Solving Linear Systems by Matrices

Problems must be in standard form to use this method!

\[ 3x - y = 5 \]
\[ 2x + y = 15 \]

The coefficients and the answer will be entered into a matrix. The matrix will consist of two rows and three columns. For the problem above, the matrix is the following:

\[
\begin{bmatrix}
3 & -1 & 5 \\
2 & 1 & 15
\end{bmatrix}
\]

Entering the problem into the calculator:

- Go to MATRX.
- Toggle to EDIT.
- Press 1 or toggle to the desired matrix.
- At MATRX EDIT [A], type in 2 x 3.
- On the first row enter the coefficients of the \( x \) term and \( y \) term of the first equation. Enter the constant on the other side of the equal sign. Press ENTER after each.
  \[
  \begin{bmatrix}
  3 & -1 & 5 \\
  \end{bmatrix}
  \]
- On the second row enter the coefficients of the \( x \) term and \( y \) term of the second equation. Enter the constant on the other side of the equal sign. Press ENTER after each.
  \[
  \begin{bmatrix}
  2 & 1 & 15 \\
  \end{bmatrix}
  \]
- After the last entry, press 2nd QUIT. (This will take you to the home screen.)

Finding the solution to the problem:

- Go to MATRX.
- Toggle to MATH.
- Toggle down to B: rref(
- Press ENTER. rref( should show on the home screen.
- Go back to MATRX.
- Under NAMES select the correct matrix where data is entered, usually [A].
- Close parentheses ) and press ENTER.

The answers will be in the last column with \( x \) being the top value and \( y \) being the bottom value.

\[
\begin{bmatrix}
1 & 0 & 4 \\
0 & 1 & 7
\end{bmatrix}
\]

The first row means \( 1x + 0y = 4 \), so \( x = 4 \).
The second row means \( 0x + 1y = 7 \), so \( y = 7 \).

The solution is the point ________________.

Practice using the matrix method to solve the puzzle on the following page.
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Solve each system by any method. Connect $x$-values and $y$-values in the diagram. When completed find: a square (outline it red), an octagon (outline it orange), a parallelogram (outline it blue), a right triangle (outline it yellow), and an obtuse triangle (outline it green).

<table>
<thead>
<tr>
<th>1. $x+y = 13$</th>
<th>2. $x+y = 14$</th>
<th>3. $y = x-7$</th>
<th>4. $x+2y = 4$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = 2x$</td>
<td>$y = x+4$</td>
<td>$y = x+7$</td>
<td>$y = x-10$</td>
</tr>
<tr>
<td>5. $y = 2x$ $3y + 2x = 48$</td>
<td>6. $x = y+8$ $4x+2y = 2$</td>
<td>7. $x = y+7$ $3x-5y = 25$</td>
<td>8. $x = 2y-12$ $5x+6y = 100$</td>
</tr>
<tr>
<td>9. $10x - 7y = 0$ $y = 24-2x$</td>
<td>10. $y = -3x$ $5x+y = 14$</td>
<td>11. $x-y = 2$ $x+y = 14$</td>
<td>12. $x+y = 16$ $x-y = 2$</td>
</tr>
<tr>
<td>13. $x - y = -24$ $x + 8y = 3$</td>
<td>14. $x - 2y = 8$ $y + 2x = -9$</td>
<td>15. $2x + 5y = -4$ $-3x + y = -11$</td>
<td>16. $2x - y = 3$ $y - x = 4$</td>
</tr>
<tr>
<td>17. $3y - 2x = 11$ $x + y = 17$</td>
<td>18. $4x + y = -1$ $2y + 6x = -12$</td>
<td>19. $3x - 2y = -25$ $x + 2y = 5$</td>
<td>20. $x+y = 1$ $y - x = 11$</td>
</tr>
<tr>
<td>21. $2x - 3y = 0$ $3x - 4y = 3$</td>
<td>22. $x - y = 30$ $3x + y = 6$</td>
<td>23. $2x + y = 14$ $x - y = 1$</td>
<td>24. $x+3y = -36$ $x-4y = -1$</td>
</tr>
</tbody>
</table>