

The Mean Weight Of A Group Of 15 Boys Is 65 Kg . One Boy Joins The Group And His Weight Is 45 Kg . What

The Mean Weight Of A Group Of 15 Boys Is 65 Kg . One Boy Joins The Group And His Weight Is 45 Kg . What implications does this have on the average weight of the group? Understanding how the addition of a new member affects the overall mean weight involves basic concepts of averages and total sums. In this article, we will explore the problem step-by-step, delve into relevant mathematical principles, and explain the calculations involved to determine whether the average weight increases, decreases, or remains the same after the new boy joins the group.

Understanding the Problem

Before diving into calculations, it's essential to grasp what the problem is asking:

- Initially, there are 15 boys in a group, with an average (mean) weight of 65 kg.
- A new boy, weighing 45 kg, joins the group.
- The question is: What is the new average weight of the group after the new boy joins?

This problem is a classic example of how averages work and can be approached systematically.

Key Concepts in Averages and Total Sums

What is an Average?

An average, or mean, is calculated by dividing the total sum of all individual values by the number of values. Mathematically:

$$\text{Average} = \frac{\text{Total Sum of Values}}{\text{Number of Values}}$$

\]

Calculating the Total Sum from the Average

Given the average and number of individuals, the total sum can be found by:

\[

$$\text{Total Sum} = \text{Average} \times \text{Number of Individuals}$$

\]

This simple formula will be central to solving the problem.

Step-by-Step Calculation

Let's proceed step-by-step:

1. Calculate the initial total weight of the 15 boys

Given:

- Number of boys: 15
- Average weight: 65 kg

Using the formula:

\[

$$\text{Initial Total Weight} = 65 \text{ kg} \times 15 = 975 \text{ kg}$$

\]

2. Add the new boy's weight to the total

- Weight of new boy: 45 kg

Updated total weight:

$$975\text{ kg} + 45\text{ kg} = 1020\text{ kg}$$

3. Find the total number of boys after the new boy joins

Number of boys:

$$15 + 1 = 16$$

4. Calculate the new average weight

Using the updated total weight and count:

$$\text{New Average} = \frac{1020\text{ kg}}{16} = 63.75\text{ kg}$$

Interpreting the Results

The initial average weight was 65 kg, and after the new boy with a weight of 45 kg joins, the new average drops to 63.75 kg.

What does this tell us?

- The average weight decreased.
- The addition of a lighter individual (45 kg) than the original average (65 kg) pulls the overall average downward.
- If a heavier individual than the current average had joined, the average would have increased.

Additional Considerations

Effect of Adding Different Weights

Suppose the new boy's weight was different; how would that affect the average?

- If the new individual weighs more than 65 kg: The average will increase.
- If the new individual weighs exactly 65 kg: The average remains unchanged.
- If the new individual weighs less than 65 kg: The average decreases, as in our example.

General Formula for the New Average

To generalize, if:

- The original group has (n) members
- The original average is (A)
- The new member's weight is (W)

Then:

$$\text{Original total} = A \times n$$

$$\text{New total} = (A \times n) + W$$

$$\text{New number of members} = n + 1$$

$$\text{New average} = \frac{(A \times n) + W}{n + 1}$$

This formula is versatile and can be used in various similar problems.

Practical Applications and Importance

Understanding how individual data points affect averages is vital in many real-world contexts:

- Education: Calculating class average grades when a new student joins.
- Business: Assessing average sales per employee when hiring new staff.
- Health & Fitness: Tracking average weight changes of a group over time.
- Data Analysis: Making informed decisions based on how data points influence overall metrics.

Common Mistakes and How to Avoid Them

When solving such problems, be cautious of:

- Miscalculating the total sum: Always multiply the average by the number of individuals.
- Forgetting to update the total number of individuals: Remember to add the new member.
- Confusing individual weight with average: Recognize that the new average depends on the total sum and count, not just the new person's weight.

Summary

In conclusion, when a new individual joins a group, the overall average weight depends on whether their weight is above or below the current average. In our specific problem, the original group of 15 boys had an average weight of 65 kg, totaling 975 kg. After adding a boy weighing 45 kg, the total weight becomes 1020 kg, and the number of boys increases to 16. The new average weight becomes 63.75 kg, which is lower than the original average, illustrating how adding a lighter member diminishes the overall mean.

Key takeaways include:

- Always compute the total sum first before calculating averages.
- Understand how individual data points influence the overall average.
- Use the general formula to approach similar problems efficiently.

Final Thoughts

Mathematics provides simple yet powerful tools to analyze real-world scenarios involving averages. Recognizing the relationship between individual weights and the overall mean helps in making quick, accurate assessments. Whether in academics, workplace, health, or daily life, mastering these concepts enhances analytical skills and decision-making capabilities.

By understanding the impact of adding new data points on averages, you can better interpret data and make informed decisions across various fields.

Frequently Asked Questions

What is the total weight of the original 15 boys in the group?

The total weight is $15 \text{ boys} \times 65 \text{ kg} = 975 \text{ kg}$.

What is the new total weight after the 45 kg boy joins the group?

The new total weight is $975 \text{ kg} + 45 \text{ kg} = 1020 \text{ kg}$.

What is the total number of boys in the group after the new boy joins?

There are now $15 + 1 = 16$ boys.

What is the new average weight of the group after the new boy joins?

The new average weight is $1020 \text{ kg} \div 16 \approx 63.75 \text{ kg}$.

How does the addition of the new boy affect the average weight of the group?

The average weight decreases from 65 kg to approximately 63.75 kg .

If the group wants to maintain an average weight of 65 kg after adding a **new boy, what should be the maximum weight of the new boy?**

The total weight should be $16 \times 65 \text{ kg} = 1040 \text{ kg}$. Since current total is 975 kg, the new boy's weight should be at most $1040 \text{ kg} - 975 \text{ kg} = 65 \text{ kg}$.

Additional Resources

The Mean Weight Of A Group Of 15 Boys Is 65 Kg is a classic problem that involves understanding averages, basic arithmetic, and how the addition of new data points can influence the overall mean. Such problems frequently appear in mathematics exams, aptitude tests, and real-world scenarios like health assessments and group weight management programs. Analyzing this problem provides insight into how averages work and the impact of individual data points on the overall group statistics. This article explores the problem in detail, breaking down the steps to find the new mean after adding a new boy, and discusses related concepts, implications, and practical applications.

Understanding the Problem Statement

The problem states that:

- There is a group of 15 boys.
- The average (mean) weight of these 15 boys is 65 kg.
- A new boy joins the group.
- The weight of this new boy is 45 kg.
- The question is to determine the new average weight of the group after the boy joins.

This is a typical example of a problem involving the calculation of averages and their changes upon adding new data points. To analyze it thoroughly, let's first understand the key concepts involved.

Key Concepts and Definitions

Average (Mean)

The average (or mean) of a set of data points is calculated as the sum of all the data points divided by the number of data points:

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

In the context of this problem, the mean weight of the group gives an idea of the typical weight of the boys.

Effect of Adding a New Data Point

When a new data point (in this case, a boy's weight) is added to a dataset, the overall mean can either increase, decrease, or stay the same, depending on the value of the new data point relative to the current mean.

Calculating the Total Weight of the Original Group

Given:

- Number of boys: 15
- Mean weight: 65 kg

Total weight of the original group:

$$\begin{aligned}\text{Total weight} &= \text{Number of boys} \times \text{Mean weight} \\ &= 15 \times 65 \\ &= 975 \text{ kg}\end{aligned}$$

This total sum is crucial because it forms the basis for calculating the new mean after the addition.

Adding the New Boy and Recalculating

The new boy weighs 45 kg, so:

- Updated total weight:

$$[975 \text{ kg} + 45 \text{ kg} = 1020 \text{ kg}]$$

- Updated number of boys:

$$[15 + 1 = 16]$$

- New mean weight:

$$[\text{New mean} = \frac{\text{Updated total weight}}{\text{Total number of boys}}]$$

$$[= \frac{1020}{16}]$$

$$[= 63.75 \text{ kg}]$$

Thus, the new average weight of the group after the boy joins is 63.75 kg.

Implications and Insights from the Calculation

Understanding the Change in Average

The original average was 65 kg, but after adding a boy weighing 45 kg (which is below the original mean), the new average decreased to 63.75 kg. This illustrates a fundamental principle:

- When a data point less than the current average is added, the overall mean tends to decrease.
- Conversely, if a data point greater than the current mean is added, the overall mean tends to increase.

Practical Applications

This concept is widely applicable in various fields:

- Health and Nutrition: Tracking average weights over time when new individuals join or leave a group.
- Data Analysis: Understanding the impact of outliers or new data points on the overall average.
- Business and Economics: Calculating average sales, costs, or profits when new transactions occur.

Features and Limitations of the Approach

Features

- Simplicity: The method relies on basic arithmetic, making it accessible and easy to apply.
- Scalability: Can be extended to larger datasets with more complex mean calculations.
- Clarity: Highlights the direct impact of individual data points on the overall average.

Limitations

- Assumption of Uniform Data: Assumes all data points are equally relevant without weighting.
- Sensitivity to Outliers: Outliers can significantly skew the mean, which may not reflect the true typical value.
- Static Data: Does not account for changes over time or other dynamic factors affecting weights.

Alternative Methods and Related Problems

While the direct calculation method described above suffices for this problem, other techniques and related problems can enrich understanding.

Weighted Averages

In cases where data points have different significance, weighted averages are used. For example, if some boys' weights are more relevant (say, based on age or height), this approach assigns weights accordingly.

Problems with Multiple Additions

Suppose multiple boys join the group with different weights. Calculating the new mean involves summing all individual weights and dividing by the total number of boys.

Example Problem

If two boys join, weighing 50 kg and 40 kg respectively, what is the new mean?

- Add their weights to the total weight.
- Divide by the new total number of boys.

Summary and Final Remarks

The problem of finding the new mean weight after a boy joins a group is a fundamental exercise in understanding averages and their behavior. Starting with the original data, calculating the total weight, and then adjusting for the new data point helps illustrate how individual values influence the overall mean. The key takeaway is that adding a data point below the current mean decreases the mean, while adding a data point above the current mean increases it. This concept extends beyond simple arithmetic into various practical domains like statistics, economics, and health sciences.

In conclusion:

- The original total weight of the 15 boys was 975 kg.
- After adding the boy weighing 45 kg, the total weight becomes 1020 kg.
- The updated number of boys is 16.
- The new average weight is 63.75 kg.

Understanding these calculations enhances one's ability to interpret data meaningfully and make informed decisions based on averages, a vital skill in both academic and real-world contexts.

Pros and Cons Summary:

- Pros:
 - Easy to understand and implement.
 - Demonstrates fundamental principles of averages.
 - Useful in practical data analysis scenarios.
- Cons:
 - Sensitive to outliers or extreme values.
 - Assumes equal relevance of all data points.
 - Doesn't account for variables like age, height, or other factors.

By mastering such problems, learners develop a solid foundation in statistical reasoning, essential for analyzing real-world data accurately and effectively.

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