5.3(B) General Launch Angle Projectiles

LEARNING TARGETS

I can interpret, analyze, and calculate the motion of a general launch angle projectile.

PROJECTILE MOTION

General Launch Angle Projectiles \( (y_f = y_i) \)

- **Max Range**
  \[ R = \frac{(v_o)^2 \sin(2\theta)}{g} \]

- **Max Height**
  \[ y_{\text{max}} = \frac{(v_o \sin \theta)^2}{2g} \]

How Far?

If a soccer player kicks a ball 60.0-mph at an angle of 30° above the ground.

- **Max Range**
  \[ R = \frac{(v_o \sin 30°)^2}{g} = \frac{(26.9\text{ m})(0.5\text{ m/s})^2}{9.8\text{ m/s}^2} = 6.3\text{ m} \]

- **Max Height**
  \[ y_{\text{max}} = \frac{(26.9\text{ m})(0.5\text{ m/s})^2}{(0.5\text{ m/s})^2} = 9.2\text{ m} \]
5.3(B) General Launch Angle Projectiles

**PROJECTILE SIMULATOR**

Set the launch speed to 30 m/s and the launch height to 0 meters. Fill in the table below to investigate the effect of launch angle on horizontal displacement.

<table>
<thead>
<tr>
<th>Launch Angle (deg)</th>
<th>Horizontal Displacement (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td></td>
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<tr>
<td>20</td>
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<tr>
<td>30</td>
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<td>50</td>
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<tr>
<td>60</td>
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<tr>
<td>70</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td></td>
</tr>
</tbody>
</table>

*Write 3 verifying statements about your findings.

**PROJECTILE MOTION**

![Graph showing projectile motion for different launch angles](image)

**PROJECTILE MOTION**

![Graph showing projectile motion for different launch angles](image)

\[ R = \frac{v_0^2}{g} \sin(\theta) \]

\[ 1245 \text{m} = \frac{v_0^2}{9.876} \sin(2 \cdot 45^\circ) \]

\[ v_0 = 408.6 \text{ ft/s} \]

\[ \frac{1245}{226.1} = 1245 \text{ m} \]