands. Use a separate color or shading for interior times than you use for exterior times.



Measuring Your World

Number Crunching

Mathematical Relationships of Statistical Data

TEACHER'S GUIDE

K5053