

# Science Lesson Plan

## Summary of Lesson: Plotting

This lesson was to give the students the basics of plotting by building off of the range equation M-File that was prepared during the M-File lesson. I asked the students to plot  $V_o$  versus Range with  $V_o$  between 0 and 5m/s with increments of 5. Students were asked to resave the previous Range equation M-File and use that as a basis. They were given five minutes or so to create a vector of  $V_o$  values from 0 to 5 on their own with the vector tutorial and the quick reference being available to them. At that point we came back as a group and I had the students give me the three ways to create this vector as well as discussed the pros and cons of each way. Then the plotting command was given to the students and they were asked to run the command. However, an error came up with all of the students because a „dot“ was needed to complete the range equation. When multiplying or dividing two vectors together a „.\*“ or „./“ or „.^2“ is needed. This is because the rules of matrix multiplication is that you multiply “row into column” Therefore, when multiplying two row vectors one of them needs to be transposed into a column vector and the rules of multiplication will give you a single number as an answer. In our case we want to multiply or divide element-by-element and still have a row vector as the answer. The “dot” before this operation does element-by-element multiplication, division, or powers. I went over this on the board with the students, which some understood and others did not. But, most just took it as a rule and put it into their memory banks. Luckily the 2011 version of Matlab will let the students know by an error message that a “dot” might be needed. Finally, we discussed and learned the commands for labeling the x and y axis, titles, and axis ranges. I also stressed the importance of commenting their codes, especially what each variable and equation is with UNITS.

**Teacher: Molly Clay**

**Period:**

**Class: Honors Physics Lowell High School**

**Date(s): October 2011**

| <b>SETTING THE STAGE</b>   |   |
|--|---|
| <u>Essential Question</u>  | Why use Matlab?   |
| <u>Content Objective(s)</u><br>(Student-friendly)  | Plotting in Matlab  |
| <u>Connection to previous or future lessons</u>  | This lesson was to teach the students how to plot in Matlab, something that they will be doing frequently in class. This connected the vector lesson as well as building upon the basic M-Files that solved the Range equation. |
| <u>Critical Thinking Questions</u>   |   |
| <u>Key Vocabulary</u>  | Command window<br>Workspace<br>Variable<br>Command History  |
| <u>Materials Needed/Safety</u>   | Laptops<br>Notebook<br>Pencil   |
| <b>ACTIVE INSTRUCTION</b>  |   |
| <ul style="list-style-type: none"><li>• Launch<br/>(Engage)</li></ul>                      | The students will get the laptop outs...working with laptops directly in the classroom will grab the students attention   |
| <ul style="list-style-type: none"><li>• Investigation<br/>(Explore)</li></ul>              | Students will learn how to plot the basic range equation over initial velocity from 0 to 25 m/s. Students also got to play around with changing   |
| <b>TIME FOR REFLECTION</b>   |   |
| <ul style="list-style-type: none"><li>• Summarization<br/>(Explain &amp; Extend)</li></ul> |   |
| <ul style="list-style-type: none"><li>• Assessment<br/>(Evaluate)</li></ul>                | NONE  |
| <ul style="list-style-type: none"><li>• Homework</li></ul>                                 | NONE  |

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%Molly Clay
%October 20, 2011
%Honors Physics 6
%Range 1

%Starting M-File:
clc;
clear all;

%Givens (Constants)
%Vo = 25;
%Initial Velocity (m/s)
Vo = [0 5 10 15 20 25];
%Vo = linspace(0,25,5)
%Vo = 0:5:25

Theta = 45;                                %Angle (Degrees)

g = 9.8;
%Gravity (m/s^2)

%Solve Range Equation
R = (Vo.^2*sind(2*Theta))/g

%Plotting

plot(Vo,R,'-.m','LineWidth',2)
xlabel('Velocity (m/s)')
ylabel('Range (m)')
title('Velocity Vs. Range')
axis([0 5 0 10])    %axis([xmin xmax ymin ymax])

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