

# A Car Drives 16 M East, Then 25 M South, Then 16 M West. Calculate The Distance Travelled By Car

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When analyzing a journey where a car moves in multiple directions, understanding the total distance traveled and the final displacement is essential. This scenario—where a car drives 16 meters east, then 25 meters south, followed by 16 meters west—serves as a practical example to explore basic concepts of distance, displacement, and vector analysis in physics and everyday travel. In this comprehensive article, we will dissect this movement step-by-step, calculate the total distance traveled, examine the final displacement, and provide useful insights to help you understand similar problems in real-world contexts.

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## Understanding the Journey: The Movement Breakdown

Before delving into calculations, it's important to understand the nature of the movements involved:

- Initial movement: 16 meters east
- Second movement: 25 meters south
- Final movement: 16 meters west

This sequence involves movements along perpendicular directions—east-west (horizontal) and north-south (vertical). Recognizing this helps in applying vector addition principles and calculating displacement.

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## Key Concepts to Understand

### Distance vs. Displacement

- Distance: The total length of the path traveled, regardless of direction.
- Displacement: The straight-line distance from the starting point to the ending point, considering direction.

## Vectors in Motion

- Movements in different directions can be represented as vectors.
- The total displacement is obtained by vector addition of individual movements.

## Calculating Total Distance and Final Displacement

- Total Distance: Sum of all individual distances traveled.
- Final Displacement: Use Pythagoras' theorem to find the straight-line distance between starting and ending points.

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## Calculating the Total Distance Traveled

The total distance traveled by the car is straightforward to compute:

1. First Leg: 16 meters east
2. Second Leg: 25 meters south
3. Third Leg: 16 meters west

Adding these:

Total Distance = 16 m + 25 m + 16 m = 57 meters

This sum reflects the actual path length the car covers during its journey.

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## Determining the Final Displacement

While the total distance gives the complete length of the journey, displacement considers only the starting and ending points. To find the displacement:

1. Identify the initial and final positions:

- Initial position: Origin point (0,0)
- After first movement (east): (16, 0)
- After second movement (south): (16, -25)
- After third movement (west):  $(16 - 16, -25) = (0, -25)$

2. Calculate the straight-line distance from starting point (0,0) to ending point (0, -25):

Since the final position is at (0, -25), the displacement vector is purely southward.

3. Displacement magnitude:

\[  
\text{Displacement} = \sqrt{(0 - 0)^2 + (-25 - 0)^2} = \sqrt{0 + 625} = 25 \text{ meters}  
\]

Final displacement = 25 meters south

This indicates that despite traveling a total of 57 meters along the path, the car ends up 25 meters directly south of its starting point.

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## Visualizing the Journey: Graphical Representation

Creating a simple diagram helps in understanding the movement:

- Start at point A (0,0).
- Move east to point B (16,0).
- Then south to point C (16,-25).
- Finally west to point D (0,-25).

The journey's path resembles an open rectangle, with the net displacement being the straight line from A to D.

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## Practical Applications of Distance and Displacement Calculations

Understanding these concepts is vital in various real-world scenarios:

- Navigation: Determining the shortest route between two points.
- Travel Planning: Estimating fuel consumption based on total distance traveled.
- Physics Problems: Analyzing motion in textbooks or exams.
- Robotics: Programming movement paths and calculating net displacement.

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## Additional Considerations: Non-Linear Movements and Angles

While the current example involves movements along perpendicular directions, many real-world motions include angles and non-linear paths. In such cases:

- Vector addition: Using components to find resultant vectors.
- Law of Cosines: To calculate displacement when movement involves angles other than 90°.
- Trigonometry: For resolving vectors into components and computing resultant vectors.

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## Summary of Key Calculations

| Aspect             | Calculation                    | Result          |
|--------------------|--------------------------------|-----------------|
|                    | -----                          | -----           |
| Total Distance     | 16 m + 25 m + 16 m             | 57 meters       |
| Final Displacement | Distance from (0,0) to (0,-25) | 25 meters south |

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## Conclusion: Understanding Movement in Everyday Life

Analyzing the journey where a car drives 16 meters east, then 25 meters south, and finally 16 meters west reinforces essential concepts of distance and displacement. While the total distance traveled reflects the actual path length, the displacement indicates the net change in position. Recognizing the difference between these two quantities is fundamental in physics, navigation, and various engineering fields.

By mastering the calculations involved—adding distances for total travel and applying the Pythagorean theorem for displacement—you can better interpret movement in both academic problems and real-life situations. Whether you’re planning routes, studying physics, or simply curious about how movement works, understanding these principles enhances your spatial awareness and problem-solving skills.

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Optimized for Search Engines (SEO Keywords):

- Distance traveled calculation
- Total distance vs displacement
- How to calculate displacement
- Vector addition in motion
- Calculating movement in perpendicular directions
- Physics problems involving movement
- Navigation and travel distance
- Pythagoras theorem in displacement
- Analyzing multi-directional movement
- Practical examples of distance and displacement

## Frequently Asked Questions

### What is the total distance traveled by the car in the given path?

The total distance traveled is  $16\text{ M} + 25\text{ M} + 16\text{ M} = 57\text{ meters}$ .

### What is the significance of calculating both total distance and net displacement in such problems?

Calculating both helps understand the overall movement (distance traveled) and the change in position (displacement), providing a complete picture of the journey's nature.

## Additional Resources

A Car Drives 16 M East, Then 25 M South, Then 16 M West: Calculating the Total Distance Traveled

In the realm of basic physics and everyday navigation, understanding how to compute the total distance traveled by a moving object—such as a car—is fundamental. Whether you're a student tackling a problem, a professional analyzing vehicle routes, or an enthusiast curious about motion, mastering the process of calculating total distance traversed is essential. This investigation delves into a specific scenario: a car's journey comprising three segments—initially 16 meters east, then 25 meters south, and finally 16 meters west—and explores how to accurately determine the total distance covered.

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## Understanding the Journey: The Path of the Car

The described movement involves three distinct segments:

1. Moving 16 meters east
2. Moving 25 meters south
3. Moving 16 meters west

At first glance, these movements might seem straightforward. However, when analyzing the total distance traveled, it becomes critical to distinguish between distance and displacement.

Distance vs. Displacement:

- Distance refers to the total length of the path traveled, regardless of direction.
- Displacement is a vector quantity representing the straight-line distance from the starting point to the ending point, considering direction.

In this context, the primary goal is to determine the total distance traveled, which involves summing

the lengths of each segment.

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## Step-by-Step Calculation of Total Distance

### Segment 1: Moving 16 M East

- Distance traveled: 16 meters
- Direction: East

### Segment 2: Moving 25 M South

- Distance traveled: 25 meters
- Direction: South

### Segment 3: Moving 16 M West

- Distance traveled: 16 meters
- Direction: West

Total Distance Traveled:

Total distance = Sum of individual segments

Total Distance = 16 m (east) + 25 m (south) + 16 m (west) =  $16 + 25 + 16 = 57$  meters

This calculation is straightforward because the car's movements are along straight lines, and no deviations or detours are involved.

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## Analyzing the Path: Is There Any Net Displacement?

While the total distance traveled is 57 meters, the displacement—the straight-line distance from start to end—may differ due to the directions of the movements.

Visualizing the Path:

- Starting point: at coordinate (0,0)
- After moving 16 meters east: position at (16,0)

- After moving 25 meters south: position at (16, -25)
- After moving 16 meters west: position at (0, -25)

Final Position:

- Coordinates: (0, -25)

Displacement:

- The straight-line distance from the origin (0,0) to (0, -25):

$$\text{Displacement} = \sqrt{[(0 - 0)^2 + (-25 - 0)^2]} = \sqrt{[0 + 625]} = \sqrt{625} = 25 \text{ meters}$$

Direction of Displacement:

- Due south, from the start point directly to the end point.

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## Implications of the Calculation: Real-World Applications

Understanding both total distance and displacement has practical implications:

- Navigation and Route Planning: Knowing the total distance helps in estimating fuel consumption, travel time, and wear-and-tear on the vehicle.
- Mapping and GIS: Accurate path calculations are essential for geographic information systems and route optimization.
- Physics and Engineering: Analyzing movement patterns aids in the design of efficient transportation systems.

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## Advanced Considerations: When Movements Are Not Along Straight Lines

In more complex scenarios, such as when a vehicle moves along curved paths or takes detours, calculating total distance involves summing all the individual path lengths, which may require advanced tools like:

- Polyline measurements
- Calculus for curves
- GPS tracking data

However, in this simplified case, the path is linear and easily measurable.

## Summary and Key Takeaways

- The total distance traveled by the car is the sum of all individual segments: 57 meters.
- The net displacement from the starting point to the final position is 25 meters south.
- Visualizing the path through coordinate geometry clarifies the relationship between distance and displacement.
- Such calculations are essential in fields ranging from navigation and transportation planning to physics education.

In conclusion, even simple movements can reveal rich insights when carefully analyzed. For this specific journey—16 meters east, then 25 meters south, then 16 meters west—the total distance is straightforward to compute, emphasizing the importance of understanding the fundamental concepts of distance and displacement in motion analysis.

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