

A Car Moving At A Uniform Speed Covers 150km In 1 1/2hours. Calculate The Uniform Speed

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Understanding the concept of uniform speed is fundamental in physics and everyday transportation. When a vehicle moves at a constant or uniform speed, its velocity remains unchanged throughout the journey. In this comprehensive guide, we will explore how to calculate the uniform speed of a car given the distance traveled and the time taken. We will break down the problem, introduce relevant formulas, and provide step-by-step instructions to solve similar problems efficiently.

Introduction to Uniform Speed

Before diving into the calculations, it is essential to understand what uniform speed entails and why it is critical in the context of motion.

What Is Uniform Speed?

Uniform speed refers to the constant rate at which an object covers a certain distance over a specific period of time. It is expressed mathematically as:

- $\text{Speed (v)} = \text{Distance (d)} / \text{Time (t)}$

This formula is the foundation for calculating the uniform speed in various real-world scenarios, including vehicle movement, running, cycling, and more.

Importance of Calculating Uniform Speed

Knowing the uniform speed of a vehicle has practical applications:

- Planning travel schedules
- Estimating arrival times
- Fuel consumption calculations
- Safety assessments
- Vehicle performance analysis

Given Data and Problem Breakdown

Let's analyze the problem statement:

> A car moving at a uniform speed covers 150 km in 1 1/2 hours. Calculate the uniform speed.

Data Provided:

- Distance traveled, $d = 150$ km
- Time taken, $t = 1 \frac{1}{2}$ hours

Objective:

- Find the uniform speed (v) of the car.

Converting Time into a Consistent Unit

Since the speed is usually expressed in kilometers per hour (km/h), it's crucial to convert the time into hours.

Step 1: Convert 1 1/2 hours into decimal hours

- $1 \frac{1}{2}$ hours = $1 + \frac{1}{2}$ hours
- $\frac{1}{2}$ hour = 0.5 hours

Therefore:

- $t = 1 + 0.5 = 1.5$ hours

Calculating the Uniform Speed

Using the fundamental formula:

Speed (v) = Distance (d) / Time (t)

Substituting the known values:

- $v = 150 \text{ km} / 1.5 \text{ hours}$

Step 2: Perform the division

- $v = 150 \text{ km} / 1.5 \text{ hours} = 100 \text{ km/h}$

Result:

The car's uniform speed is 100 kilometers per hour (km/h).

Additional Considerations and Variations

While this problem is straightforward, understanding how to handle variations in data is vital for real-world applications.

1. Different Units of Time

- If the time is given in minutes, convert it into hours before calculation.

For example:

- $90 \text{ minutes} = 90/60 = 1.5 \text{ hours}$

2. Different Distance Units

- Ensure the distance is in kilometers if you want the speed in km/h.

- Convert miles to kilometers if necessary ($1 \text{ mile} \approx 1.609 \text{ km}$).

3. Calculating Speed in Other Units

- To find speed in meters per second (m/s):

- Convert distance to meters ($1 \text{ km} = 1000 \text{ meters}$)

- Convert time to seconds ($1 \text{ hour} = 3600 \text{ seconds}$)

Practical Applications of Calculating Uniform Speed

Understanding and calculating uniform speed is applicable in various fields:

- Travel Planning: Estimating arrival times based on known speeds.
- Navigation: Adjusting routes to maintain consistent speeds.
- Transportation Engineering: Designing roads and traffic systems.
- Vehicle Performance Testing: Measuring how different factors affect speed.
- Sports and Athletics: Monitoring athletes' speed during training.

Common Problems and Solutions in Calculating Uniform Speed

Below are typical problems similar to the original question, with solutions:

Problem 1:

A cyclist covers 60 km in 2 hours. What is the cyclist's speed?

Solution:

- $d = 60 \text{ km}$
- $t = 2 \text{ hours}$

$$v = 60 \text{ km} / 2 \text{ hours} = 30 \text{ km/h}$$

Problem 2:

A train travels 300 miles in 5 hours. What is its speed in miles per hour?

Solution:

- $d = 300 \text{ miles}$
- $t = 5 \text{ hours}$

$$v = 300 \text{ miles} / 5 \text{ hours} = 60 \text{ mph}$$

Summary and Key Takeaways

- The fundamental formula for uniform speed is $v = d / t$.
- Always ensure units are consistent before performing calculations.
- Convert time to hours for km/h, minutes to hours, seconds to hours, etc.

- Practice with different data sets to become proficient in various scenarios.

Conclusion

Calculating the uniform speed of a vehicle is a straightforward process when you understand the core formula and proper unit conversions. In the scenario where a car travels 150 km in 1 1/2 hours, the uniform speed is 100 km/h. Mastering these calculations enhances your understanding of motion, aids in travel planning, and provides valuable insights into vehicle performance and transportation logistics.

FAQs

Q1: Can a car have a different average speed and uniform speed?

A: Yes. Average speed accounts for variations in speed during the journey, while uniform speed assumes constant velocity throughout.

Q2: How do I calculate the time if I know the distance and speed?

A: Rearrange the formula: $t = d / v$.

Q3: Why is it important to convert time into hours?

A: Because the standard unit for speed in km/h requires time in hours for consistency.

By understanding and applying these principles, you can confidently calculate the uniform speed in various motion problems, ensuring accurate results and better comprehension of the concepts involved.

Frequently Asked Questions

How do you calculate the uniform speed of a car that covers 150 km in 1.5 hours?

To calculate the uniform speed, divide the distance traveled by the time taken: $\text{Speed} = \text{Distance} / \text{Time}$. So, $\text{Speed} = 150 \text{ km} / 1.5 \text{ hours} = 100 \text{ km/h}$.

What is the formula used to find the speed of a moving vehicle?

The formula is $\text{Speed} = \text{Distance} / \text{Time}$. In this case, it helps determine the car's constant speed based on the given distance and time.

If a car covers 150 km in 1.5 hours, how long will it take to cover 300 km at the same speed?

At a speed of 100 km/h, $\text{time} = \text{Distance} / \text{Speed}$. For 300 km, $\text{Time} = 300 \text{ km} / 100 \text{ km/h} = 3 \text{ hours}$.

What units should be used for distance, time, and speed in these calculations?

Distance should be in kilometers (km), time in hours (h), and speed in kilometers per hour (km/h) for standard calculations.

What assumptions are made when calculating the uniform speed of the car in this problem?

The main assumption is that the car travels at a constant, uniform speed throughout the entire journey without any acceleration or deceleration.

Additional Resources

Understanding the Concept of Uniform Speed and Distance-Time Calculations

When it comes to motion and transportation, understanding fundamental concepts like speed, distance, and time is essential. These concepts form the backbone of physics and everyday practical applications such as travel planning, vehicle efficiency assessments, and even safety protocols. Today, we delve into a specific problem involving a car moving at a uniform speed, covering a certain distance in a given time, and we will explore how to calculate its uniform speed. This problem not only reinforces basic principles but also highlights the importance of precise calculations in real-world scenarios.

Introduction to Uniform Speed

Before addressing the problem at hand, it's crucial to understand what uniform speed means. Uniform speed refers to motion where an object covers equal distances in equal intervals of time. This is one of the simplest forms of motion and is characterized by:

- Constant velocity magnitude
- No acceleration or deceleration

- A straight-line path (often assumed in basic problems)

In practical terms, driving a car at a steady speed without speeding up or slowing down exemplifies uniform speed. This concept is essential for calculating travel times, planning routes, and estimating arrival times.

Problem Overview and Statement

Let us restate the problem in detail:

> A car moving at a uniform speed covers a distance of 150 km in 1½ hours. The task is to calculate the uniform speed of the car.

The problem involves three key quantities:

- Distance traveled (d) = 150 km
- Time taken (t) = 1½ hours = 1.5 hours
- Unknown: Speed (v)

Understanding how these quantities relate through the fundamental distance-speed-time relationship is crucial in solving the problem.

Fundamental Relationship Between Distance, Speed, and Time

The core formula connecting these variables is:

$$\text{Speed } (v) = \frac{\text{Distance } (d)}{\text{Time } (t)}$$

This simple yet powerful equation forms the basis of many problems in kinematics, especially those involving uniform motion.

- Distance (d): How far the object travels during a specific period.
- Speed (v): The rate at which the object covers distance.
- Time (t): The duration taken to cover the distance.

By rearranging this formula, if two quantities are known, the third can be computed:

$$v = \frac{d}{t}$$

Step-by-Step Calculation of the Car's Uniform Speed

Let's analyze how to calculate the speed based on the provided data:

Step 1: Convert Time into Consistent Units

In physics, it's important to maintain consistent units. Since distance is given in kilometers, time should be in hours for a straightforward calculation of speed in km/h.

Given time:

- 1½ hours = 1.5 hours

Step 2: Apply the Distance-Speed-Time Formula

Using the formula:

$$v = \frac{d}{t}$$

Substitute the known values:

$$v = \frac{150 \text{ km}}{1.5 \text{ hours}}$$

Step 3: Perform the Division

Calculating:

$$v = \frac{150}{1.5}$$

$$v = 100 \text{ km/h}$$

Result:

The car's uniform speed is 100 km/h.

Understanding the Significance of the Result

The calculated speed of 100 km/h is a typical highway speed, emphasizing how real-world measurements align with theoretical calculations. This speed falls within the legal speed limits for many countries, illustrating how physics principles directly relate to everyday driving.

Key points to note:

- Driving at 100 km/h ensures the driver covers 150 km in approximately 1.5 hours.
- Maintaining a uniform speed simplifies travel planning and fuel efficiency.
- Variations in speed, such as acceleration or deceleration, would complicate the calculation and require more detailed analysis.

Additional Considerations and Real-World Applications

While the calculation appears straightforward, several real-world factors can influence actual speed and travel time:

- Traffic conditions: Congestion or roadblocks can cause deviations from the uniform speed.
- Road conditions: Slippery or uneven surfaces may necessitate speed adjustments.
- Legal speed limits: These govern the maximum permissible speed, affecting planning.
- Vehicle performance: Mechanical factors may influence achievable and sustainable speeds.

Understanding these factors underscores the importance of accurate measurements and calculations, enabling better travel logistics and safety.

Extensions and Related Problems

Once familiar with basic speed calculations, students and enthusiasts can explore more complex problems, such as:

- Variable speed scenarios: Where speed changes during the journey, requiring calculus or average speed calculations.
- Different units: Converting speed into m/s or miles per hour.
- Multiple segments: Calculating overall speed when a journey involves different speeds in different segments.
- Time optimization: Finding the fastest route or minimum time given constraints.

Implications for Physics and Engineering

Understanding uniform speed calculations isn't just academic; it's vital in designing vehicles, planning transportation systems, and optimizing logistics. For example:

- Automobile design: Engineers ensure engines deliver consistent power for steady speeds.
- Navigation systems: GPS algorithms rely on accurate speed and time data.
- Traffic management: Authorities analyze average speeds to improve safety and flow.

Summary and Final Remarks

In conclusion, the problem of calculating the uniform speed of a car covering 150 km in 1½ hours exemplifies fundamental physics principles. The straightforward relationship between distance, time, and speed allows for quick and accurate computation:

$$\boxed{\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{150 \text{ km}}{1.5 \text{ hours}} = 100 \text{ km/h}}$$

This calculation not only reinforces basic mathematical skills but also demonstrates practical applications in everyday life. Whether you're a student learning physics, a driver planning your trip, or an engineer designing transportation systems, understanding these core concepts is crucial.

Remember, mastering the simple relationships allows for tackling more complex scenarios, making physics an invaluable tool in interpreting and navigating the world around us.

Final Thought:

Always ensure units are consistent and calculations are checked for accuracy. Small errors can lead to significant misunderstandings, especially in critical applications like transportation safety and planning.

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