L6. More on Iteration

Using a Count Variable

Developing For-Loop Solutions

A Year-Printing Fragment

```matlab
First = input('Enter first year');
Last = input('Enter last year');
for y = First:Last
    fprintf('%5d
',y)
end
```

How It Works

```matlab
for y = First:Last
    fprintf('%5d
',y)
end
```

Suppose First is 1999 and Last is 2001.

Is the value in y <= than the value in Last?

Yes. Execute the loop body and increment y.
**How It Works**

```
for y = First:Last
    fprintf('%5d
',y)
end
```

Output

<table>
<thead>
<tr>
<th>First</th>
<th>Last</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>2001</td>
<td>2000</td>
</tr>
</tbody>
</table>

1999
2001
2000

Is the value in \( y \) <= the value in Last?

Yes. Execute the loop body and increment \( y \).

```
for y = First:Last
    fprintf('%5d
',y)
end
```

Output

<table>
<thead>
<tr>
<th>First</th>
<th>Last</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>2001</td>
<td>2001</td>
</tr>
</tbody>
</table>

1999
2001
2001

Is the value in \( y \) <= the value in Last?

Yes. Execute the loop body and increment \( y \).

```
for y = First:Last
    fprintf('%5d
',y)
end
```

Output

<table>
<thead>
<tr>
<th>First</th>
<th>Last</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>2001</td>
<td>2002</td>
</tr>
</tbody>
</table>

1999
2001
2002

Is the value in \( y \) <= the value in Last?

No. The loop is finished.
Problem Solving With the For-Loop

```
for count variable = expression for starting value : expression for ending value
  The calculation to be repeated.
end
```

Developing For-Loop Solutions

Illustrate the thinking associated with the design of for-loops

The methodology of stepwise refinement.

An example..

A Game: TriStick

Pick three sticks each having a random length between zero and one.

You win if you can form a triangle whose sides are the sticks. Otherwise you lose.

Win:

```
  ___
  |
  ||
```

Lose:

```
  ___
  |
  --
```

Problem

Estimate the probability of winning a game of TriStick by simulating a million games and counting the number of wins.

Pseudocode

```
Initialize running sum variable.
Repeat 1,000,000 times:
  Play a game of TriStick by picking the three sticks.
  If you win
    increment the running sum
Estimate the probability of winning
```
% Initialize running sum variable.
wins = 0;
for n = 1:1000000
    Play the nth game of TriStick by picking the three sticks.
    If you win
        increment the running sum.
end
% Estimate the prob of winning
p = wins/1000000

Refine the Loop Body

% Play the nth game of TriStick
% by picking the three sticks.
a=rand(1); b=rand(1); c=rand(1);
if (a<b+c) && (b<a+c) && (c<a+b)
    % No stick is longer than the sum of the other two.
    wins = wins+1;
end

Key Problem-Solving Strategy

Progress from pseudocode to Matlab through a sequence of refinements.
Comments have an essential role during the transitions. They "stay on" all the way to the finished fragment.