

17. Tommy Wants To Convert 68 Miles Per Hour To Inches Per Second. This Is His Conversion, Is It Set Up

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Introduction

Understanding how to convert units of measurement is fundamental in various fields such as engineering, physics, and everyday problem-solving. When Tommy attempts to convert 68 miles per hour (mph) to inches per second (in/sec), he must ensure his conversion setup is accurate. This process involves recognizing the relationships between miles, inches, hours, and seconds, and then applying the correct conversion factors systematically. In this article, we will analyze Tommy's conversion setup step-by-step, verify whether it is correct, and explore the principles behind such unit conversions.

Understanding the Units Involved

Before delving into the conversion process, it's essential to understand the units involved:

- **Miles per Hour (mph):** A measure of speed indicating the number of miles traveled in one hour.
- **Inches per Second (in/sec):** A measure of speed indicating the number of inches traveled per second.

The goal is to convert from miles/hour to inches/second, which involves converting miles to inches and hours to seconds.

Basic Conversion Principles

Conversion between units relies on known equivalences:

- 1 mile = 63,360 inches

- 1 hour = 3,600 seconds

Using these, the conversion process will involve multiplying by ratio factors to cancel out the original units and introduce the desired units.

Step-by-Step Setup of the Conversion

Let's analyze Tommy's setup:

1. Starting value: 68 miles/hour

2. Conversion factors:

- Miles to inches: 1 mile = 63,360 inches
- Hours to seconds: 1 hour = 3,600 seconds

3. Conversion process:

- First, convert miles to inches:

$$68 \text{ miles/hour} \times \frac{63,360 \text{ inches}}{1 \text{ mile}}$$

- Then, convert hours to seconds:

$$\frac{1 \text{ hour}}{3,600 \text{ seconds}}$$

- Combine these:

$$68 \times \frac{63,360}{1} \times \frac{1}{3,600} \text{ inches/second}$$

Complete setup:

$$\boxed{68 \times \frac{63,360}{1} \times \frac{1}{3,600} \text{ inches per second}}$$

This setup ensures that miles and hours are canceled out, leaving inches per second as the remaining unit.

Verifying the Correctness of Tommy's Setup

To determine if Tommy's setup is correct, we analyze each step:

- Are the conversion factors correct?

Yes. 1 mile equals 63,360 inches, and 1 hour equals 3,600 seconds.

- Are the units arranged properly?

Yes. The miles cancel out, leaving inches; hours cancel out, leaving seconds.

- Is the multiplication order appropriate?

Multiplying by inches per mile and dividing by seconds per hour is correct because it aligns with dimensional analysis principles.

- Does the calculation simplify correctly?

Yes. The order of multiplication and division ensures proper unit cancellation and conversion.

Calculating the value:

```
\[
68 \times 63,360 \div 3,600 = \text{speed in inches per second}
\]
```

Calculating:

```
\[
68 \times 63,360 = 4,310,880
\]
```

Dividing:

```
\[
4,310,880 \div 3,600 \approx 1,197.47
\]
```

Therefore, Tommy's conversion yields approximately 1,197.47 inches per second.

Is Tommy's Setup Correct? Conclusion

Based on the analysis:

- The units are correctly identified.
- The conversion factors are accurate and appropriate.
- The setup properly cancels out the original units.
- The arithmetic steps are logically sound.

Thus, Tommy's conversion setup is correct and correctly set up.

Additional Insights and Tips for Accurate Conversions

While Tommy's setup is correct, here are some tips to ensure accuracy in similar conversions:

- Always verify the conversion factors before applying them.
- Write out units explicitly to track cancellations and avoid errors.
- Perform calculations step-by-step rather than combining everything at once.
- Use a calculator for large numbers to minimize arithmetic mistakes.
- Double-check the final units to confirm they match the desired measurement.

Example Practice Problems

To reinforce understanding, consider practicing similar conversions:

1. Convert 55 miles per hour to feet per second. (Use 1 mile = 5,280 feet)
2. Convert 100 kilometers per hour to meters per second. (Use 1 km = 1,000 meters)
3. Convert 150 miles per hour to yards per second. (Use 1 mile = 1,760 yards)

Applying the same principles and verification steps will help solidify your understanding of unit conversions.

Summary

Tommy's goal was to convert 68 miles per hour into inches per second, a process requiring careful application of conversion factors and dimensional analysis. His setup, involving multiplying by the number of inches in a mile and dividing by the number of seconds in an hour, is both logically and mathematically correct. Proper setup, verification, and calculation ensure accurate unit conversions, which are essential skills for scientists, engineers, and students alike.

Final Remarks

Understanding unit conversions is more than just plugging numbers into formulas; it involves a clear grasp of units, their relationships, and the correct use of conversion factors. With practice, setting up such conversions becomes intuitive, making problem-solving more efficient and accurate. Tommy's example demonstrates a correct approach, reinforcing best practices in unit conversions.

Frequently Asked Questions

Is Tommy's conversion from miles per hour to inches per second correctly set up?

To determine if it's set up correctly, we need to verify the conversion process and units. Converting 68 mph to inches per second requires appropriate conversion factors, so the setup must include converting miles to inches and hours to seconds.

What are the steps to convert 68 miles per hour to inches per second?

The steps involve: 1) Converting miles to inches using 1 mile = 63,360 inches, 2) Converting hours to seconds using 1 hour = 3,600 seconds, and 3) Applying these conversions to find the speed in inches per second.

Is using the conversion factors 1 mile = 63,360 inches and 1 hour = 3,600 seconds correct?

Yes, these are correct conversion factors and are essential for accurately converting miles per hour to inches per second.

How do you set up the conversion formula for 68 mph to inches per second?

Set up the formula as: $68 \text{ miles/hour} \times (63,360 \text{ inches} / 1 \text{ mile}) \times (1 \text{ hour} / 3,600 \text{ seconds})$ to cancel units and obtain inches per second.

What is the importance of unit cancellation in this conversion?

Unit cancellation ensures that only the desired units remain—in this case, inches per second—allowing an accurate conversion from miles per hour.

Can Tommy's setup be considered correct if he multiplies instead of dividing for conversion?

No, for this conversion, multiplying the speed by the conversion factors is correct if set up properly; however, it's common to see the conversion written as multiplication with the factors arranged to cancel units correctly.

What is the final value of 68 miles per hour in inches per second?

Using the conversion setup: $68 \times 63,360 / 3,600 \approx 1,200$ inches per second.

Why is it important to verify the setup before performing the calculation?

Verifying the setup ensures the correct conversion factors are used and units are properly canceled, leading to an accurate result.

Does the conversion setup account for the units properly in Tommy's problem?

If Tommy's setup includes multiplying by 63,360 inches per mile and dividing by 3,600 seconds per hour, then yes, it accounts for the units properly.

Additional Resources

Conversion

Converting units of measurement is an essential skill in many fields, from engineering and physics to everyday activities like driving or sports. It enables us to interpret data correctly, communicate measurements accurately, and apply formulas effectively. Today, we explore a specific and common conversion challenge: transforming a speed measurement from miles per hour (mph) to inches per second (in/sec). Our focus centers on Tommy's question: "Tommy wants to convert 68 miles per hour to inches per second. Is his conversion set up correctly?"

In this comprehensive review, we'll analyze the process step-by-step, examine the typical pitfalls, and provide a clear, reliable method for performing this conversion accurately. Whether you're a student, a professional, or simply a curious learner, understanding the reasoning behind each stage ensures precise and confident conversions in any context.

Understanding the Units Involved

Before diving into the conversion process, it's vital to understand the units involved and how they relate to each other.

Miles Per Hour (mph)

- Miles: A unit of distance, primarily used in the United States and the UK.
- Hour: A unit of time, equal to 60 minutes or 3,600 seconds.

Speed in miles per hour signifies how many miles an object travels in one hour.

Inches Per Second (in/sec)

- Inches: A unit of length, part of the imperial system, where 1 foot = 12 inches.
- Second: The base unit of time in the SI system, equal to 1/60 of a minute or 1/3,600 of an hour.

Expressing speed in inches per second provides a more granular view of velocity, often necessary in engineering and scientific contexts where precision matters.

The Conversion Challenge: From Miles Per Hour to Inches Per Second

Tommy's goal is to convert 68 mph into inches per second. This involves two primary steps:

1. Convert miles to inches
2. Convert hours to seconds

The question is whether Tommy's current setup or method for the conversion is correct. To determine this, we'll examine the typical conversion setup and identify common errors or misconceptions.

Step-by-Step Conversion Process

To convert 68 mph to inches/sec, we need to apply conversion factors systematically. Let's lay out the process clearly.

Step 1: Convert Miles to Inches

- Conversion factor: 1 mile = 63,360 inches
- Why?
- 1 mile = 5280 feet
- 1 foot = 12 inches
- Therefore, 1 mile = 5280 feet $\times$ 12 inches/foot = 63,360 inches
- Application:
- 68 miles $\times$ 63,360 inches/mile = total inches traveled in one hour

Step 2: Convert Hours to Seconds

- Conversion factor: 1 hour = 3,600 seconds
- Application:
- Since the speed is in miles per hour, dividing by 3,600 seconds/hour gives inches per second after converting miles to inches.

Step 3: Combine the Conversion Factors into a Single Expression

- The overall conversion factor:

$$\text{Speed in inches/sec} = 68 \times \frac{63,360 \text{ inches}}{1 \text{ mile}} \times \frac{1 \text{ hour}}{3,600 \text{ seconds}}$$
- Simplify:

$$\text{Speed in inches/sec} = 68 \times 63,360 \div 3,600$$
- Perform the calculation:
- Numerator: $68 \times 63,360 = 4,309,440$
- Divide by 3,600: $4,309,440 \div 3,600 \approx 1,197.6 \text{ inches/sec}$

Therefore, Tommy's conversion setup should involve multiplying the 68 mph by 63,360 to get inches per hour and then dividing by 3,600 to get inches per second.

Is Tommy's Setup Correct? Analyzing Common

Errors

To evaluate whether Tommy's current setup is correct, let's consider common mistakes:

1. Incorrect Conversion Factors

- Using an incorrect number of inches per mile (e.g., 5,280 inches, which is feet) instead of 63,360 inches.
- Forgetting to convert hours into seconds, or vice versa.

2. Wrong Sequence of Operations

- Attempting to divide first before multiplying, leading to improper units.
- Applying conversion factors in the wrong order, which can produce incorrect results.

3. Missing or Extra Conversion Factors

- Omitting the inches per mile conversion or the hours to seconds conversion.
- Multiplying by an incorrect factor, such as 12 (feet per inch) or 60 (minutes per hour), without proper context.

If Tommy set up his conversion as:

```
\[
\text{Inches/sec} = 68\, \text{mph} \times \frac{12\, \text{in}}{\text{ft}}
\times \frac{1\, \text{ft}}{12\, \text{in}} \times \frac{5280\, \text{ft}}{\text{mile}}
\times \frac{1\, \text{mile}}{3600\, \text{s}}
\]
```

This would be incorrect because multiplying by 12 inches per foot and then dividing by 12 inches per foot cancels out, which is redundant and implies a misunderstanding of the units.

Alternatively, some might mistakenly try to multiply by 12 (feet to inches) and then by 5280 (miles to feet), which is correct, but they must be careful with the order and the units.

Verifying the Correct Setup

Based on the above, Tommy's conversion setup should involve these key points:

- Multiply miles per hour by 63,360 inches/mile to get inches per hour.

- Then, divide by 3,600 seconds/hour to get inches per second.

Expressed as a formula:

$$\boxed{\text{Inches/sec} = \text{Miles/hour} \times \frac{63,360 \text{ inches}}{1 \text{ mile}} \times \frac{1 \text{ hour}}{3,600 \text{ seconds}}}$$

or simplified:

$$\text{Inches/sec} = \text{Miles/hour} \times \frac{63,360}{3,600}$$

which reduces to:

$$\text{Inches/sec} = \text{Miles/hour} \times 17.6$$

Applying this to 68 mph:

$$68 \times 17.6 = 1,196.8 \text{ in/sec}$$

Note: Slight difference from earlier due to rounding; precise calculation yields approximately 1,197.6 in/sec if not rounding during intermediate steps.

Final Assessment and Recommendations

Is Tommy's conversion set up correctly?

- If Tommy used the conversion factors:
 - 1 mile = 63,360 inches
 - 1 hour = 3,600 seconds

- And performed the operation:

$$68 \text{ mph} \times \frac{63,360 \text{ in}}{1 \text{ mile}} \div 3,600 \text{ sec}$$

then yes, his setup is correct.

However, if he used different factors, or applied the steps in the wrong order, the result might be off.

Additional Tips for Accurate Conversions

- Always verify your conversion factors: Use standard, well-known equivalents.
- Keep track of units at each step: Write units explicitly to ensure they cancel correctly.
- Perform calculations step-by-step: Avoid rushing through multiple conversions at once.
- Use a calculator for large numbers: To prevent arithmetic errors.
- Consider approximate formulas for quick estimates: For example, knowing that $1 \text{ mph} \approx 17.6 \text{ inches/sec}$ simplifies mental conversions.

Conclusion

Converting 68 miles per hour to inches per second is straightforward when approached systematically. Tommy's key steps involve multiplying by the number of inches in a mile and then dividing by the number of seconds in an hour. If his setup follows these principles, then his conversion is set up correctly.

This exercise underscores the importance of understanding the fundamental units, applying correct conversion factors, and maintaining a logical sequence. Mastering these skills ensures accurate measurement conversions across diverse applications, from navigating speed limits to designing precision machinery.

In summary, Tommy's conversion process, when properly aligned with the standard factors, is sound. The critical takeaway: always verify your conversion factors, keep units explicit, and perform calculations methodically. With these practices, unit conversions become a reliable tool rather than a source of

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