

Coding a fractal



- Many fractals are implemented as a function that accepts x/y coordinates, size, and a *level* parameter.
 - The *level* is the number of recurrences of the pattern to draw.

- Example, Koch snowflake:

```
snowflake(window, x, y, size, 1);
```



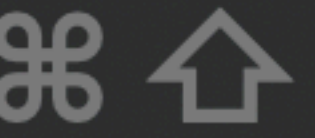
```
snowflake(window, x, y, size, 2);
```



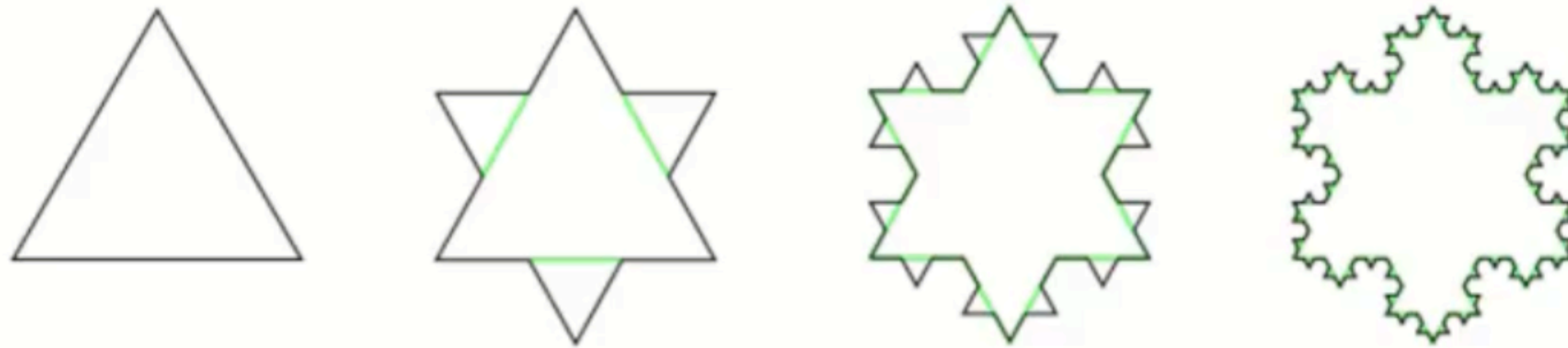
```
snowflake(window, x, y, size, 3);
```



Koch snowflake

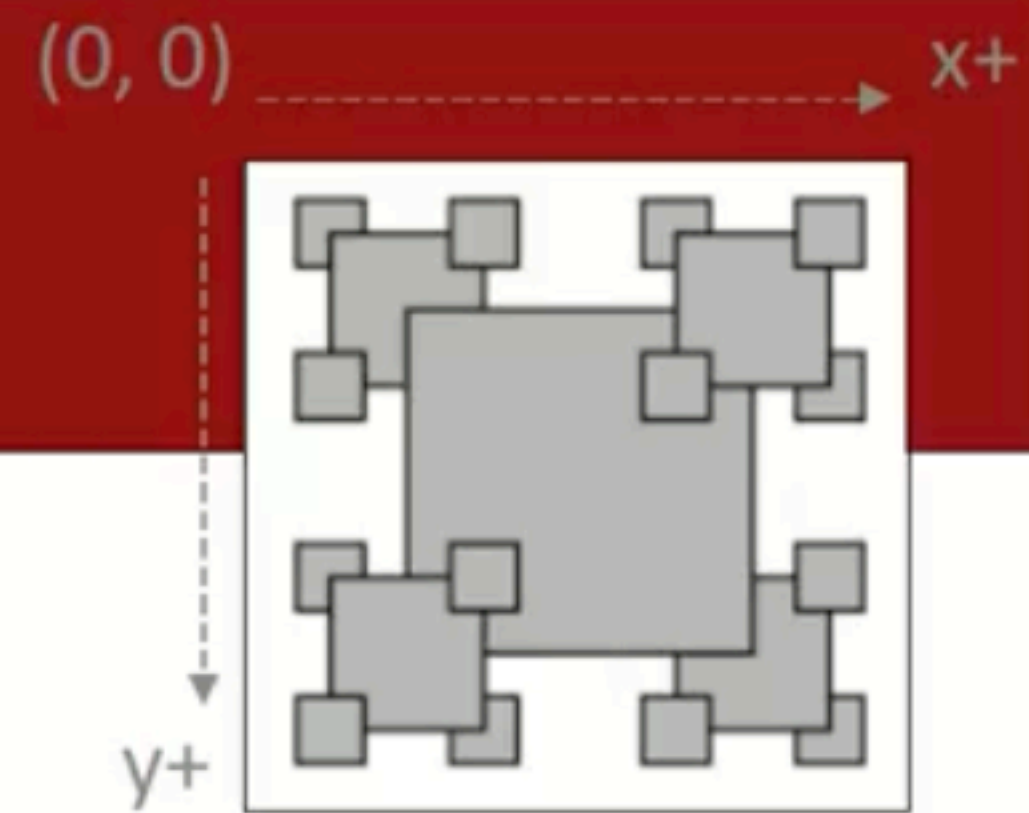


- **Koch snowflake:** A fractal formed by pulling a triangular "bend" out of each side of an existing triangle at each level.



- Start with an equilateral triangle, then:
 - Divide each of its 3 line segments into 3 parts of equal length.
 - Draw an eq.triangle with middle segment as base, pointing outward.
 - Remove the middle line segment.

Boxy fractal



- Where should the following line be inserted in order to get the figure at right?

```
window.fillRect(x, y, size, size); // draws a gray square
```

```
void fractal(GWindow& gw, int x, int y, int size, int order) {  
    if (order >= 0) {  
        // A) here  
        fractal(gw, x-size/2, y-size/2, size/2, order-1);  
        // B) here  
        fractal(gw, x+size/2, y+size/2, size/2, order-1);  
        // C) here  
        fractal(gw, x+size/2, y-size/2, size/2, order-1);  
        // D) here  
        fractal(gw, x-size/2, y+size/2, size/2, order-1);  
        // E) here  
    }  
}
```


Stanford graphics lib



```
#include "gwindow.h"
```

<code>gw.drawLine(x1, y1, x2, y2);</code>	draws a line between the given two points
<code>gw.drawPolarLine(x, y, r, t);</code>	draws line from (x,y) at angle <i>t</i> of length <i>r</i> ; returns the line's end point as a GPoint
<code>gw.getPixel(x, y)</code>	returns an RGB int for a single pixel
<code>gw.setColor("color");</code>	sets color with a color name string like "red", or #RRGGBB string like "#ff00cc", or RGB int
<code>gw.setPixel(x, y, rgb);</code>	sets a single RGB pixel on the window
<code>gw.drawOval(x, y, w, h);</code> <code>gw.fillRect(x, y, w, h); ...</code>	other shape and line drawing functions (see online docs for complete member list)

```
GWindow gw(300, 200);  
gw.setTitle("CS 106X Fractals");  
gw.drawLine(20, 20, 100, 100);
```

