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Understanding how far a vehicle travels over a certain period at a constant speed is a fundamental aspect of physics and everyday problem-solving. Whether you're a student working on math problems, a driver estimating travel times, or a transportation enthusiast, grasping the concept of steady speed and distance calculations is essential. In this guide, we'll explore how to determine the distance traveled by a car moving at a constant speed, based on the information that it covers 2 1/2 miles in 3 1/3 minutes. We'll break down the problem, explain the concepts involved, provide step-by-step calculations, and offer practical tips for solving similar problems.

Understanding the Problem: Traveling at a Steady Speed

The problem states that:

- The car travels 2 1/2 miles in a given time.
- The time taken is 3 1/3 minutes.
- The question asks: How far will the car travel? (which implies calculating the distance over a different period or verifying the distance traveled in the given time).

Before diving into calculations, it's important to clarify key concepts:

Key Concepts

- **Speed:** The rate at which an object covers distance over time, typically expressed in miles per hour (mph), kilometers per hour (km/h), or miles per minute.
- **Steady Speed:** Moving at a constant rate without acceleration or deceleration.
- **Distance:** The total length of the path traveled, usually in miles or kilometers.
- **Time:** The duration over which the movement occurs, in minutes, hours, or

seconds.

Converting Units for Consistent Calculations

To accurately determine the distance traveled at a steady speed, it's crucial to work with consistent units. Commonly, we'll convert minutes to hours because speed is often expressed in miles per hour.

Why Convert Minutes to Hours?

- Most speed measurements are in miles per hour (mph).
- Converting time to hours simplifies the calculation of distance using the formula:

Distance = Speed × Time

Conversion Process

1. Convert $3 \frac{1}{3}$ minutes to hours:

◦ First, convert $3 \frac{1}{3}$ minutes to an improper fraction:

$$\blacksquare 3 \frac{1}{3} = \frac{10}{3} \text{ minutes}$$

◦ There are 60 minutes in an hour, so:

$$\blacksquare \text{Time in hours} = \left(\frac{10}{3}\right) \div 60 = \left(\frac{10}{3}\right) \times \left(\frac{1}{60}\right) = 10 / (3 \times 60) = 10 / 180 = 1 / 18 \text{ hours}$$

Therefore, the time taken is $\frac{1}{18}$ hours.

Calculating the Speed of the Car

Knowing that the car travels $2 \frac{1}{2}$ miles in $\frac{1}{18}$ hours, we can find its steady speed.

Step-by-Step Calculation

1. Express $2 \frac{1}{2}$ miles as an improper fraction:

$$\circ 2 \frac{1}{2} = (2 \times 2 + 1) / 2 = (4 + 1) / 2 = 5/2 \text{ miles}$$

2. Calculate speed:

$$\circ \text{Speed} = \text{Distance} / \text{Time}$$

$$\circ \text{Speed} = (5/2) \text{ miles} / (1/18) \text{ hours}$$

3. Dividing by a fraction is equivalent to multiplying by its reciprocal:

$$\circ \text{Speed} = (5/2) \times (18/1) = (5 \times 18) / 2 = 90 / 2 = 45 \text{ mph}$$

Result: The car's steady speed is 45 miles per hour.

Determining How Far the Car Will Travel

Now that we know the speed, we can determine how far the car will go over any period. For instance, if asked to find out how far it travels in a different period, the process involves multiplying the speed by the new time.

Examples of Distance Calculations

1. Distance traveled in 1 hour:

$$\circ \text{Distance} = \text{Speed} \times \text{Time} = 45 \text{ mph} \times 1 \text{ hour} = 45 \text{ miles}$$

2. Distance traveled in 30 minutes:

- Convert 30 minutes to hours: $30/60 = 0.5$ hours
- Distance = $45 \text{ mph} \times 0.5 \text{ hours} = 22.5 \text{ miles}$

3. Distance traveled in 2 hours:

- Distance = $45 \text{ mph} \times 2 \text{ hours} = 90 \text{ miles}$

Practical Applications and Related Problems

Understanding these calculations allows for various real-world applications, including:

- Estimating travel times for road trips based on steady speeds.
- Calculating distances covered during different periods of travel.
- Assessing the impact of changing speeds on overall travel distances.
- Planning routes and estimating arrival times with different driving speeds.

Sample Problem: How Far Will a Car Travel in 4 Hours?

Suppose the car maintains the same speed of 45 mph. To find the distance traveled in 4 hours:

- Distance = Speed $\times$ Time = $45 \text{ mph} \times 4 \text{ hours} = 180 \text{ miles}$

This simple calculation emphasizes the importance of understanding the relationship between speed, time, and distance.

Additional Tips for Solving Similar Problems

To effectively approach problems involving steady speeds and distances, consider these strategies:

1. **Always convert units consistently:** If speed is in mph, convert time to hours.
2. **Use the basic formula:** Distance = Speed $\times$ Time.
3. **Express fractions carefully:** Convert mixed numbers to improper fractions for easier calculations.
4. **Check your work:** Verify units and calculations to prevent errors.
5. **Practice with real-world scenarios:** Apply concepts to practical situations like driving, cycling, or running.

Summary and Conclusion

In this comprehensive guide, we've explored how to determine the distance a car travels at a steady speed based on the information that it covers 2 1/2 miles in 3 1/3 minutes. By converting time to hours and using the formula Distance = Speed $\times$ Time, we've calculated that the car's constant speed is 45 miles per hour. From there, applying the same principles allows you to find the distance traveled in any given period.

Understanding the relationship between speed, time, and distance is fundamental in physics, transportation planning, and everyday life. Whether you're calculating travel times, estimating arrival dates, or solving math problems, mastering these concepts will enhance your problem-solving skills and help you make informed decisions related to movement and travel.

Remember: Always ensure your units are consistent, and double-check your calculations to maintain accuracy. With practice, solving such problems will become intuitive, empowering you to address a wide range of real-world scenarios confidently.

Frequently Asked Questions

What is the speed of the car in miles per minute?

The car travels 2.5 miles in 3 1/3 minutes, which is approximately 3.33

minutes. So, speed = $2.5 \div 3.33 \approx 0.75$ miles per minute.

How do you convert 3 1/3 minutes into a decimal?

3 1/3 minutes equals $3 + 1/3 = 3 + 0.333\dots$, which is approximately 3.333 minutes.

What is the total distance the car will travel in 10 minutes at this steady speed?

At 0.75 miles per minute, in 10 minutes, the car will travel $0.75 \times 10 = 7.5$ miles.

How can you determine the distance traveled in any given time using the given information?

First, find the speed in miles per minute (distance $\div$ time), then multiply the speed by the desired time to find the distance.

What units should you use when calculating distance traveled at a steady speed?

Use consistent units; in this case, miles for distance and minutes for time, then multiply speed (miles per minute) by time (minutes) to get miles.

If the car travels 2 1/2 miles in 3 1/3 minutes, what is its average speed in miles per hour?

Convert 3 1/3 minutes to hours: $3.333 \text{ minutes} \div 60 \approx 0.05556 \text{ hours}$. Speed = $2.5 \text{ miles} \div 0.05556 \text{ hours} \approx 45 \text{ miles per hour}$.

What is the formula to find the distance traveled given speed and time?

Distance = Speed $\times$ Time. Ensure units are compatible when applying the formula.

Additional Resources

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Understanding how far a vehicle travels over a certain period at a steady speed is a fundamental concept in physics and everyday life. Whether you're a student solving a math problem or a traveler trying to estimate your journey time, knowing how to compute distance based on speed and time is essential.

In this article, we will analyze the problem: a car traveling at a steady speed covers $2\frac{1}{2}$ miles in $3\frac{1}{3}$ minutes, and we will determine how far it will go in a given period or under different conditions. This exploration will include detailed calculations, explanations of key concepts, and practical applications to deepen your understanding.

Understanding the Basic Principles: Distance, Speed, and Time

Before diving into calculations, it is paramount to understand the fundamental relationship among distance, speed, and time. This relationship is often expressed as:

$$\text{Distance} = \text{Speed} \times \text{Time}$$

- Distance: How far an object travels (measured in miles, kilometers, etc.).
- Speed: How fast the object moves (miles per hour, kilometers per hour, etc.).
- Time: Duration of travel (hours, minutes, seconds).

In the context of this problem, the speed remains constant, simplifying the calculations since acceleration or deceleration factors are not involved.

Converting the Given Data to Consistent Units

Given data:

- Distance traveled: $2\frac{1}{2}$ miles
- Time taken: $3\frac{1}{3}$ minutes

To work efficiently, all units should be converted to compatible forms, typically hours for speed calculations in miles per hour (mph).

Step 1: Convert Distance to a Decimal

$$2\frac{1}{2} \text{ miles} = 2.5 \text{ miles}$$

Step 2: Convert Time to Hours

$$3\frac{1}{3} \text{ minutes} = (3 + \frac{1}{3}) \text{ minutes} = (3 + 0.333...) \text{ minutes} = 3.333... \text{ minutes}$$

Since 1 hour = 60 minutes,

Time in hours = $3.333... / 60 \approx 0.05556$ hours

Calculating the Speed

Using the basic formula:

Speed = Distance / Time

Plugging in the values:

Speed = $2.5 \text{ miles} / 0.05556 \text{ hours} \approx 45 \text{ miles per hour}$

This indicates that the car's steady speed is approximately 45 mph.

Determining How Far the Car Will Travel in a Given Period

Having established the speed, we can now analyze various scenarios:

Scenario 1: How far will the car travel in 1 hour?

Using the speed:

Distance = Speed $\times$ Time

Distance = $45 \text{ mph} \times 1 \text{ hour} = 45 \text{ miles}$

Scenario 2: How far will it travel in 2 hours?

Distance = $45 \text{ mph} \times 2 \text{ hours} = 90 \text{ miles}$

Scenario 3: How far in 30 minutes?

Since 30 minutes = 0.5 hours,

Distance = $45 \text{ mph} \times 0.5 \text{ hours} = 22.5 \text{ miles}$

Practical Applications and Variations

Understanding these calculations is crucial in real-world contexts such as trip planning, estimating arrival times, and understanding vehicle performance.

Estimating Travel Time for a Given Distance

Suppose you need to travel 60 miles at the same steady speed:

$\text{Time} = \text{Distance} / \text{Speed} = 60 \text{ miles} / 45 \text{ mph} \approx 1.33 \text{ hours}$, or approximately 1 hour and 20 minutes.

Adjusting for Different Speeds

If the car accelerates or decelerates, the calculation adjusts accordingly. For example, at 60 mph:

- Distance in 1 hour = 60 miles
- In 30 minutes = 30 miles

Features and Considerations in Real-World Scenarios

While the calculations above assume constant speed, real-world driving involves various factors:

- Pros:
 - Simplifies calculations when speed is steady.
 - Useful for planning and estimating travel times.
 - Provides a clear understanding of the relationships among key variables.
- Cons:
 - Actual speeds fluctuate due to traffic, road conditions, and driver behavior.
 - Acceleration and deceleration are not accounted for in steady-speed models.
 - External factors like stops, turns, and terrain influence actual distance and time.

Features:

- Using constant speed assumptions helps in understanding basic physics principles.
- Can be applied to GPS and navigation tools for better route planning.
- Useful in educational contexts to develop problem-solving skills.

Additional Practice Problems

To reinforce understanding, consider these practice scenarios:

1. If a car travels at 50 mph, how far will it go in 2 hours?
2. A vehicle covers 3 miles in 4 minutes. What is its speed in miles per hour?
3. How long will it take a car traveling at 60 mph to reach a destination 120 miles away?

Conclusion

In summary, by understanding the fundamental relationship between distance, speed, and time, we can accurately calculate how far a car traveling at a steady speed will go over a specified period. In the given problem, the car's speed is approximately 45 mph, meaning it will travel about 45 miles in one hour, or proportionally more or less for different durations. This knowledge is not only academically valuable but also practically applicable in everyday planning and transportation logistics. Recognizing the assumptions involved, such as constant speed, helps in applying these principles effectively and understanding their limitations in real-world scenarios.

Remember: Always convert units consistently and double-check your calculations to ensure accuracy!

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