**Food Flinger Activity**  
Unit 4: Vectors and Projectile Motion

**Purpose:** To study projectile motion using a potato launcher  
**Materials:** Potato launcher, food projectiles  
**Data:** All data has been collected ahead of time  
**Disclaimer:** Potato launchers shoot projectiles over long distances with high velocities. Improper use can result in serious injury. It is very important to have adult supervision during use.

**Equations:**

\[
v_x = \frac{x}{t}
\]

\[
v_y = g \cdot \left(\frac{t}{2}\right)
\]

\[
y = \frac{1}{2} g \cdot \left(\frac{t}{2}\right)^2
\]

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**Figure 1** – Sketch the motion of the potato

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**Table 1** – Potato launch data

<table>
<thead>
<tr>
<th>Angle</th>
<th>Range (m)</th>
<th>Average Range (m)</th>
<th>Time (s)</th>
<th>Average Time (s)</th>
<th>Launch Velocity (v_x) (m/s)</th>
<th>Launch Velocity (v_y) (m/s)</th>
<th>Height y (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30°</td>
<td>1) 116</td>
<td></td>
<td>1) 4.5</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>2) 112</td>
<td></td>
<td>2) 4.8</td>
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<tr>
<td></td>
<td>3) 117</td>
<td></td>
<td>3) 4.7</td>
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<tr>
<td>45°</td>
<td>1) 145</td>
<td></td>
<td>1) 5.6</td>
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<tr>
<td></td>
<td>2) 156</td>
<td></td>
<td>2) 5.1</td>
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<tr>
<td></td>
<td>3) 153</td>
<td></td>
<td>3) 5.4</td>
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</tr>
<tr>
<td>60°</td>
<td>1) 114</td>
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<td>1) 4.6</td>
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<td></td>
<td>2) 113</td>
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<td>2) 4.9</td>
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<tr>
<td></td>
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<td>3) 4.4</td>
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</tr>
</tbody>
</table>

**Table 1** – Potato launch data
In the figure below, sketch the horizontal (X) and vertical (Y) components of the potato velocity at different points in the motion. The first one is done for you.

**Discussion:**
1. Describe the motion of the object.

2. Is the horizontal component of the projectile’s velocity constant? Why or why not?

3. Is the vertical component of the projectile’s acceleration constant? Why or why not?

4. How would a horizontal wind blowing at 8.4 m/s affect the projectile’s horizontal velocity?

**Extra Credit:** Sports equipment engineers devote much of their time to product design. In building a football for instance, many factors are considered including shape, weight, materials, durability, performance, cost, and even manufacturing. On a separate sheet of paper, design a projectile for the potato launcher that would give maximum range. Make sure to include labeled diagrams. In your report, discuss the design factors you considered for your projectile.

This worksheet created by LEAPS Graduates Logan McLeod and Chuck Schelle, and LEAPS Undergraduates Kok Cheng and Shera Wu.