**Harold’s Physics of Projectiles**

**“Cheat Sheet”**

26 November 2017

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| **The Classic Cannon Ball Problem** | | |
| Diagram | Image result for cannon ball physics Image result for physics parabolic ball problem  2  0  1 | |
| **G**ivens | Degrees inclined from horizontal | |
| **U**nknowns | **Horizontal (x-axis)** | **Vertical (y-axis)** |
| ❶ How far is it at time *t*?  ❹ How far will it land? () | ❷ How high is it at time *t*?  ❺ How high will it go? () |
| ❸ When will it land? () | |
| Observations | Notes:   * Subscripts are dimensions, time, or both. Examples:   + is the velocity in the x direction.   + is the initial horizontal position, or horizontal position at time = 0 s.   + is the initial velocity in the y direction (vertical) * Horizontal and vertical dimensions are orthogonal (independent from one another). * Assume no wind resistance (drag). If we factored in wind resistance, then differential calculus is needed. * The cannon ball will reach its highest point exactly half way through its journey. [ and | |
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| **E**quations |  |  |
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We are now ready to solve for all 5 unknowns in the order 1,2,3,4,5.

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|  | **Horizontal (x-axis)** | **Vertical (y-axis)** |
| **S**olve |  |  |
|  |  |
| **S**ubstitute |  |  |
| Box Answer | Distance travelled | ❷  Height travelled |

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| **S**olve |  |  |
| **S**ubstitute |  | |
| Box Answer | Time the cannon ball was in the air | |

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| **S**olve |  |  |
| **S**ubstitute |  |  |
| Box Answer | ❹  Farthest distance the cannon ball travelled | ❺  Highest distance the cannon ball travelled |