Car Skid Marks

Dek and Mani are traffic accident investigators. Their job is to find out how and why accidents happen. To do this they gather evidence from the scenes of accidents.

When a car suddenly brakes to a stop, it can leave skid marks. These marks can be used to figure out the speed of the car. This might give evidence that the driver was going over the speed limit.

On a dry test track, a car is driven at different speeds, in miles per hour (mph). Each time it brakes as hard as possible. The skid length is then measured in feet. Here are the results:

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>0</th>
<th>19</th>
<th>27</th>
<th>29</th>
<th>37</th>
<th>39</th>
<th>49</th>
<th>54</th>
<th>56</th>
<th>60</th>
<th>66</th>
<th>69</th>
<th>74</th>
<th>76</th>
<th>80</th>
<th>85</th>
<th>89</th>
<th>93</th>
<th>98</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (feet)</td>
<td>0</td>
<td>20</td>
<td>37</td>
<td>42</td>
<td>61</td>
<td>68</td>
<td>100</td>
<td>120</td>
<td>131</td>
<td>150</td>
<td>180</td>
<td>200</td>
<td>230</td>
<td>240</td>
<td>270</td>
<td>300</td>
<td>330</td>
<td>360</td>
<td>400</td>
</tr>
</tbody>
</table>

The relationship shown in the table looks complicated, so Dek and Mani both try to work out a ‘rule of thumb’ for estimating the speed of a car from the length of the skid marks:

Dek

I’ve got an easy rule.

Halve the length of the skid mark in feet.

This gives an estimate for the speed in miles per hour.

Mani

My rule is more complicated. I use the formula:

\[ y = \frac{x}{4} + 30 \]

\( y \) is the speed of the car in miles per hour

\( x \) is the length of the skid mark in feet
Car Skid Marks (continued)

A car was travelling on a dry flat road with brakes in good condition. The skid marks for the car measured 200 feet.

1. Which rule gives the best estimate for the speed of the car: Dek’s or Mani’s? Show all your work.

2. Dek and Mani argue about which rule is the best one to use for any traffic accident. What is your advice? Show your work and explain your reasoning.
Sample Responses to Discuss: Ezra

I will carefully select a range of skid lengths to test Dek and Mani’s rules of thumb.

<table>
<thead>
<tr>
<th>Length of skid</th>
<th>Correct speed</th>
<th>Dek’s speed</th>
<th>Mani’s speed</th>
<th>Rest rule of thumb</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0 (Error 0)</td>
<td>30</td>
<td>Dek</td>
</tr>
<tr>
<td>20</td>
<td>29</td>
<td>21 (Error 29 - 21 = 8)</td>
<td>40.5 (40.5 - 21)</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>49</td>
<td>50 (Error 50 - 49 = 1)</td>
<td>55 (55 - 49 = 6)</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>56</td>
<td>75 (15 - 60 = 15)</td>
<td>70.5 (67.5 - 60 = 7.5)</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>69</td>
<td>100 (100 - 69 = 31)</td>
<td>80 (80 - 69 = 11)</td>
<td></td>
</tr>
<tr>
<td>240</td>
<td>76</td>
<td>120 (120 - 76 = 44)</td>
<td>90 (90 - 76 = 14)</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>85</td>
<td>150 (150 - 85 = 65)</td>
<td>105 (105 - 85 = 20)</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>93</td>
<td>150 (150 - 93 = 57)</td>
<td>120 (120 - 93 = 27)</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>98</td>
<td>700 (700 - 98 = 102)</td>
<td>130 (130 - 98 = 32)</td>
<td></td>
</tr>
</tbody>
</table>

Clearly explain Ezra’s method. (You do not need to check Ezra’s arithmetic; it is correct).

Use Ezra’s method to complete the final column.
What conclusion could Ezra make?

How could Ezra improve his work? Fully explain your answer.
Sample Responses to Discuss: Leanne

Clearly explain Leanne’s method.

What conclusion could Leanne make?

How could Leanne improve her work? Fully explain your answer.
How Did You Work?

Complete the sentences and mark the boxes that apply to your work.

1. The method I used to complete the task on my own was

   I advised Dek and Mani that

2. The method we used in our group was

   We advised Dek and Mani that

3. My method is similar to one of the sample responses

   My method is similar to (Add name of sample response)

   Because

   OR My method is different from both the sample responses

   Because

4. Our method is similar to one of the sample responses

   Our method is similar to (Add name of sample response)

   Because

   OR Our method is different from both the sample responses

   Because

5. A ‘rule of thumb’ that is better than Dek’s or Mani’s is