SPEEDING TICKETS

New York state wants to change its system for assigning speeding fines to drivers. The current system allows a judge to assign a fine that is within the ranges shown in Table 1.

Table 1. New York Speeding Fines

<table>
<thead>
<tr>
<th>Miles per Hour over Speed Limit</th>
<th>Minimum Fine</th>
<th>Maximum Fine</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 10</td>
<td>$45</td>
<td>$150</td>
</tr>
<tr>
<td>11 – 30</td>
<td>$90</td>
<td>$300</td>
</tr>
<tr>
<td>31 or more</td>
<td>$180</td>
<td>$600</td>
</tr>
</tbody>
</table>

Some people have complained that the New York speeding fine system is not fair. The New Drivers Association (NDA) is recommending a new speeding fine system. The NDA is studying the Massachusetts system because of claims that it is fairer than the New York system.

Table 2. Massachusetts Speeding Fines

<table>
<thead>
<tr>
<th>Miles per Hour over Speed Limit</th>
<th>Fine</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 10</td>
<td>$100 flat charge</td>
</tr>
<tr>
<td>11 or more</td>
<td>$100 flat charge plus $10 for each additional mph above the first 10 mph</td>
</tr>
</tbody>
</table>

In this task, you will:

- analyze the speeding fine systems for both New York and Massachusetts.
- use data to propose a fairer speeding fine system for New York state.
1.

**Part A**
Use the information in Table 2 to plot data points for Massachusetts speeding fines.

- Plot a point to represent the fine for driving 5 mph over the speed limit.
- Plot additional points for each increment of 5 mph over the speed limit up to 45 mph over the speed limit.

Scoring

For this item, a full-credit response (1 point) includes

![Massachusetts Speeding Fines](image)

For this item, a no-credit response (0 points) includes none of the features of a full-credit response.
2. 

**Part B**
Create an equation to calculate the Massachusetts speeding fine, \( f \), based on the number of miles per hour, \( m \), over the speed limit when \( 1 \leq m \leq 10 \).

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>f</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>9</td>
<td>&lt;</td>
<td>\leq</td>
</tr>
<tr>
<td>0</td>
<td>-</td>
<td>-</td>
<td>\pi</td>
<td>\sqrt{}</td>
</tr>
</tbody>
</table>

**Scoring**
For this item, a full-credit response (1 point) includes

- \( f = 100 \), and equivalent responses.

For this item, a no-credit response (0 points) includes none of the features of a full-credit response.
3.

**Part C**
Create an equation to calculate the Massachusetts speeding fine, \( f \), based on the number of miles per hour, \( m \), over the speed limit when \( m > 10 \).

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>f</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>9</td>
<td>&lt;</td>
<td>≤</td>
</tr>
<tr>
<td>0</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>()</td>
</tr>
</tbody>
</table>

**Scoring**

For this item, a full-credit response (1 point) includes

- \( f = 100 + 10(m - 10) \) or \( f = 10(m - 10) + 100 \) or \( f = 10m \), and equivalent responses.

For this item, a no-credit response (0 points) includes none of the features of a full-credit response.
4.

The graph below shows data from a sample of actual fines for driving above the speed limit in New York.

**Part A**

Use the Connect Line tool to create a piecewise linear model with two line segments, one for $1 \leq m \leq 20$ and one for $20 \leq m \leq 40$, that approximates the best fit for the data.

Scoring

For this item, a full-credit response includes (1 point) includes

- the graph of a piecewise linear function that approximates the data points on the graph. (Note: There is a range of acceptable answers, near $f = 2m + 90$ for $1 \leq m \leq 20$; $f = 15m - 170$ for $20 \leq m \leq 40$.)

For example:

For this item, a no-credit response (0 points) includes none of the features of a full-credit response.
5.

**Part B**

Using your model from part A, create an equation to calculate the speeding fine, $f$, based on the number of miles per hour, $m$, over the speed limit when $1 \leq m \leq 20$.

This equation will be the start of the proposed new model for the New York speeding fine system.

Scoring

For this item, a full-credit response (1 point) includes

- writing an equation with a slope ranging between 1 and 3, AND a $y$-intercept ranging between 80 and 100
  
  OR
  
  - writing an equation that matches the (correct or incorrect) line graphed as the first piece of item number 1435.

  For example,
  
  - $f = 2m + 90$

For this item, a no-credit response (0 points) includes none of the features of a full-credit response.

  For example,
  
  - $f = 15.5m - 201.5$
6.

**Part C**
Using your model from part A, create an equation to calculate the speeding fine, \( f \), based on the number of miles per hour, \( m \), over the speed limit when \( m > 20 \).

This equation will complete the proposed new model for the New York speeding fine system.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>f</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Scoring
For this item, a full-credit response (1 point) includes
- writing an equation with a slope ranging between 13 and 18, AND a \( y \)-intercept ranging between -260 and -120.
  
  OR
- writing an equation that matches the (correct or incorrect) line graphed as the second piece of item number 1435.
  
  For example,
- \( f = 15m - 170 \)

For this item, a no-credit response (0 points) includes both
- all other responses.

  For example,
- \( f = 2m + 95 \)
Do you agree or disagree with the claim? Explain your reasoning using specific examples from this task.

Scoring

For this item, a full-credit response (2 points) includes

- agreeing with the claim
  AND
- justifying the response by citing at least one comparison between values used in the two systems.
  For example,
  - “I agree. In the current system, a driver who is ticketed for speeding by 11 mph could be fined $300. A driver who is ticketed for speeding by 30 mph could be fined $90. In the new system, any driver who speeds by 11 mph would pay $112 and a driver who speeds by 30 mph would pay $280. It is fairer that drivers who speed by the same amount will pay the same fine and the fine will increase as the excess speed increases.”

For this item, a partial-credit response (1 point) includes

- agreeing with the claim
  AND
- justifying the response WITHOUT citing any examples
  OR
- justifying the incorrect response by citing examples from previous incorrect work in any of the previous items.

Continued on next page
For example,
- “I agree. It is fairer that drivers who are ticketed for the same excess speed will pay the same fine and the fine will increase as the excess speed increases.”

For this item, a no-credit response (0 points) includes none of the features of a partial- or full-credit response.

For example,
- “I agree.”

This item is not graded on spelling or grammar.