

# CS122 Engineering Computation Lab

## Lab 3

Bruce Char  
Department of Computer Science  
Drexel University  
Winter 2010

## Review of Lab 2 Cycle

- Lab 2 – pre lab quizlet, lab 2 and quiz 2 completed along with pre lab 3 quizlet
  - Quiz grades to be issued this week
  - 2nd chat session held on 2/01 – 0 attendees
- Major Lab 2 concepts to remember
  - Use of user defined functions to create plots of boxes
  - Introduction to Maple's table and for loop features

## Review of Lab 2 Cycle

- drawBoxB function syntax:
  - drawBoxB:=(width, length, xlo, ylo ,c) →
    - display([line([xlo,ylo],[xlo+width,ylo],color=c),
    - line([xlo+width,ylo],[xlo+width,ylo+height],color=c),
    - line([xlo,ylo],[xlo,ylo+height],color=c),
    - line([xlo,ylo+height],[xlo+width,ylo+height],color=c)],
    - axes=none, scaling=constrained);

# Review of Lab 2 Cycle

- Maple table and for loop usage in the chemical reaction problem
  - `Atab:=table();`
  - `indexTab:=table();`
  - `for i from 1 to 50 do`
    - `indexTab[i] := i; # note use of for loop counter I`
    - `Atab[i] := .....`;
    - Etc.
  - `end do;`
  - `# remember to convert tables to lists before using in plot functions`
  - `# since these functions expect a list type parameter`

# Administrative Notes

- Please continue to contact your individual instructors with questions and problems
- Will determine and communicate future of on-line chat sessions – what additional lab / quiz support activities would be helpful – current activities include:
  - CLC consultation
  - Quiz hint slides
  - Chat sessions
  - Special (by invitation) extra consultation

# Lab 3 Overview

- Based on materials from Chapter 12 and 13 readings
  - Chapter 12 – More on repetition and looping
    - “while” loop – conditional looping + relational operators
    - Combining “for” and “while” loops
    - Dealing with runaway (infinite) “while” loops
  - Chapter 13 – Conditional execution
    - Choosing alternatives – if .. then .. else .. elif constructs

# Lab 3 Overview

- Lab 3 outline
  - Part 1 – Analysis of Blammo trajectory options
    - 1.1 - Applying a “for” loop to calculate Blammo’s distance for a variety of firing angles – starter script provided
    - 1.2 – Finding the smallest firing angle for Blammo to achieve a particular flight distance
    - 1.3 – Find all firing angles that enables Blammo to hit target
    - 1.4 – Plot a movie (animation) of all trajectories for different firing angles

# Lab 3 Overview

- Lab 3 outline
  - Part 2 – Movement of a particle within a box
    - 1.1 - Create a movie of a particle bouncing of the East wall of a box (using the drawBoxB function from Lab 2)
    - 1.2 – Extend the 1.1 script to also bounce off of West wall
    - 1.3 – Extend the 1.2 script to also bounce off of the North and South walls
    - 1.4 – Create a movie using a “non-square” box and diagonal particle movement



# Lab 2 Maple Concepts: Discussion and Demo

- Conditional looping with “while” loops
  - while (condition) do
    - loop body
  - end do;
  - The loop body will continue to get executed as long as the condition = true
  - The condition expression usually utilizes 1 or more relational operator (< <= > >= <> = )
  - Sometimes, a variable in the condition expression must be initialized so that it will have a value for the 1<sup>st</sup> condition test
  - Faulty program logic can result in an endless (infinite) loop
    - Use “stop (red)” hand on Maple icon list
    - If this does not stop the execution, use “Force quit” from the Maple menu

# Lab 2 Maple Concepts: Discussion and Demo

- “while” loops - continued
  - “while” and “for” loops can be used in combine when you want to potentially loop over a series of values, but also want to stop when a certain condition is met.
  - ex.  $\rightarrow$  for angle from 0 to 90 while ( $\cos \geq \sin$ ) do
    - This loop has the potential to loop 91 times
    - But will stop looping once  $\cos < \sin$ .
    - In some iteration (angle = 45), the  $\cos$  and  $\sin$  will become equal. Before, the  $\cos$  is  $> \sin$  and after, the  $\cos < \sin$ .
    - Therefore, this loop will execute 46 times, for angles of 0 through 45

# Lab 2 Maple Concepts: Discussion and Demo

- Choosing among alternative actions – “if” statement
  - if (condition) then
    - Code to execute if condition is true
  - end if;
  
  - if (condition) then
    - Code to execute if condition is true
  - else
    - Code to execute if condition is false
  - end if;
  
  - Many examples in chapter readings, demo and lab

# Lab 2 Maple Concepts: Discussion and Demo

- Choosing among cases – if-then-elif-else-end
  - if (condition1) then
    - Code to execute if condition1 is true
  - elif (condition2) then
    - Execute if condition2 is true
    - Note – only can reach here if condition 1 was false
  - elif (condition3) then
    - if condition 3 true (1 and 2 were false)
  - else
    - “catch all” bucket – if all case conditions specified above were false
  - end if;
- See chapter 13 for examples of this construct

# Lab 2 Maple Concepts: Discussion and Demo

- Animation / Movie basics

An animation is actually a series of “snapshot” plots which are displayed one by one to give the appearance of a continuous “movie”

- “insequence=true” in the display function designates the plots as an animated sequence
- When executed, the initial plot in the sequence appears on the screen. By “right-clicking” on this plot and selecting
  - Animate → Play

The animation will run (see demo for example animation)

Note the overall syntax and order of operations in the demo example!

# Lab 2 Maple Concepts: Discussion and Demo

- Use of the ptpos (list) variable in Part 2 of today's lab
  - ptpos[x,y] is a list that represents a point in the X-Y grid with an x coordinate = x and y coordinate = y
  - ptpos[9,1] indicates a point within the box whose location in a 10x10 box will be at x=9 and y=1
  - To access the x component of the point → ptpos[1]
  - Likewise, the y component is accessed → ptpos[2]

# Lab 3 Maple Concepts: Discussion and Demo

- Demo of Maple features needed for this lab
  - Open the Maple worksheet demo file from the course web site
    - CS122Lab3Demo.mw
  - The following concepts are illustrated
    - Example 1 – produce table of sine and cosines functions for angles from 0 to 90 degrees
    - Example 2 – script to find and report the angle between 0 and 90 degrees for which the sine and cosine are equal
    - Example 3 – produce table of sines and cosines for angles between 0 to 90 where cosine is greater than sine
    - Example 4 – Create a movie of sine and cosine values for 0 through 90 degrees

## Quiz Week (6) Activities

- Quiz 3 will be released on Friday (2/12) at 6 PM
  - Deadline: Wednesday (2/03) at 4:30 PM)
  - Makeup quiz – from Thursday (2/17) at 9 AM through Sunday (2/21) at 11:30 PM
    - 30% penalty
- Pre-lab 4 quizlet
  - From Thursday (2/17 – 9 AM) through Monday (2/22 – 8 AM)
- Be sure to visit the CLC for quiz assistance
- Next chat – we will communicate status via email