Random Position

- random(low,high) – generates float value between low and high

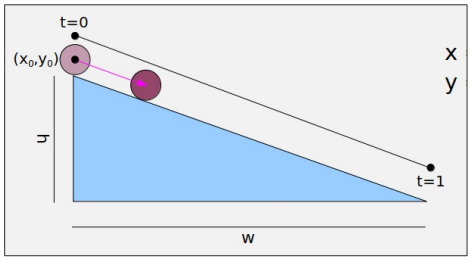
```
{
  float x = random(0,width);
  ellipse(x,height/2,30,30);
}
```

- noise(t) – generates float value between 0 and 1 (use map to scale)

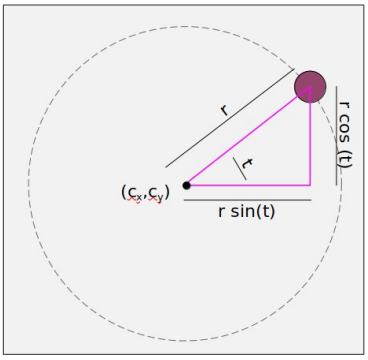
  t is an animation variable. The value used for initializing t affects the sequence of numbers generated; the size of the increment for t affects the smoothness of the values (smaller = smoother).

```
{
  float x = map(noise(t),0,1,15,width-15);
  ellipse(x,height/2,30,30);
}
t = t + .01;
```

Constrained Motion – Parametric Equations



- ramp – w, h are determined by the dimensions of the ramp, (x_0,y_0) by the position of the ramp and the object moving along it
  - $x = x_0 + t\,w$
  - $y = y_0 + t\,h$
- circle – (c_x,c_y) is the center of the circle, r is the radius
  - $x = c_x + r \cos t$
  - $y = c_y + r \sin t$



t is an animation variable. It is typically initialized to 0 to start at the beginning of the path.

```
{
  float x = 10 + t*100;       // using ramp equations
  float y = 20 + t*50;
  ellipse(x,y,30,30);
}
t = t + .01;
```

At the End of Class

Hand in whatever you have done during class, even if a sketch is incomplete.

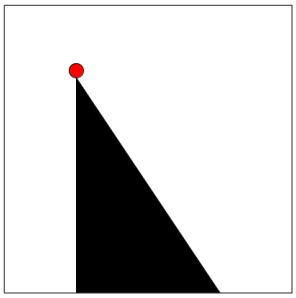
- Make sure each sketch is named as directed and has a comment with the names of your group. Also be sure to save your sketches! (This should be in your sketchbook **~/cs120/sketchbook**)
- Copy the entire directory for each sketch (not only the .pde file) into your handin directory (**/classes/cs120/handin/*username***). You only need to hand in one copy for the group.

Names: _____

Exercises

For all sketches, be sure to **include a comment with the names of your group at the beginning of the sketch.**

1. The red circle should slide down the ramp.

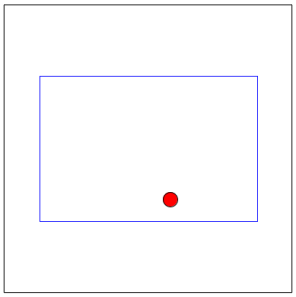


   - Prepare to draw the picture shown – label the positions and sizes needed to draw the circle and the triangle. (Draw on the picture!)
   - Based on that information, fill in the table below with the values needed for the ramp equations.

	value		**value**
x0	100	**w**	200
y0	100-10 (for a 20x20 ellipse)	**h**	300

   - Using what you've figured out above, the pattern for constrained motion, and the ramp equations, create a sketch named **sketch_250924a** where a small red circle starts at the top of a ramp, as shown, and then slides down the ramp. The drawing window should be 400x400.

2. The circle should wander (using Perlin noise) within the blue rectangle shown. Both its *x* and *y* coordinates will be determined by Perlin noise.



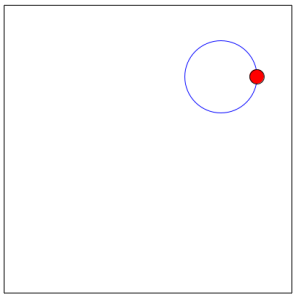
   - The range of values to map the Perlin noise value to is needed to use Perlin noise. Fill in the table below with the coordinate values specified.

	value		**value**
left side of blue rect	50	**top of blue rect**	100
right side of blue rect	350	**bottom of blue rect**	300

   - Using what you've figured out above and the pattern for Perlin noise, create a sketch named **sketch_250924b** where a small red circle wanders smoothly within the area defined by the blue box. You do not need to draw the blue box itself, just the red circle. The drawing window should be 400x400.

     Note: you will need two separate *t* parameters, one for *x* and one for *y*. Update both by the same amount, but initialize them to different values. (If you initialize both *t* parameters to similar values, you'll notice that the ellipse only moves along or near a diagonal line — this is because `noise(t)` always generates the same value for the same value of *t*.) Choose an increment that gives a smooth but not too slow effect.

3. The red circle should move along the path shown by the blue circle.
    - Fill in the table below with information about the blue circle.



	value		value
c_x	300	**r**	50
c_y	100		

    - Using what you've figured out above, the pattern for constrained motion, and the circular motion equations, create a sketch named **sketch_250924c** where a small red circle moves around the blue circle shown. (You do not need to draw the blue circle; it is there just to show the motion path.) The drawing window should be 400x400.

If you have time –

- Save a copy of your sketch from #3 as **sketch_250924d**, then modify the copy so that the red circle spirals in to the center of the blue circle. How can you do that? (What else is changing besides *t*?)
- These ideas aren't limited to motion and position. Create a new sketch named **sketch_250924e** which explores some of these possibilities. For example, have the width and height of a rectangle or ellipse vary according to circular motion or have the color determined by Perlin noise.
- Combine acceleration/deceleration with constrained motion – have the ellipse accelerate as it moves down the ramp, or create a pendulum which swings back and forth in a circular path (speeding up as it gets to the bottom of the swing and slowing as it reaches the ends of the swing). Create a new sketch named **sketch_250924f**.