CS 2334 Lab 13

Recursion

DrawLine

drawLine(int x1, int y1, int x2, int y2)

Say you want to draw the line shown by the hypotenuse

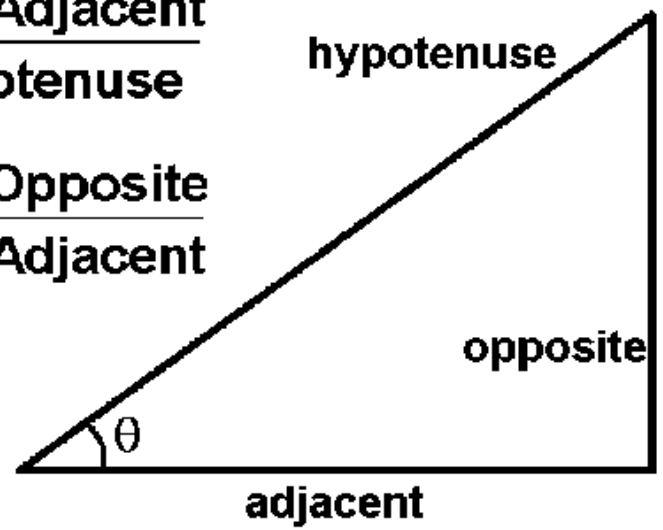
You know the starting point (x1, y1), Θ, and the length of the line

What are x2 and y2?

$$\text{SIN}\,\theta = \frac{\text{Side Opposite}}{\text{Hypotenuse}}$$

$$\text{COS}\,\theta = \frac{\text{Side Adjacent}}{\text{Hypotenuse}}$$

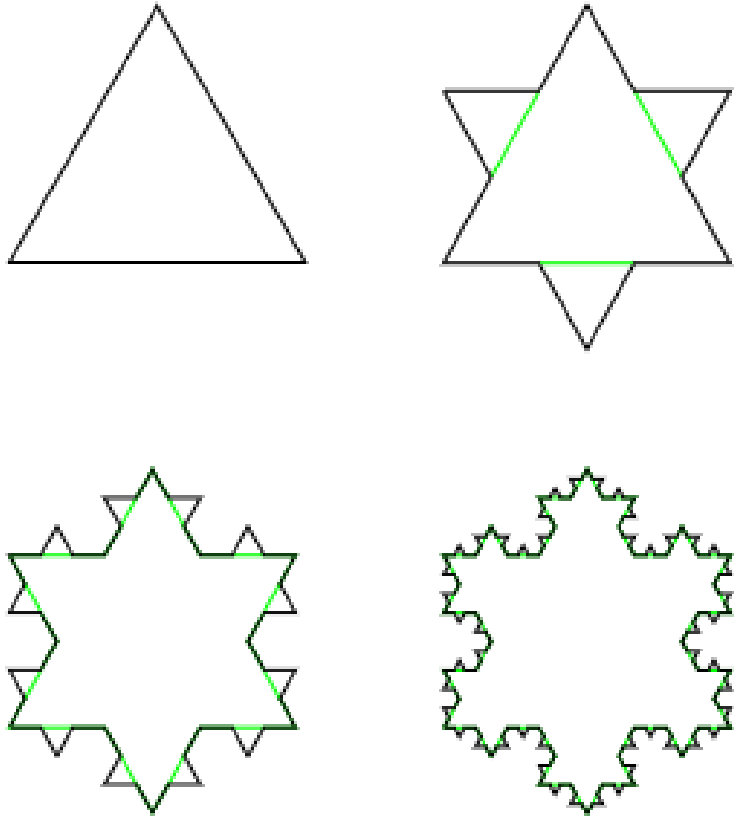
$$\text{TAN}\,\theta = \frac{\text{Side Opposite}}{\text{Side Adjacent}}$$



http://www.pages.drexel.edu/~so29/SinCosTan.htm

Koch Snowflake

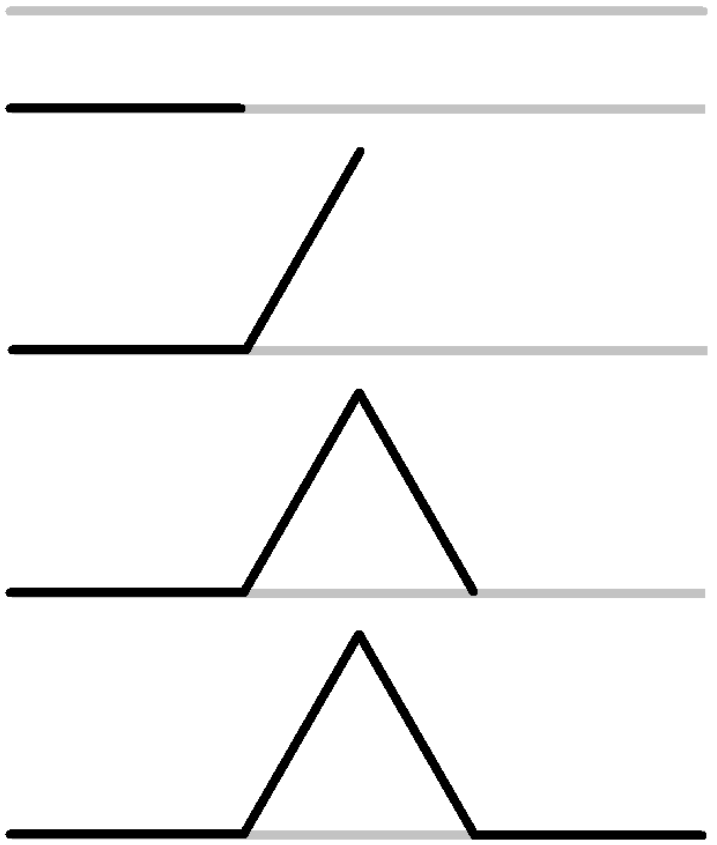
- Start with an equilateral triangle
- Recursively alter each line segment:
  - Divide the line segment into 3 segments of equal length
  - Draw an equilateral triangle that has the middle segment from step 1 as its base and points outward
  - Remove the line segment that is the base of the triangle from step 2
- Each new segment is 1/3 the length of the original



https://en.wikipedia.org/wiki/Koch_snowflake

Example of One Iteration

- Use same starting point as original segment
- Draw 1st new segment in the same direction
- Rotate by π/3, draw 2nd segment
- Rotate the opposite direction by 2π/3, draw 3rd segment
- Rotate to original direction, draw 4th segment



Interesting Properties

- What is the perimeter?
- What about the area?

Interesting Properties

- What is the perimeter?
  - Increase by 1/3 with each iteration
  - After n iterations, perimeter is $(4/3)^n$ times the original triangle perimeter
  - After an infinite number of iterations: perimeter is infinite
- What about the area?
  - finite

javax.swing.Timer

- Fires one or more ActionEvents at specified intervals
- An example use is an animation object that uses a Timer as the trigger for drawing its frames
- Setting up a timer involves creating a Timer object, registering one or more action listeners on it, and starting the timer using the start method

Timer example

```
int delay = 100;  //milliseconds

ActionListener listener = new ActionListener() {
        public void actionPerformed(ActionEvent e) {
                //…Perform a task…
        }
};

Timer timer = new Timer(delay, taskPerformer);
timer.start();
```

Lab13

- Recursively create a Koch Snowflake
- Animate using the Timer class

Demonstration…

Submission

- Submit only one file: lab13.zip (casing matters)
- Due date: Friday, November 20th @11:59pm
- Submit to lab13 dropbox on D2L