Math 25 Elementary Algebra: Annotated Sample of Student Work

**Multiple Representations Outcome:** Students will demonstrate the ability to use verbal, graphical, numerical, and symbolic representations of mathematical ideas.

**Criteria:**
- Construction, use and interpretation of tables, coordinate graphs, and symbolic models to solve problems involving linear or quadratic scenarios.

**Rubric’s levels of performance:**

<table>
<thead>
<tr>
<th>Unsatisfactory=1</th>
<th>Proficient=3</th>
<th>Excellent=5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graphs or tables are frequently misinterpreted. Attempts to construct tables and graphs, but work is incomplete, unorganized, inappropriately scaled, or incorrect. No clear labeling. Consistently has difficulty constructing equations from information given in any form.</td>
<td>In most cases correctly interprets and uses information from tables and graphs to answer a question if extrapolation is not required. Usually can accurately construct linear equations from tables, graphs, and verbal descriptions. In most cases can successfully use given info to construct tables and graphs to answer a question but difficulty setting an appropriate window may impede finding a solution.</td>
<td>Correctly interprets graphs and tables and uses information to find a solution, including the use of extrapolation. Accurately constructs and uses tables and graphs in a manner that supports a complete solution. Tables and graphs are accurately and precisely labeled.</td>
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</tbody>
</table>

Problems designed to assess the Multiple Representations Outcome begin at #7.
For #7 below:
This student has correctly graphed the first equation using the y-intercept and slope (note the point that is “down 2 and over 3” from the y-intercept, (0,1).)

He correctly manipulates the second equation into y=mx+b form but does not graph it. Note that the given YSCL precludes plotting the y-intercept, (0,-6.5), of this second equation on the grid. He does not change the scale or extrapolate beyond the grid in order to finish the problem.

The solution he gives is incorrect because it does not satisfy the second equation.
8. A graph and a table of values is given for the equation \( y = 2x^2 - 7x + 5 \).

<table>
<thead>
<tr>
<th>X</th>
<th>( y = 2x^2 - 7x + 5 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>14</td>
</tr>
<tr>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>-1</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
</tr>
</tbody>
</table>

a. Use an algebraic process to solve the equation \( 2x^2 - 7x + 5 = 2 \).

\[
\begin{align*}
2x^2 - 7x + 5 &= 2 \\
2x^2 - 7x + 3 &= 0 \\
(x - 1)(x - 3) &= 0 \\
2x - 1 &= 0 \\
x - 3 &= 0 \\
x &= \frac{1}{2} \\
\end{align*}
\]

b. Explain how the graph can be used to check your answer.

You could use the graph to check where the parabola crosses \( y \) at 2. The graph shows where it hits on the \( x \)-axis.

He makes accurate use of the table to solve an equation. 😊

He clearly explains how to interpolate within the table to estimate a solution. 😊

Demonstrates that he knows how to use the graph to check an answer; note that he illustrates his explanation on the graph. 😊
9. Use the table at the right to complete the following tasks.

a. Find the slope of the line for each table entries.

\[
\frac{195 - 0}{3 - 1} = \frac{195}{2} = 97.5
\]

b. Write a sentence that uses the slope in the context of this problem. This means that for every three hours that they travel they would advance 195 miles, also that for every hour of travel you will advance 65 miles.

c. Find the equation that models the data in the table.

\[
y = 65x - 500
\]

d. Use your equation from part c to find how long it takes to get home.

\[
x = \frac{500 - 65x}{65}
\]

Correctly uses his equation to answer this question.

Attempts to use \( y = mx + b \), but incorrectly uses first entry in the table as \( b \) instead of calculating \( b \).

Uses table to find change in \( x \) and \( y \) but fails to note that \( y \) is decreasing.

Correct equation from the graph 😊

Correct use of his equation to answer the question.
Correctly uses verbal info in constructing models. 😊

Constructs a graph and makes use of similar figures in the graph to solve the problem. 😊

Conclusion: The Teaching Community rated this student at LEVEL 3, proficient in the use of multiple representations. Though he had trouble solving a system by graphing, he did demonstrate the ability to graph an equation. He seemed to have difficulty with the scale provided. He consistently used information from tables and graphs to solve equations, including interpolating within a table. He accurately constructed linear equations from a graph and verbal descriptions, though he had difficulty when information was given in a table. He made good use of a graph to construct similar figures to solve #12.