CS122 Engineering Computation Lab
Lab 3

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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 1st 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. → for angle from 0 to 90 while (cos >= 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 form 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