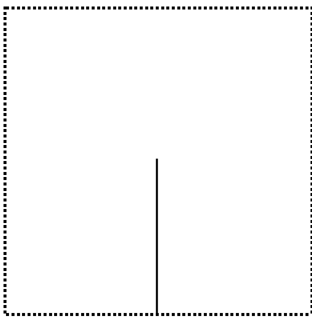
Name: ______________________________

Question 1 – Listen to what the flower people say (20 points; 30 min.)

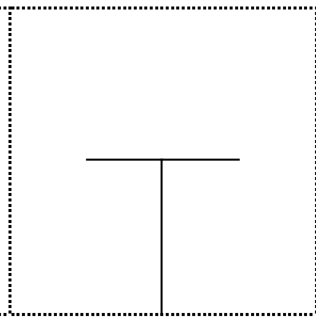
You come up with an idea for a cool fractal flower. The idea is to start with a stem (as in Figure 1) which is a line from the bottom center of the window to the middle. Then make a left and right turn and recurse. Figure 3 shows what happens when you do this a couple of times. We've provided `draw-half-line`:

```
;; Draw a line from (x1,y1) halfway to (x2,y2) as in Figure 4
(define (draw-half-line x1 y1 x2 y2)
  (position-pen x1 y1)
  (draw-line-to (/ (+ x1 x2) 2) (/ (+ y1 y2) 2)))
```



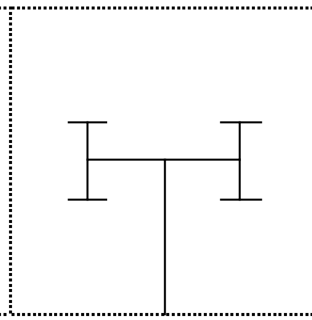
n = 0

Figure 1



n = 1

Figure 2



n = ?

Figure 3

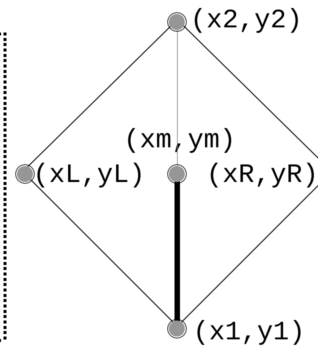


Figure 4

a) Fill in the blanks to complete the `flower` procedure below. Use Figure 4 to help you understand the temporary variables `xm`, `ym`, `xL`, `yL`, `xR` and `yR`. (15 points)

```
(define (flower x1 y1 x2 y2 n)
  (if (= n 0)
      (draw-half-line x1 y1 x2 y2)
      (let ((xm (/ (+ x1 x2) 2))
            (ym (/ (+ y1 y2) 2))
            (xL (/ (- (+ x2 x1 y1) y2) 2))  ;; Do NOT worry about how we
            (yL (/ (- (+ x2 y1 y2) x1) 2))  ;; calculated xL,yL,xR or yR
            (xR (/ (- (+ x2 x1 y2) y1) 2))  ;;
            (yR (/ (- (+ x1 y1 y2) x2) 2))) ;; Simply look at Figure 4

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```

b) What was the value of `n` that generated Figure 3? (3 points) __________

c) Modify Figure 3 to show the result of the next generation of `flower` (i.e., with `n` one larger than the correct answer to part (b) above). (2 points)