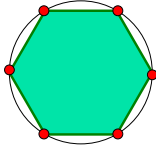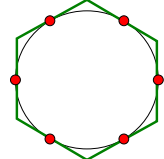---

- Previous Lecture:
  - Iteration using **for**

- Today's Lecture:
  - Iteration using **while**
  - Review loops, conditionals using graphics

- Announcements:
  - Read FVL 3.2 before lab next week
  - Project 2 due Thursday, 2/14
  - We do not use **break** in this course

Example: n-gon $\rightarrow$ circle

Inscribed hexagon
$(n/2) \sin(2\pi/n)$

Circumscribed hexagon
$n \tan(\pi/n)$

As n approaches infinity, the inscribed and circumscribed areas approach the area of a circle. How big should n be?

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Find n such that **outerA** and **innerA** converge

Now organize the tasks $\rightarrow$ algorithm:

n gets initial value
Repeat until tolerance is reached:
*   calculate innerA, outerA for current n*
*   diff= outerA – innerA*
*   increase n*

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Find n such that **outerA** and **innerA** converge

n gets initial value
while *‹tolerance isn't reached yet›*
*   calculate innerA, outerA for current n*
*   diff= outerA – innerA*
*   increase n*
end

Indefinite iteration

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```
% Convergence of inner and outer areas of regular n-gons on unit circle

fprintf('\n  n\t A(n)\t  B(n)\n');

% Initialize n, innerA, and outerA
n= 3;
innerA= 3*sqrt(3)/4;
outerA= 3*sqrt(3);
tol= 0.01;  % convergence tolerance

% Compute and print areas until convergence
while (outerA - innerA > tol)
    fprintf('%4d %9.6f %9.6f \n', n, innerA, outerA);
    n= n+1;
    innerA = (n/2)*sin(2*pi/n);
    outerA = n*sin(pi/n)/cos(pi/n);
end
fprintf('%4d %9.6f %9.6f \n', n, innerA, outerA);
```

Common loop patterns

Do something *n* times

```
for k= 1:n
    % Do something
end
```

Do something an indefinite number of times

```
%Initialize loop variables

while ( not stopping signal )
    % Do something

    % Update loop variables
end
```

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Pattern to do something n times

```
for k= 1:1:n
    % Do something

end
```

```
%Initialize loop variables
k= 1;
while ( k <= n )
    % Do something

    % Update loop variables
    k= k+1;
end
```

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---

for-loop or while-loop: that is the question

- **for**-loop: loop body repeats a *fixed* (predetermined) number of times. The "increment" is *fixed*.

- **while**-loop: loop body repeats an *indefinite* number of times under the control of the "loop condition."

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What will be displayed when you run the following script?

```
for k = 4:6
    disp(k)
    k= 9;
    disp(k)
end
```

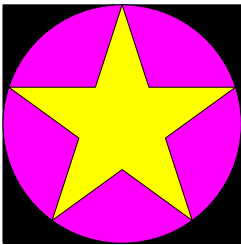| 4 9		4 4		*Something else …*
A	*or*	B	*or*	C

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Review loops/conditionals using user-defined graphics function

```
drawRect(...)
drawDisk(...)
drawStar(...)
```


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```
% drawDemo
close all
figure
axis equal off
hold on

drawRect(0,0,2,2,'k')
drawDisk(1,1,1,'m')
drawStar(1,1,1,'y')

hold off
```

Example: Nested Stars