Part I: Introduction

1. What is the purpose of wheel bearings on a skateboard?

2. What is friction?

3. Why do skateboarders want to use skateboards with less friction?

4. How would too little friction not be good?

5. Besides bearings, what are some other factors that can affect how far a skateboard travels on a ramp?
Part II: Choosing Bearings

A skateboard manufacturing company is testing four types of bearings: Grades A, B, C, and D. Four skateboards, which are identically manufactured except for their bearings, are tested. Using a ramp, each skateboard is released from the same height and the distance it travels is measured in meters. This is repeated 5 times with each skateboard. The results are indicated by the data in the table below.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
<th>Trial 4</th>
<th>Trial 5</th>
<th>Sum of 5 Trials</th>
<th>Average Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade A</td>
<td>4 m</td>
<td>3 m</td>
<td>4 m</td>
<td>5 m</td>
<td>4 m</td>
<td>4 m</td>
<td></td>
</tr>
<tr>
<td>Grade B</td>
<td>10 m</td>
<td>10 m</td>
<td>11 m</td>
<td>9 m</td>
<td>11 m</td>
<td>11 m</td>
<td></td>
</tr>
<tr>
<td>Grade C</td>
<td>1 m</td>
<td>2 m</td>
<td>3 m</td>
<td>2 m</td>
<td>2 m</td>
<td>2 m</td>
<td></td>
</tr>
<tr>
<td>Grade D</td>
<td>8 m</td>
<td>9 m</td>
<td>8 m</td>
<td>8 m</td>
<td>8 m</td>
<td>8 m</td>
<td></td>
</tr>
</tbody>
</table>

1. Complete the second to the last column in the data table by finding the sum of the 5 trials for each grade of bearings.

2. Complete the last column in the data table by calculating the average distance each skateboard travelled. Round your answers to the nearest whole number.

\[ \text{Average Distance} = \frac{\text{Sum of 5 Trials}}{\text{Total Number of Trials}} \]

3. Which grade of bearings produces the most friction? ________________
   How did you determine your answer? ________________
Part III: Performance Testing

The manufacturing company decides to use Grade A bearings, based on the demand of their customers. To test the overall performance of the skateboard for consistency, engineers release each one from various heights on the ramp and record the distance it travels. The skateboard is released from each height 3 times and the results are displayed in the data table below. Data for the release height of 3 meters has purposely been omitted from the data table.

<table>
<thead>
<tr>
<th>Release Height</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
<th>Sum of 3 Trials</th>
<th>Average Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 meter</td>
<td>8 m</td>
<td>7 m</td>
<td>8 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 meters</td>
<td>16 m</td>
<td>18 m</td>
<td>19 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 meters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 meters</td>
<td>35 m</td>
<td>40 m</td>
<td>36 m</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Complete the second to the last column in the data table by finding the sum of the 3 trials for each release height.

2. Complete the last column in the data table by calculating the average distance the skateboard travelled from each release height. Round your answers to the nearest whole number.

   \[
   \text{Average Distance} = \frac{\text{Sum of 3 Trials}}{\text{Total Number of Trials}}
   \]

3. Based on the Average Distances calculated in the last column, what do you think the Average Distance would be for the release height of 3 meters? Explain how you arrived at your answer.
4. On the grid below, plot the Release Height vs. Average Distance data.

5. Draw a line of best fit through the 3 points you plotted. Then use the line to approximate the average distance for a release height of 3 meters. 

6. How does this approximation compare to your estimation in question #3?
Part IV: Potential Energy and Kinetic Energy

1. The energy of a body with respect to its position is called ____________ energy.

2. The energy of a body with respect to its motion is called ____________ energy.

3. Which energy is highest when the skateboard is at the top of the ramp? ____________________

4. As the skateboard travels down the ramp, its kinetic energy ________ (increases or decreases).

5. _____________energy is converted into _____________energy as the skateboard travels down the ramp.

6. Mechanical energy is equal to __________________________ plus ____________________________.

7. If we take friction into consideration, mechanical energy would be converted to ____________.