# If = (4, 8) And = (2, 6), Find |2.5a 36|. - 20 O 25 O-6 O 42

**If = (4, 8) And = (2, 6), Find |2.5a 36|. - 20 O 25 O-6 O 42**

Understanding how to evaluate determinants and solve related matrix problems is fundamental in linear algebra. The problem presented involves vectors and determinants, which are crucial concepts used across various fields such as engineering, computer science, physics, and mathematics. In this comprehensive guide, we'll explore step-by-step how to interpret the notation, compute the necessary determinants, and arrive at the solution for the given problem. Whether you're a student preparing for exams or a professional brushing up on linear algebra concepts, this article will serve as a valuable resource.

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## Understanding the Problem Statement

Before diving into calculations, it's essential to interpret the problem accurately.

The problem states: *If = (4, 8) And = (2, 6), Find |2.5a 36|. - 20 O 25 O-6 O 42.*

While the notation appears somewhat ambiguous, a common interpretation in vector and matrix problems is as follows:

- The vectors a and b are given as:

- a = (4, 8)

- b = (2, 6)

- The expression |2.5a 36| suggests a determinant involving scaled vector a and possibly a scalar or a constant term.

- The options listed (-20, 25, -6, 42) are likely the multiple-choice answers for the determinant value.

Given the context, the most probable scenario is that the problem asks us to compute the determinant of a 2x2 matrix constructed from scaled vectors or constants, perhaps something like:

\[
\left| \begin{bmatrix}

2.5a & 36 \\
\text{?} & \text{?}
\end{bmatrix} \right|
\]

or a similar configuration.

In many linear algebra contexts, when dealing with vectors and determinants, the key is understanding how to assemble the matrix and interpret the notation.

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# Key Concepts in Determinant Calculation

Before proceeding with the solution, let's review essential concepts related to determinants and vectors:

## 1. Vectors and Matrices

- Vectors are ordered lists of numbers, e.g., $a = (a_1, a_2)$.
- Matrices are rectangular arrays of numbers, with determinants defined primarily for square matrices.

## 2. Determinant of a 2x2 Matrix

For matrix:

\[
A = \begin{bmatrix}
a & b \\
c & d
\end{bmatrix}
\]

the determinant is:

\[
|A| = ad - bc
\]

This value gives information about the area (in 2D) scaled by the transformation represented by the matrix.

## 3. Scalar Multiplication of Vectors

When multiplying a vector by a scalar, each component is scaled accordingly. For example:

$$
k \times \mathbf{a} = (k \times a_1, k \times a_2)
$$

## 4. Combining Vectors and Scalars in Determinants

Vectors can form the rows or columns of matrices. When calculating determinants involving scaled vectors, the scalar factors are multiplied by the components.

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# Step-by-Step Solution Approach

Given the initial vectors:

- $\mathbf{a} = (4, 8)$

- $\mathbf{b} = (2, 6)$

And the expression involving 2.5a and 36, along with options, our goal is to interpret and compute the value.

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## Step 1: Scale Vector $\mathbf{a}$ by 2.5

Calculate:

$$
2.5 \times \mathbf{a} = 2.5 \times (4, 8) = (2.5 \times 4, 2.5 \times 8) = (10, 20)
$$

---

## Step 2: Construct the Matrix for Determinant Calculation

Given the notation |2.5a 36|, it suggests forming a 2x2 matrix with:

- First column: the scaled vector \(2.5 \times \mathbf{a} = (10, 20)\)

- Second column: a scalar or vector involving 36

Since 36 is a scalar, the most logical approach is to interpret the matrix as:

\[
\begin{bmatrix}
10 & 36 \\
20 & \text{?}
\end{bmatrix}
\]

But we need a second component for the second row.

Alternatively, perhaps the problem is asking for the determinant of a matrix formed by:

\[
\begin{bmatrix}
2.5a_x & 36 \\
2.5a_y & \text{?}
\end{bmatrix}
\]

or perhaps the entire 2x2 matrix is:

\[
\begin{bmatrix}
2.5a_x & 36 \\
2.5a_y & \text{some value}
\end{bmatrix}
\]

Given the options and the notation, a more probable interpretation is that the matrix is:

\[
\begin{bmatrix}
2.5a_x & 36 \\
2.5a_y & \text{?}

\end{bmatrix}
\]

But to clarify, it's standard in these types of problems that the determinant involves the vectors or their scaled versions.

Alternatively, the problem may involve calculating the determinant of a matrix:

\[
\begin{bmatrix}
2.5a_x & 36 \\
2.5a_y & 0
\end{bmatrix}
\]

which simplifies to:

\[
\left| \begin{bmatrix}
10 & 36 \\
20 & 0
\end{bmatrix} \right|
\]

Calculating this determinant:

\[
(10)(0) - (36)(20) = 0 - 720 = -720
\]

But this value doesn't match any options provided.

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## Step 3: Alternative Interpretation — Using Vectors for Determinant

Since the options are small integers, perhaps the problem is asking for the determinant of a matrix formed by vectors scaled appropriately, or the area of the parallelogram spanned by scaled vectors.

Given:

- \(\mathbf{a} = (4,8)\)

- $\mathbf{b} = (2,6)$

and scaled:

- $2.5 \times \mathbf{a} = (10, 20)$

- $\mathbf{b}$ remains as (2,6), unless specified otherwise.

The determinant (area) of the parallelogram formed by vectors $\mathbf{u}$ and $\mathbf{v}$ in 2D is:

$$
|\mathbf{u} \times \mathbf{v}| = |u_1 v_2 - u_2 v_1|
$$

Calculating:

$$
|10 \times 6 - 20 \times 2| = |60 - 40| = 20
$$

This matches one of the options: 20.

This is a promising lead.

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# Final Calculation and Answer

Based on the above reasoning, the most logical interpretation is:

- The problem involves calculating the determinant (area) of the parallelogram formed by the scaled vector $2.5 \times \mathbf{a}$ and the vector $\mathbf{b}$.

- The calculation:

$$
|2.5 \times \mathbf{a} \times \mathbf{b}| = |(10, 20) \times (2, 6)| = |(10)(6) - (20)(2)| = |60 - 40| = 20
$$

Therefore, the correct answer is 20.

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## Summary of Key Points

To summarize, here are the main takeaways from this problem:

- Scaling vectors involves multiplying each component by the scalar.
- The determinant of two vectors in 2D gives the area of the parallelogram they span.
- Calculating the determinant of a 2x2 matrix formed by two vectors involves cross-multiplying components and subtracting.
- In multiple-choice questions, understanding the geometric interpretation helps identify the correct answer.

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## Additional Tips for Solving Similar Problems

When approaching similar linear algebra problems, keep these tips in mind:

1. Always interpret the notation carefully and consider geometric meanings.
2. Break down complex expressions into smaller parts, such as vector scaling and determinant calculation.
3. Use the cross product formula in 2D to find areas or determinants directly:

   $$
   |\mathbf{u} \times \mathbf{v}| = |u_1 v_2 - u_2 v_1|
   $$

4. Verify your calculations by matching with provided options.

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## Conclusion

In this article, we've walked through the process of interpreting the problem

## Frequently Asked Questions

### Given vectors a = (4, 8) and b = (2, 6), how do you compute the determinant |2.5a 36|?

First, interpret 2.5a as (2.54, 2.58) = (10, 20). The determinant |2.5a 36| is then |10 36; 20 36|, which equals (10)(36) - (20)(36) = 360 - 720 = -360.

### What is the determinant of the matrix formed by 2.5 times vector a and the scalar 36?

The determinant is calculated as (2.5 4) 36 - (2.5 8) 36 = 10 36 - 20 36 = 360 - 720 = -360.

### How do you evaluate |2.5a 36| with given vectors a = (4, 8)?

Convert 2.5a to (10, 20). Then compute the determinant of the matrix [[10, 36], [20, 36]]: 1036 - 2036 = -360.

### What are the possible multiple-choice answers for |2.5a 36|?

The options are 20, 25, -6, and 42. Based on the calculation, the correct value is -360, which is not listed, indicating a possible mistake or different interpretation.

### Is the determinant |2.5a 36| dependent on vector b = (2, 6)?

No, the calculation involves only 2.5a and the scalar 36; vector b does not directly influence this determinant.

### How can the determinant |2.5a 36| be related to the given options?

Since the calculation yields -360, but options are much smaller, the question might be asking for the absolute value or a different interpretation. Clarify whether it’s a scalar or matrix determinant.

## What is the correct value of |2.5a 36| based on the vectors provided?

The correct value, based on standard determinant calculation, is -360. None of the provided options match this, suggesting a possible typo or different context.

## Can the determinant |2.5a 36| be equal to any of the options listed: 20, 25, -6, 42?

No, the calculated determinant is -360, which does not match any listed options. It indicates a need to double-check the problem's parameters.

## What is the significance of the options 20, 25, -6, and 42 in the context of this problem?

They appear to be multiple-choice answers for the magnitude or a related value. However, the calculation of the determinant yields -360, which is outside these options, suggesting a possible misinterpretation or error.

# Additional Resources

Matrix Operations and Determinants: A Deep Dive into the Calculation of |2.5a 36|

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# Understanding the Foundations: Matrices and Their Notations

In the realm of linear algebra, matrices serve as fundamental building blocks for numerous mathematical and real-world applications, including computer graphics, engineering, physics, and data analysis. To comprehend the problem at hand—calculating the determinant |2.5a 36|—it's essential to understand the notation, the underlying concepts, and what each component signifies.

What Are Matrices?

A matrix is a rectangular array of numbers arranged in rows and columns. For example, a 2x2 matrix looks like this:

\[
\begin{bmatrix}
a_{11} & a_{12} \\

a_{21} & a_{22}
\end{bmatrix}
\]

where each element is denoted by \(a_{ij}\), representing the element in the \(i^{th}\) row and \(j^{th}\) column.

Matrix Notation in the Given Problem

In the problem statement:

> If \(a = (4, 8)\) and \(b = (2, 6)\), find \(|2.5a \quad 36|\).

It appears we're dealing with vectors and matrices, but the notation is somewhat ambiguous. The notation \(|2.5a \quad 36|\) most likely refers to the determinant of a 2x2 matrix formed by multiplying vector \(a\) by 2.5 and placing it alongside a scalar 36 as the second column.

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# Deciphering the Problem: Breaking It Down

## Step 1: Clarify the Given Vectors

Given:

- \(a = (4, 8)\)
- \(b = (2, 6)\)

These are 2D vectors with components:

\[
a = \begin{bmatrix} 4 \\ 8 \end{bmatrix}
\quad
b = \begin{bmatrix} 2 \\ 6 \end{bmatrix}
\]

The problem then asks for the determinant of a matrix formed by scaling \(a\) and including the number 36.

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## Step 2: Interpreting the Matrix Construction

The expression:

\[
|2.5a \quad 36|
\]

likely indicates a 2x2 matrix with:

- First column: \(2.5a\)
- Second column: 36

Since 36 is a scalar, it's probably intended as a scalar multiple of some vector or as a scalar value positioned as an element.

Possible interpretations:

1. Matrix with scaled vector and scalar as entries:

\[
\begin{bmatrix}
2.5 \times 4 & 36 \\
2.5 \times 8 & \text{??}
\end{bmatrix}
\]

But this seems inconsistent unless the second column is also a vector.

2. Matrix with scaled vector and a scalar as the second column:

Suppose the matrix is:

\[
\begin{bmatrix}
2.5 \times 4 & 36 \\
2.5 \times 8 & 6
\end{bmatrix}
\]

But the problem explicitly says:

> If \(a = (4,8)\) and \(b = (2,6)\), find \(|2.5a \quad 36|\).

Alternatively, perhaps the notation indicates a matrix:

$$
\begin{bmatrix}
2.5a_1 & 36 \\
2.5a_2 & 0
\end{bmatrix}
$$

which would be:

$$
\begin{bmatrix}
2.5 \times 4 & 36 \\
2.5 \times 8 & 0
\end{bmatrix}
= \begin{bmatrix}
10 & 36 \\
20 & 0
\end{bmatrix}
$$

and the determinant is to be calculated.

In conclusion, the most logical interpretation, considering the structure, is that the matrix is:

$$
\begin{bmatrix}
2.5a_1 & 36 \\
2.5a_2 & 0
\end{bmatrix}
$$

which simplifies to:

$$
\begin{bmatrix}
10 & 36 \\
20 & 0
\end{bmatrix}
$$

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# Calculating the Determinant: Step-by-Step Process

## What Is the Determinant?

The determinant of a 2x2 matrix:

$$
\begin{bmatrix}
p & q \\
r & s
\end{bmatrix}
$$

is given by:

$$
|A| = ps - qr
$$

This scalar value provides information about the matrix, such as whether it is invertible. If the determinant is zero, the matrix is singular and non-invertible.

---

## Applying the Formula

Using the matrix:

$$
\begin{bmatrix}
10 & 36 \\
20 & 0
\end{bmatrix}
$$

the determinant is:

$$
|A| = (10)(0) - (36)(20) = 0 - 720 = -720

\]

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# Final Answer and Interpretation

The computed determinant:

\[
|2.5a \quad 36| = -720
\]

This value indicates that the matrix formed by scaling vector \(a\) by 2.5 and pairing it with the scalar 36 (interpreted as an element in the matrix) is invertible, as the determinant is non-zero. The negative sign signifies the orientation of the transformation represented by this matrix.

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# Additional Insights: Variations and Clarifications

While the above interpretation provides a clear path to the solution, it's important to consider alternative scenarios or common misunderstandings:

- If the second column is intended to be the vector \(b = (2,6)\):

Then the matrix would be:

\[
\begin{bmatrix}
2.5 \times 4 & 2 \\
2.5 \times 8 & 6
\end{bmatrix}
= \begin{bmatrix}
10 & 2 \\
20 & 6
\end{bmatrix}
\]

Its determinant:

$$
(10)(6) - (2)(20) = 60 - 40 = 20
$$

This is a plausible alternative, especially considering the vectors $a$ and $b$.

- Understanding the context:

Without explicit clarification, the most straightforward assumption is that the matrix is constructed with the scaled vector $a$ and the scalar 36 as its entries.

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## Implications and Applications of Determinant Calculations

Knowing how to compute determinants of matrices derived from vectors and scalars is vital in multiple fields:

- Geometry: Determining areas of parallelograms formed by vectors.
- Physics: Analyzing transformations and their invertibility.
- Engineering: Stability analysis and control systems.

Calculating determinants allows practitioners to understand the properties of linear transformations, such as their invertibility and the scale factor applied to areas or volumes.

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## Conclusion: Mastering Matrix Determinants in Practical Contexts

This exploration underscores the importance of careful interpretation and methodical computation. Although the original notation posed some ambiguity, the logical approach led to a clear result: the determinant of the matrix constructed as interpreted is $-720$.

For students and professionals alike, mastering the calculation of determinants—and understanding the geometric and algebraic implications—is essential for advancing in linear algebra and its applications. Whether dealing with simple 2x2 matrices or complex higher-dimensional systems, the principles remain consistent: interpret the problem carefully, apply the fundamental formulas, and cross-verify your results.

In sum, the determinant $|2.5a \quad 36|$ evaluates to $-720$ based on the most reasonable interpretation, exemplifying the power and elegance of linear algebra techniques in analyzing and transforming data.

## If 4 8 And 2 6 Find 2 5a 36 20 O 25 O 6 O 42

If 4 8 And 2 6 Find 2 5a 36 20 O 25 O 6 O 42

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