Digital Outputs and for loops

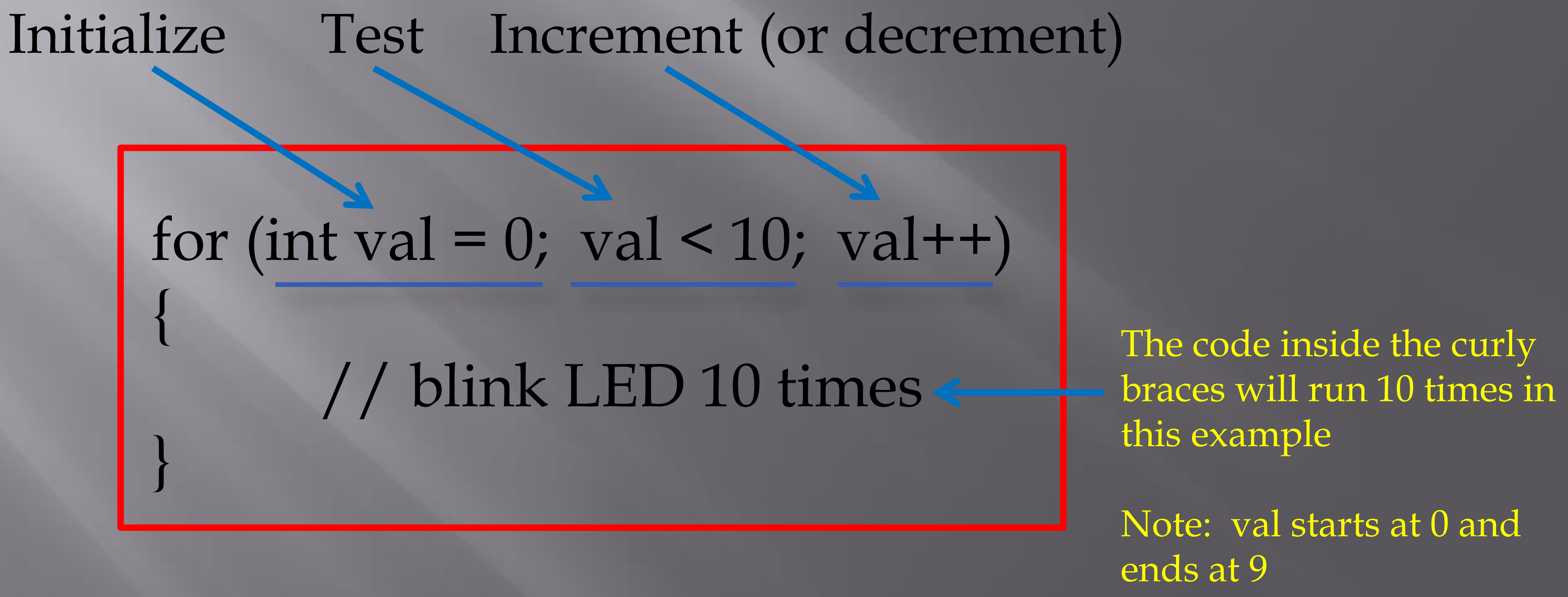
Objectives

- Understand how *for* loops work
- Using variables in *for* loops

Looping Structures: *for loops*

Any time you need to repeat a line or several lines of code the easiest way is to use a *for loop*.

A *for loop* has three main parts:



Initialize Test Increment (or decrement)

```
for (int val = 0;  val < 10;  val++)
{
        // blink LED 10 times
}
```

The code inside the curly braces will run 10 times in this example

Note: val starts at 0 and ends at 9

Looping Structures: *for loops*

Note: The counting variable is usually initialized inside the for loop.

```
for (int val = 0;  val < 10;  val++)
{
        // blink LED 10 times
}
```

This is because the variable is never used outside of the loop
This type of variable is “local” to the function

Looping Structures: *for loops*

```
for (int val = 0;  val < 10;  val++)
{
            // blink LED 10 times
}
```

What this code "says" is:

1. Set variable 'val' initially to zero
2. As long as 'val' is less than a value (10 in this case):
   Run the code inside the curly braces
   if the value is 10, jump past the { } code and continue the program
4. Add one to val, and go to step 2

Example – fast / slow flashing

Example: flash an LED slow 5 times and then fast 10 times.

First, let's setup two variables for the flash rates:

```
int slow = 500;   // 500 milliseconds
int fast = 200;   // 200 milliseconds
```

Next, we'll use two for loops:

```
for (int i=0; i<5; i++)           // loop 5 times
{
    digitalWrite(Led, HIGH);      // Flash code
    delay(slow);
    digitalWrite(Led,LOW);
    delay(slow);
}
for (int i=0; i<10; i++)          // loop 10 times
{
    digitalWrite(Led, HIGH);      // Flash code
    delay(fast);
    digitalWrite(Led,LOW);
    delay(fast);
}
```

The power of using variables

Could we also use variables for the number of times we flash?? Yes!

Now, let’s setup two variables – for the flash rate and # of flashes:

```
int slow = 500;    // 500 milliseconds
int flashes = 5;   // Number of slow flashes

for (int i=0; i< flashes; i++)  // loop 5 times
{
    digitalWrite(Led, HIGH);
    delay(slow);
    digitalWrite(Led,LOW);
    delay(slow);
}
```

Why would we want to do this?

- Using variables instead of fixed values allows us to change the value anywhere we want in the program.
- We will see why this is important later when we learn about functions.

Previous assignment example

```
const int LED1 = 2;     // Assign names for pin #'s
const int LED2 = 3;
const int LED3 = 4;
const int LED4 = 5;

void setup()
{
  pinMode (LED1, OUTPUT);
  pinMode (LED2, OUTPUT);
  pinMode (LED3, OUTPUT);
  pinMode (LED4, OUTPUT);
}

void loop()
{
   for (int i = 2; i <6; i++)          // we can use a simple var name
   {
      digitalWrite(i, HIGH);
      delay(500);
      digitalWrite(i, LOW);
   }
}
```

This code would create this counting sequence:

```
0000
0001
0010
0100
1000
```