1  for → while

[P2.3.2 from FVL] Define an integer as “good” if it is not divisible by 2, 3, 5, or 7. Write a script that displays the number of positive “good” integers less than one million. (a) Use a for-loop. (b) Use a while-loop.

2  MATLAB graphics: circles & rectangles

Complete the script below to draw as many non-overlapping circles as possible inside a rectangle. The diameter of each circle is the width of the rectangle. Center the set of circles inside the rectangle. Assume that functions \texttt{DrawRect} and \texttt{DrawDisk} are available. Read the function comments, shown below, to find out how to use the functions. Assume that all the graphics commands for setting up a figure window have been entered—write only the code to draw the rectangle and circles. Use a loop to draw the circles!

\textit{Problem Solving Strategy}: Work on a problem in steps! Solve a simpler version first—draw the first circle tangent to the left side of the rectangle. After you figure out this simpler version, then modify your code to center the circles.

\begin{verbatim}

% Commands to set up the graphics window ... not shown

L= input('What is the length L of the rectangle? ');
W= input('What is the width W of the rectangle (W<=L)? ');

% Draw the rectangle with lower left corner at (0,0)

% Draw circles inside the rectangle

function DrawRect(a,b,L,W,c)
    \% Adds a rectangle to the current window. Assumes hold is on.
    \% The rectangle has vertices (a,b), (a+L,b), (a+L,b+W),
    \% and (a,b+W) and color c where c is one of 'r', 'g', 'y', etc.

\end{verbatim}
function DrawDisk(xc, yc, r, c)
% Adds a circular disk to the current window.
% Assumes hold is on.
% The disk has radius r, center(xc,yc) and
% color c where c is one of 'r', 'g', 'y', etc.

3 Step pyramid

Complete the script below to draw a step pyramid. The base rectangle is $L$-by-$H$ where $H \leq L$. Each step has the same height $H$. The next rectangle up is $2/3$ the length of the rectangle below, and so forth. The top step must have a length no less than $H$. Assume that functions DrawRect and DrawDisk are available. Use a while-loop. Again assume that all the graphics commands for setting up the window have been entered.

% Commands to set up the graphics window ... not shown

L = input('What is the length $L$ of the base of the step pyramid? ');
H = input('What is the height $H$ of each step ($H \leq L$)? ');

% Draw the step pyramid. Lower left corner of the base is at (0,0)

Check your graphics programs on a computer later! Use the following commands to set up a graphics window:

- close all    % close all figure windows
- figure      % new figure window
- axis equal off % all axes: same scale, no display
- hold on      % hold all calls to plot on current axes

At the end of the script, add the commands hold off and shg.