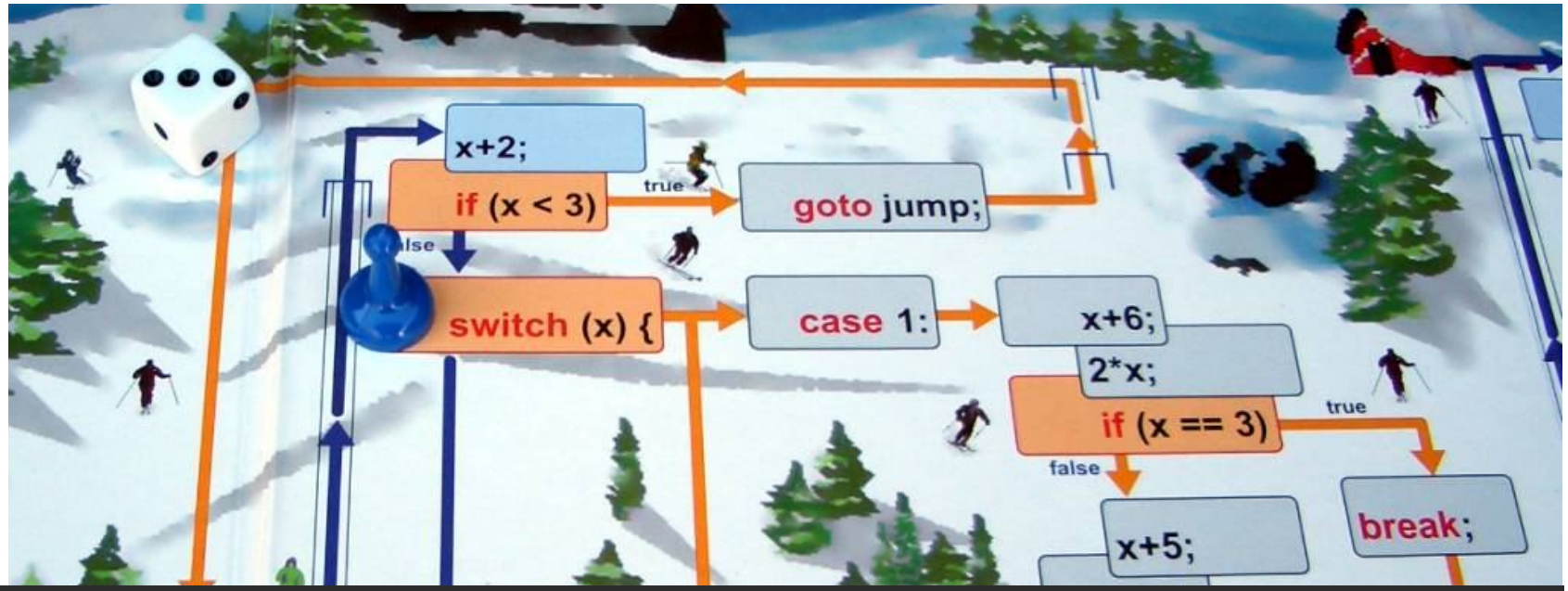


Conditionals and Loops

Instructor: Neng-Hao (Jones) Yu
Time: Mon. 6:10 – 9:10pm
Place: 商院大樓 260509
Course website: http://programming101.cs.nccu.edu.tw

Recaps

- What's the difference between **static mode** and **dynamic mode**?
- How to detect mouse press or key press?
- Boundary detection
- Slow down a bouncing ball
- Press a key to toggle the animation on and off
- Press a rectangle button

Exercise: press mouse to draw

- Requirement:
  - draw a line while mouse pressed
  - stop drawing while mouse released

Boundary detection

```
int x;

void setup() {
  size(300, 300);
  background(255);
  x = width;
}

void draw() {
    background(255);
    ellipse(x, height/2, 10, 10);
    x-=10;
    // move to the right side of the screen
    // when it hits the edge
}
```

Slow down a bouncing ball

- https://github.com/shiffman/LearningProcessing/blob/master/chp05_conditionals/example_5_6_bouncingball/example_5_6_bouncingball.pde
- Why it gets stuck when

```
xpeed = xpeed * -0.9;
```

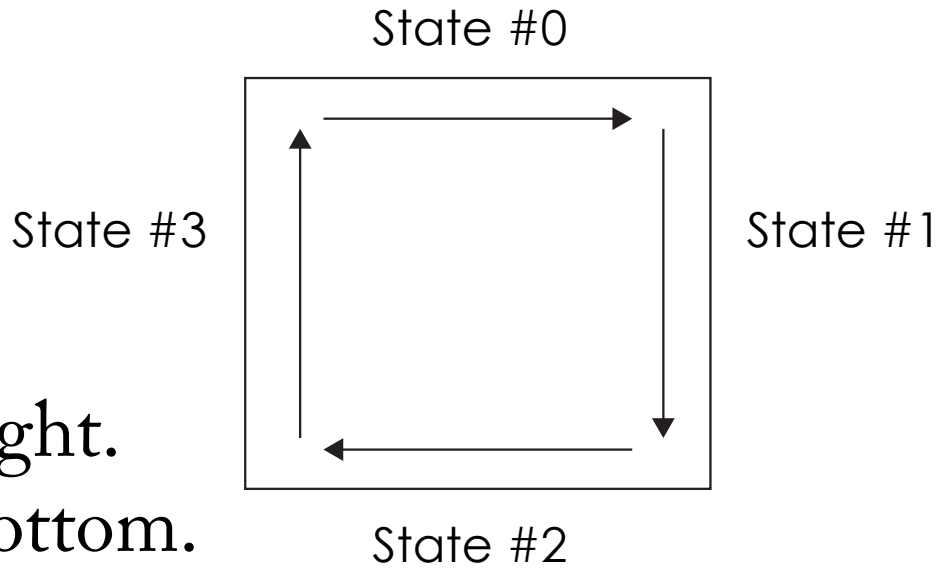
Press a key to toggle the animation

- start from Boundary detection and add code to pause/start the animation by pressing a key

Press a Button

- Press a button to clear the screen
  - start from previous exercise: mouse drawing

State machine



- State #0: left to right.
- State #1: top to bottom.
- State #2: right to left.
- State #3: bottom to top.

http://www.learningprocessing.com/examples/chapter-5/example-5-8/


?
暂停

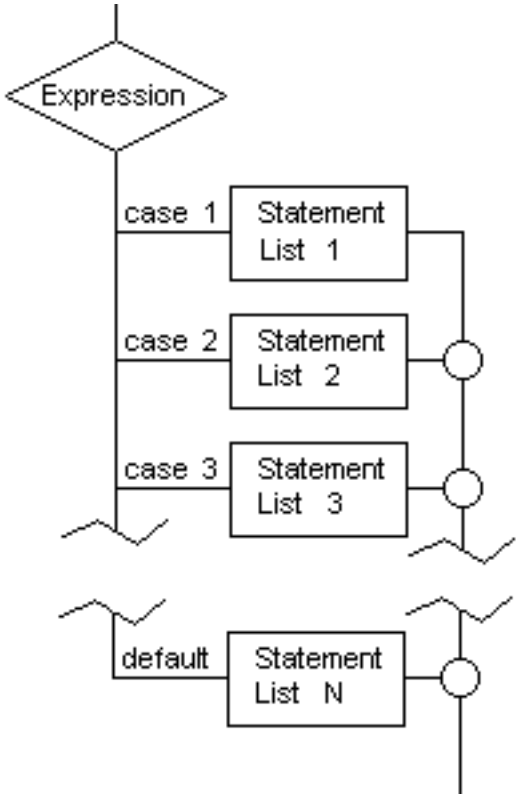
switch statements

```
switch ( expression ) {
        case cond1:
                do something…;
                break;
        case cond2:
                do something…;
                break;
        default:
                do something…;
                break;
}
```

if

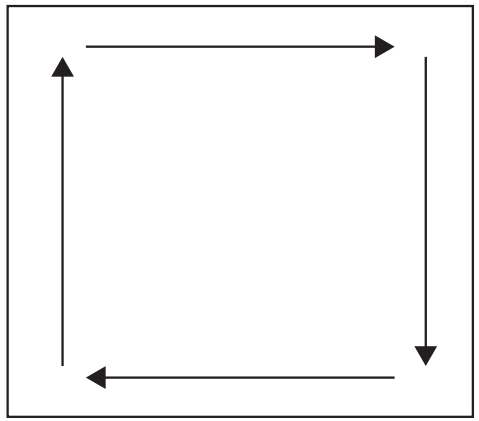
elseif

else



```
char grade = 'B';
    switch(grade){
        case 'A':
            println("Great job - you are getting an A");
            break;
        case 'B':
            println("good job - you are getting a B");
            break;
        case 'C':
            println("average - you are getting a C");
            break;
        case 'D':
            println("work harder - you are getting a D");
            break;
        case 'F':
            println("I'm sorry - you are failing");
            break;
        default:
            println("Invalid data");
            break;
    }
```

Exercise: Square following edge



Rewrite squareEdge.pde with “Switch statement”

5mins

Lottery

```
int rnd;

rnd = (int)random(6)+1;

println(rnd);

switch (rnd){
  case 1:    case 2:    case 3:
      println("win");
      break;
  default:
      println("lose");
}
```

Example: lottery

Keyboard control

```
void keyPressed() {
  if (key == CODED) {
       switch( keyCode )
       {
         case UP:
           ySpeed -= thrustY;
           break;

         case DOWN:
           ySpeed += thrustY;
           break;
       }
  }
}
```

https://gist.github.com/jonesfish/44308c500987d7d93d25

https://gist.github.com/jonesfish/9513b11ef926adec637d

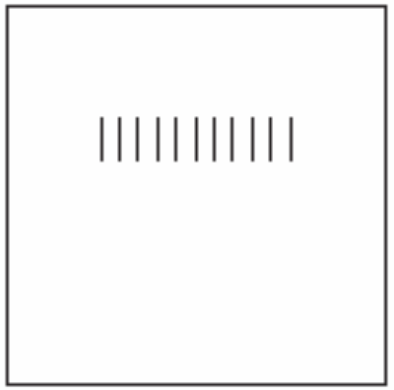
The concept of iteration

- Iteration: something that repeats

- Draw 10 circles on the screen
  - write one statement instead of 10 lines of code

Without Iteration

```
// No variables
stroke(0);
line( 50,60, 50,80);
line( 60,60, 60,80);
line( 70,60, 70,80);
line( 80,60, 80,80);
line( 90,60, 90,80);
line(100,60,100,80);
line(110,60,110,80);
line(120,60,120,80);
line(130,60,130,80);
line(140,60,140,80);
line(150,60,150,80);
```



http://www.learningprocessing.com/examples/chapter-6/example-6-1-many-lines/

Without Iteration

```
// No variables
stroke(0);
line( 50,60, 50,80);
line( 60,60, 60,80);
line( 70,60, 70,80);
line( 80,60, 80,80);
line( 90,60, 90,80);
line(100,60,100,80);
line(110,60,110,80);
line(120,60,120,80);
line(130,60,130,80);
line(140,60,140,80);
line(150,60,150,80);
```

```
// With x variable
int x = 50;
int spacing = 10;

line(x,60,x,80);
x = x + spacing;
line(x,60,x,80);
x = x + spacing;
line(x,60,x,80);
x = x + spacing;
line(x,60,x,80);
x = x + spacing;
line(x,60,x,80);
x = x + spacing;
…
```

http://www.learningprocessing.com/examples/chapter-6/example-6-2/

Using Iteration

- Plan the 'exit' condition:
  When to stop drawing lines
  - x == 150?
  - x > 150?

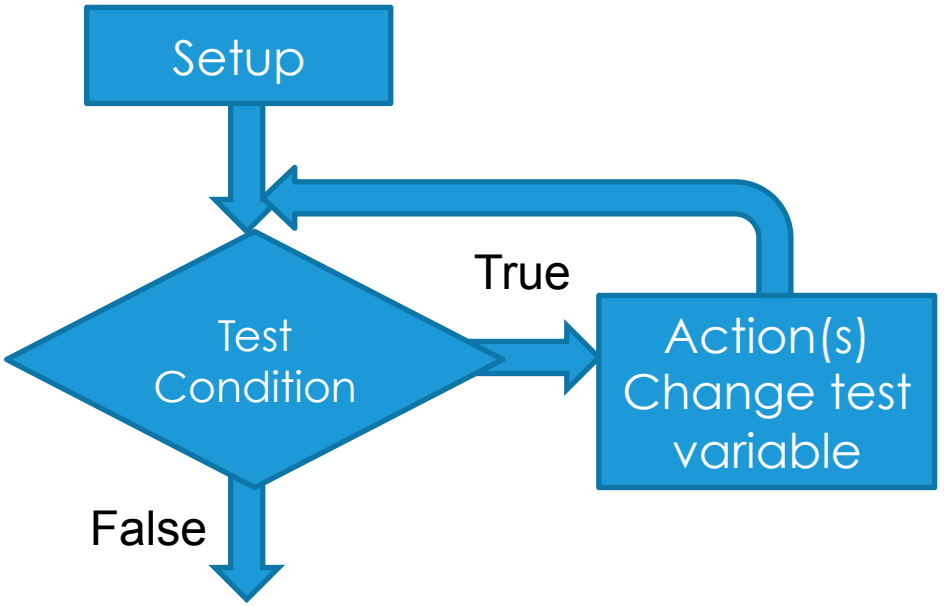
```
// Loop Version
int x = 50;
int spacing = 10;
int endLegs = 150;

while(x <= endLegs) {
   line(x,60,x,80);
   x = x + spacing;
}
```

```
// With x variable
int x = 50;
int spacing = 10;

line(x,60,x,80);
x = x + spacing;
line(x,60,x,80);
x = x + spacing;
line(x,60,x,80);
x = x + spacing;
line(x,60,x,80);
x = x + spacing;
line(x,60,x,80);
x = x + spacing;
...
```

http://www.learningprocessing.com/examples/chapter-6/example-6-3/

How to plan a loop

- Three Parts in every loop:
  - Setup variables
  - Test Condition
  - Change test variable

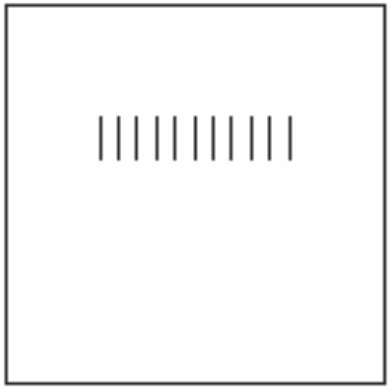


- Make sure the loop will end!
  - The condition should be false at some point…
    - Or you have an ‘infinite’ loop! (not good)

Three Parts of the Loop

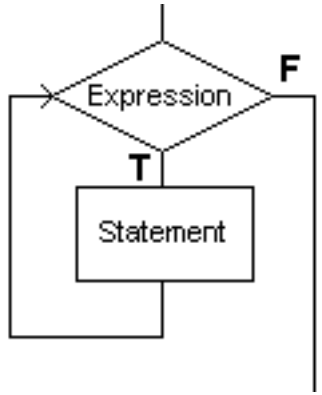
- Find the three parts:
  - Setup
  - Test
  - Change

```
// Loop Version
int x = 50;
int spacing = 10;
int endLegs = 150;

while(x < endLegs) {
   line(x,60,x,80);

   x = x + spacing;
}
```



while loops

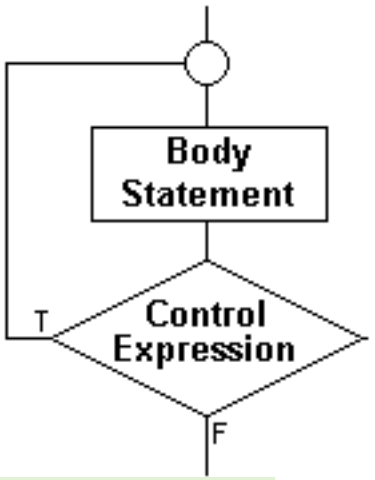
```
while ( expression ) {
        do something;
        // avoid infinite loop!!
}
```




```
int monthInAYear = 1;
while(monthInAYear <= 12) {
    println(monthInAYear);
    monthInAYear ++;
}
```

do..while loops

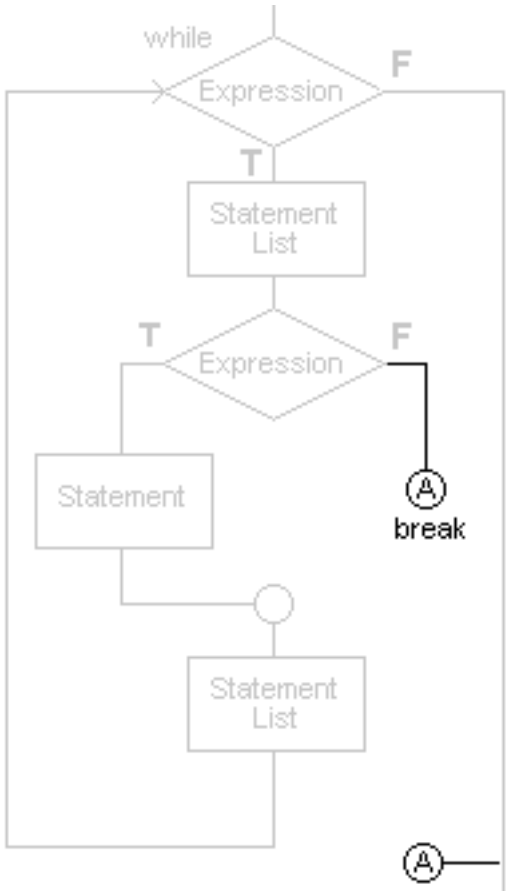
```
do {
        do something;
        // avoid infinite loop!!
} while ( expression );
```




```
int monthInAYear = 1;
do{
    println(monthInAYear);
    monthInAYear++;
}while(monthInAYear <= 12);
```

break

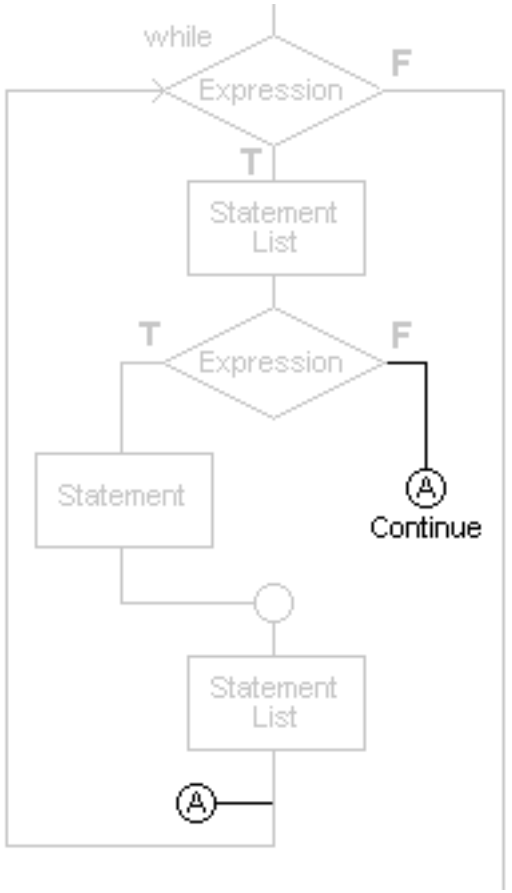
```
int i = 0;
while (i < 10) {
    ++i;
    if (i > 5) {
      break;
    }
    println (i);
 }
```



break_loop

continue

```
int i = 0;
while (i < 10) {
    ++i;
    if (i < 5) {
      continue;
    }
    println ( i );
}
```



Exercise:

- Find odd numbers from 1~10
- output:

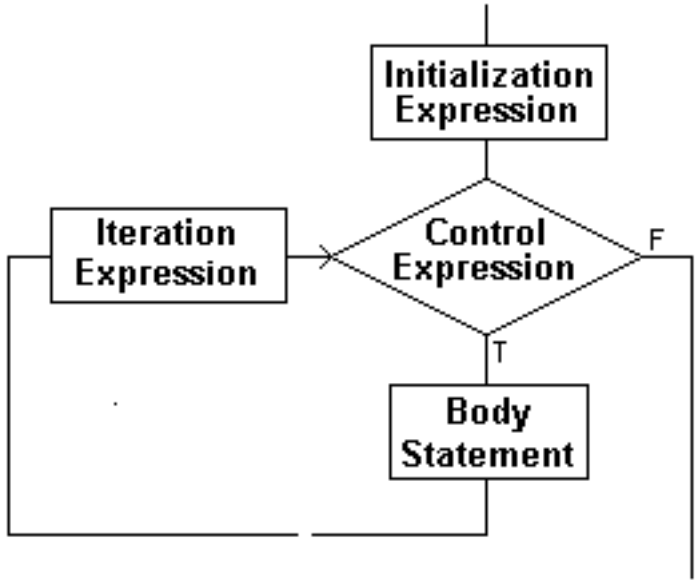
  1 is an odd number.
  3 is an odd number.
  5 is an odd number.
  7 is an odd number.
  9 is an odd number.

Exercise: Graybar

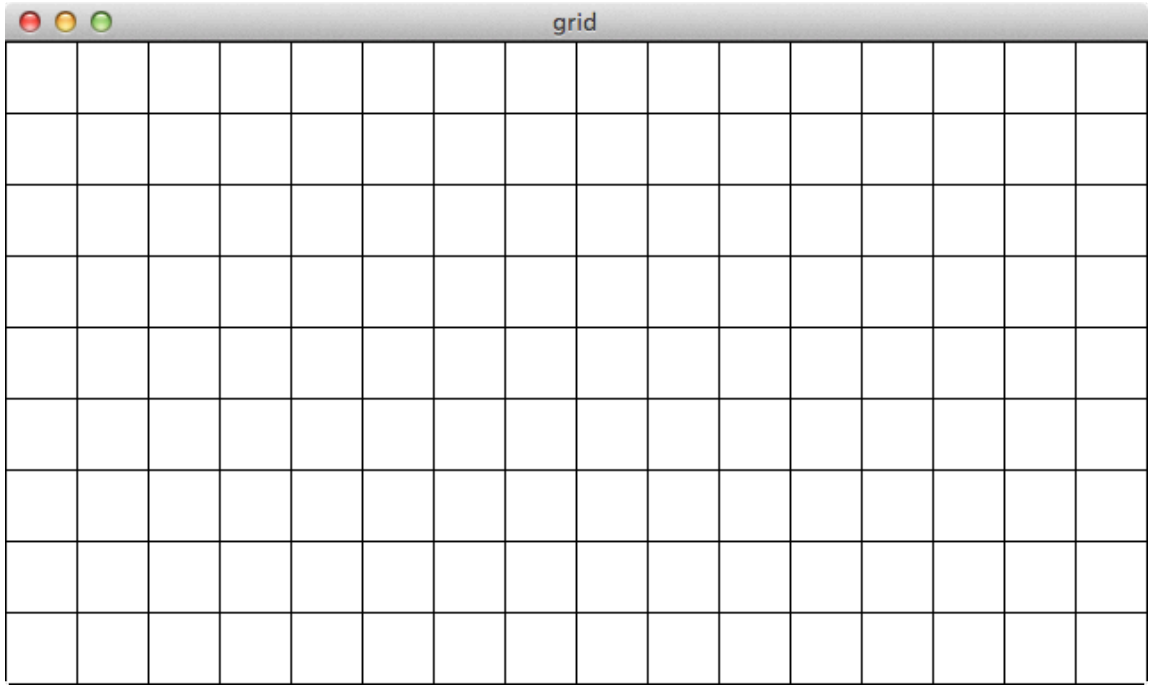
for loops (Iteration)

```
for (setup variable; test condition; change test variable)
{
      do something;
}
```

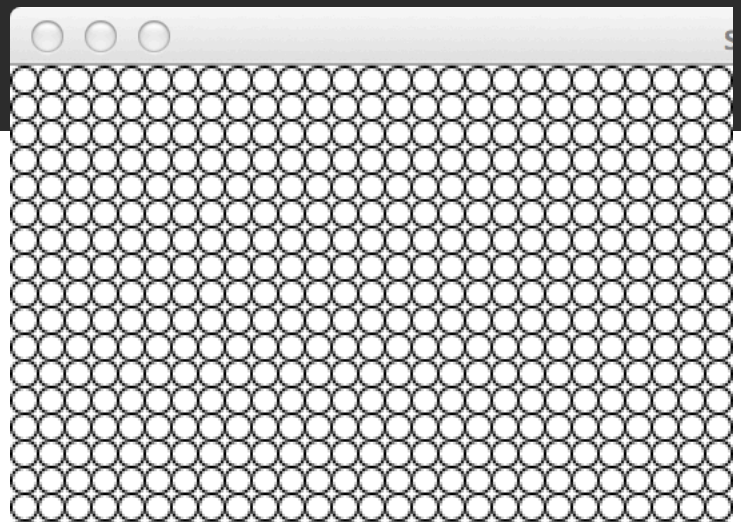
```
for (int i = 0; i <= 10; ++i) {
    if (i % 2 == 1) {
      println(i + " is odd.");
    }
}
```



Exercise: draw a 40x40 grid



Nested loop



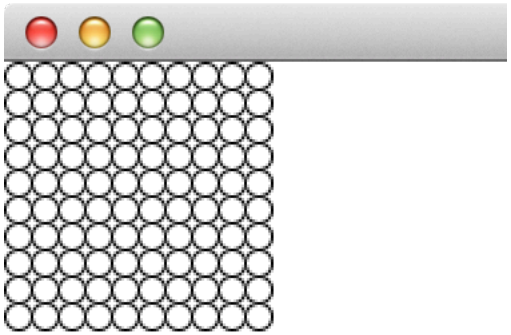
- draw ellipse in each grid

```
size(640,360);
background(255);

int x;
int y;
int spacing = 10;

// How to improve the following code?
for (x = 5; x<=width; x+=spacing){
  ellipse(x,5,10,10);
}
for (y = 5; y<=height; y += spacing) {
  ellipse(5,y,10,10);
}
```

https://gist.github.com/jonesfish/05e79f9e687232ef9aef

Nested loop v2

- draw n*n circles on canvas by given n

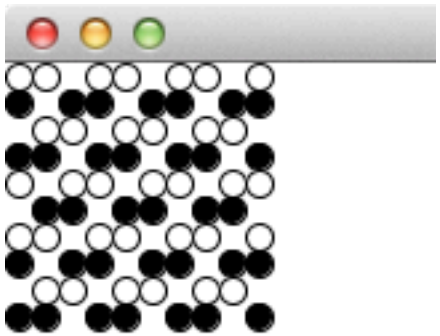


Hint:

```
for (int i = 0; i < n; i++)
```

Group exercise:

- challenge #1:
  - draw 10x10 circles on canvas **with a single loop**
- challenge #2:
  - draw black circles in even row
- challenge #3:
  - skip every third circle



Loop vs draw()

```
int x = 0;

void setup(){
  size(400,300);
  frameRate(10);
}

void draw(){
  while ( x < width){
    ellipse(x,150,15,15);
    x += 10;
  }
}
```

repeat all the time, refresh the screen continuously

repeat at single frame

https://gist.github.com/jonesfish/90b942bc8464cbac45b5

Math

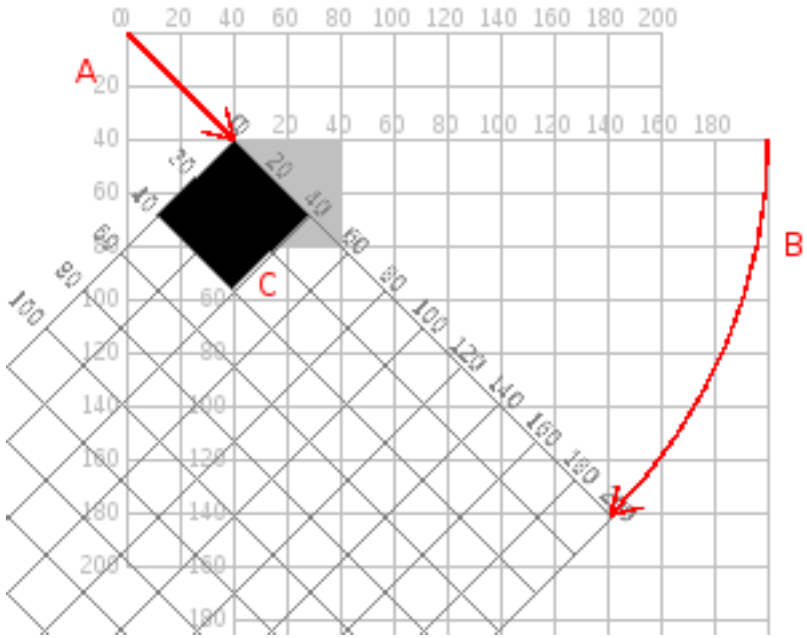
- `abs()`
- `ceil()`
- `floor()`
- `round()`
- `sq()`
- `pow()`
- `min()`
- `max()`
- `norm()`
- `constrain()`
- `map()`
- `dist()`

http://processing.org/reference/

https://gist.github.com/jonesfish/7ab805f1da4f7ba1bf6a

Math

- `translate()`
- `rotate()`
- `scale()`
- `pushMatrix()`
- `popMatrix();`



https://gist.github.com/jonesfish/3e93c7c11b08795654bc

Math

- `radians()`
- `degrees()`
- `sin()`

Exercise (5mins) : draw a sin wave

Prime Number: http://www.jasondavies.com/primos/

- `atan2(y, x)`

https://gist.github.com/jonesfish/1c6b2c76652e8a963f91