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Area of a Triangle

To determine the area of a triangle formed by three given nodes, it is important to understand how to apply the coordinates of these nodes effectively. This can be achieved using the determinant method for area calculation.

Step 1: Determine the Given Coordinates

- Node 1 (N1): (1, 1)
- Node 2 (N2): (5, 1)
- Node 3 (N3): (1, 5)

Explanation: The problem provides the coordinates for each node which is essential for geometric calculations.

Step 2: Area of a Triangle Formula

The area \(A\) of a triangle formed by points \((x_1, y_1)\), \((x_2, y_2)\), and \((x_3, y_3)\) is given by:

$$ A = \frac{1}{2} \left| x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2) \right| $$

Supporting Statement: This formula uses the determinant of a matrix formed by the points' coordinates.

Step 3: Substitute the Given Coordinates

$$ A = \frac{1}{2} \left| 1(1 - 5) + 5(5 - 1) + 1(1 - 1) \right| $$

Explanation: Substitution of nodes' coordinates into the formula.

Step 4: Simplify the Expressions

$$ A = \frac{1}{2} \left| 1(-4) + 5(4) + 1(0) \right| $$
$$ A = \frac{1}{2} \left| -4 + 20 + 0 \right| $$
$$ A = \frac{1}{2} \left| 16 \right| $$

Supporting Statement: Simplify the multiplications and additions inside the determinant expression.

Step 5: Calculate the Final Area

$$ A = \frac{1}{2} \times 16 = 8 $$

Explanation: Final calculation after taking the absolute value inside the determinant formula and simplifying.

Final Answer

The area of triangle element e_1 formed by the given nodes is 8 square units.

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