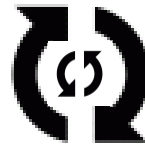
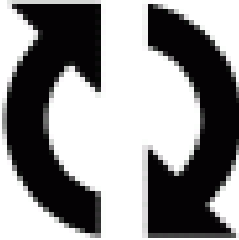


Playing around with the Loops (Nested Loops)

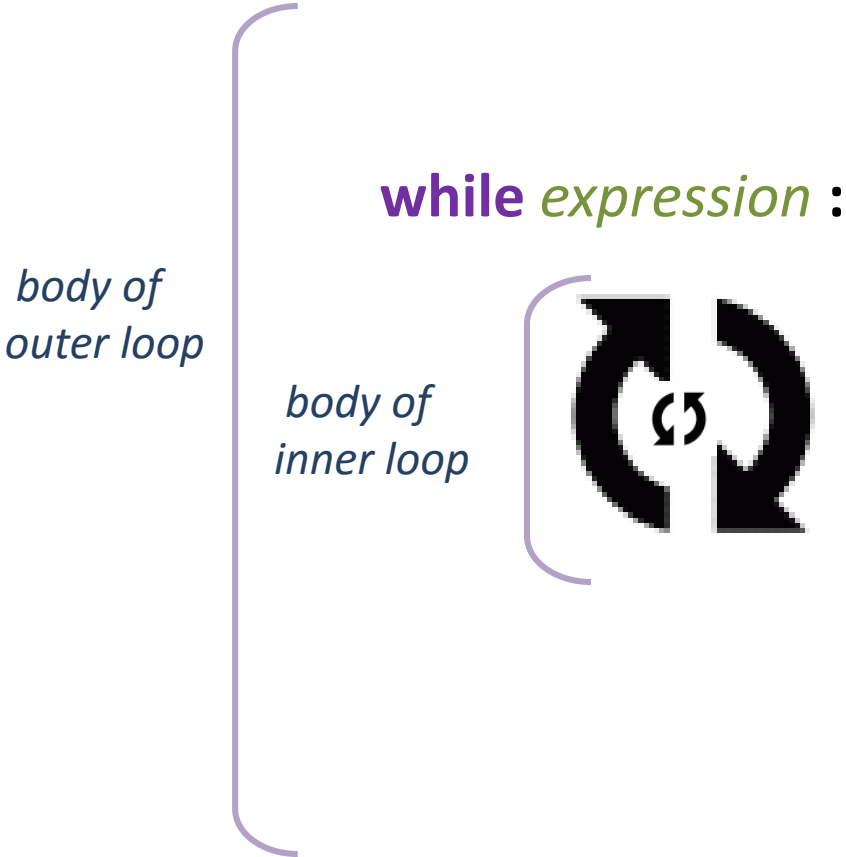


while *expression* :

*body of
outer loop*



while *expression* :



x = 1

while x < 3:

y = 1

while y < 4:

print (x , “ , ” , y)

y = y + 1

print ("end of inner loop ")

x = x + 1

*body of
outer loop*

*body of
inner loop*

→ **x = 1**

while x < 3:

y = 1

while y < 4:

print (x , “ , ” , y)

y = y + 1

print ("end of inner loop ")

x = x + 1

x = 1

→ **while** ⁽¹⁾**x < 3:** True

y = 1

while y < 4:

print (x , “ , ” , y)

y = y + 1

print ("end of inner loop ")

x = x + 1

x = 1

while ⁽¹⁾**x < 3:**

→ **y = 1**

while **y < 4:**

print (**x** , “ , ” , **y**)

y = y + 1

print (“end of inner loop “)

x = x + 1

x = 1

while ⁽¹⁾**x < 3:**

y = 1

→ **while** ⁽¹⁾**y < 4:** True

print (x , “ , ” , y)

y = y + 1

print ("end of inner loop ")

x = x + 1

x = 1

Output:

while ⁽¹⁾**x < 3:**

1, 1

y = 1

while ⁽¹⁾**y < 4:**

→ **print** (⁽¹⁾**x**, “,” , ⁽¹⁾**y**)

y = y + 1

print ("end of inner loop ")

x = x + 1

x = 1

Output:

while ⁽¹⁾**x < 3:**

1, 1

y = 1

while ⁽¹⁾**y < 4:**

print (⁽¹⁾**x**, “,” , ⁽¹⁾**y**)

→ **y =** ^(1 + 1)**y + 1**

print ("end of inner loop ")

x = x + 1

x = 1

Output:

while ⁽¹⁾**x < 3:**

1, 1

y = 1

while **y < 4:**

print (**x** , “ , ” , **y**)

⁽²⁾ ← (1 + 1)
→ **y = y + 1**

print ("end of inner loop ")

x = x + 1

x = 1

Output:

while ⁽¹⁾ **x < 3:**

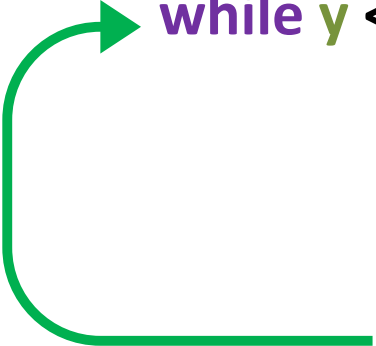
1, 1

y = 1

while **y < 4:**

print (x , “ , ” , y)

⁽²⁾ **y = y + 1**



print ("end of inner loop ")

x = x + 1

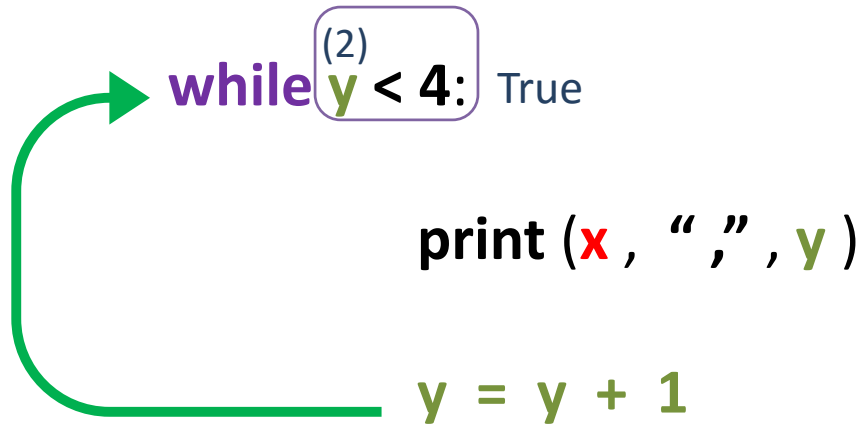
x = 1

Output:

while ⁽¹⁾ **x < 3:**

1, 1

y = 1



print ("end of inner loop ")

x = x + 1

x = 1

Output:

while ⁽¹⁾**x < 3:**

1, 1

1, 2

y = 1

while ⁽²⁾**y < 4:**

→ **print** (⁽¹⁾**x**, “,” , ⁽²⁾**y**)

y = y + 1

print ("end of inner loop ")

x = x + 1

x = 1

Output:

while ⁽¹⁾**x < 3:**

1, 1

1, 2

y = 1

while ⁽²⁾**y < 4:**

print (⁽¹⁾**x**, “,” , ⁽²⁾**y**)

→ **y =** ^(2 + 1)**y + 1**

print ("end of inner loop ")

x = x + 1

x = 1

Output:

while ⁽¹⁾**x < 3:**

1, 1

1, 2

y = 1

while **y < 4:**

print (**x** , “ , ” , **y**)

⁽³⁾ ← (2 + 1)
→ **y = y + 1**

print ("end of inner loop ")

x = x + 1

x = 1

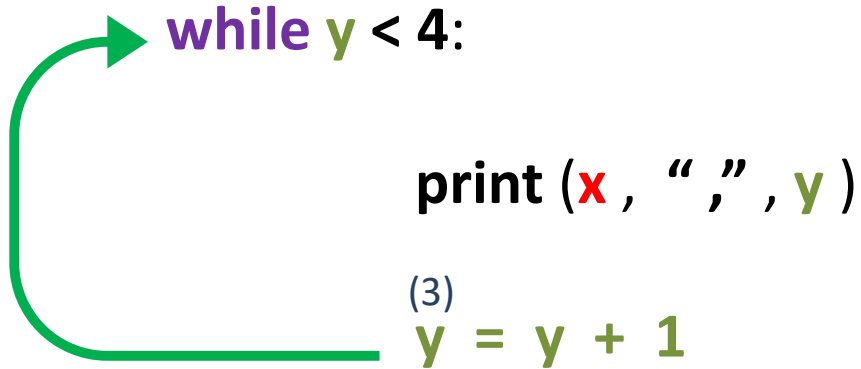
Output:

while ⁽¹⁾ **x < 3:**

1, 1

1, 2

y = 1



print ("end of inner loop ")

x = x + 1

x = 1

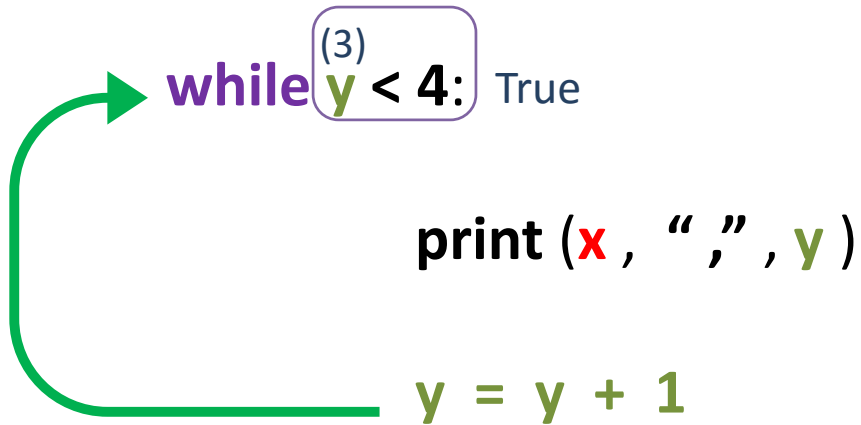
Output:

while ⁽¹⁾ **x < 3:**

1, 1

1, 2

y = 1



print ("end of inner loop ")

x = x + 1

x = 1

while ⁽¹⁾**x < 3:**

y = 1

while ⁽³⁾**y < 4:**

→ **print** (⁽¹⁾**x**, “,” , ⁽³⁾**y**)

y = y + 1

print ("end of inner loop ")

x = x + 1

Output:

1, 1

1, 2

1, 3

x = 1

while ⁽¹⁾**x < 3:**

y = 1

while ⁽³⁾**y < 4:**

print ⁽¹⁾**(x, “,” ,** ⁽³⁾**y)**

→ y = ^(3 + 1)**y + 1**

print ("end of inner loop ")

x = x + 1

Output:

1, 1

1, 2

1, 3

x = 1

while ⁽¹⁾**x < 3:**

y = 1

while y < 4:

print (x , “ , ” , y)

⁽⁴⁾ ← (3 + 1)
→ **y = y + 1**

print ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

x = 1

while ⁽¹⁾ **x < 3:**

y = 1

while **y < 4:**



print (**x** , " , " , **y**)

⁽⁴⁾ **y = y + 1**

print ("end of inner loop ")

x = x + 1

Output:

1 , 1

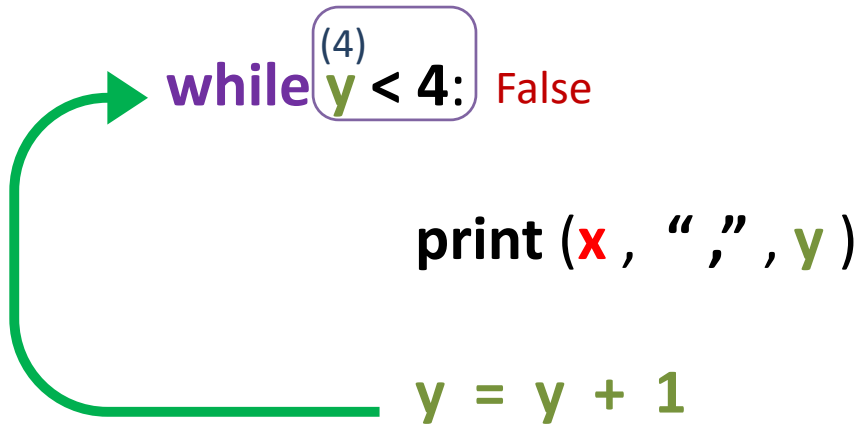
1 , 2

1 , 3

x = 1

while ⁽¹⁾ **x < 3:**

y = 1



print ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

x = 1

while ⁽¹⁾ **x < 3:**

y = 1

while ⁽⁴⁾ **y < 4:** False

~~**print (x , " , y)**~~

~~**y = y + 1**~~

print ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

x = 1

while ⁽¹⁾**x < 3:**

y = 1

while y < 4:

print (x , “ , ” , y)

y = y + 1

→ **print ("end of inner loop ")**

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

x = 1

while ⁽¹⁾**x < 3:**

y = 1

while y < 4:

print (x , “ , ” , y)

y = y + 1

print ("end of inner loop ")

→ x = x + 1
^(1 + 1)

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

x = 1

while ⁽¹⁾ **x < 3:**

y = 1

while y < 4:

print (x , “ , ” , y)

y = y + 1

print ("end of inner loop ")

→ ⁽²⁾ **x = x + 1**

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

x = 1

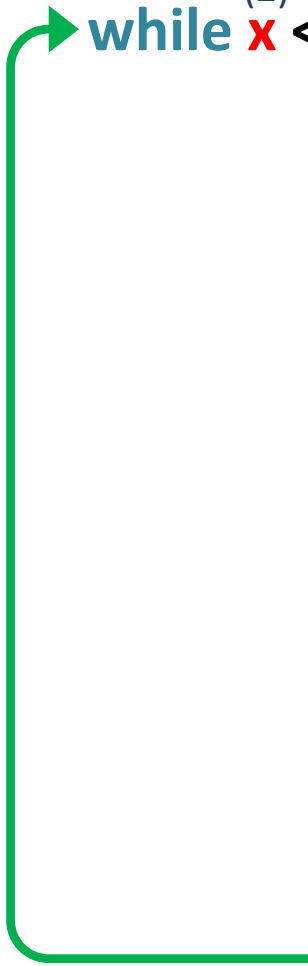
Output:

1 , 1

1 , 2

1 , 3

end of inner loop



```
while x < 3:  
    y = 1  
    while y < 4:  
        print (x , " , " , y )  
        y = y + 1  
    print ( "end of inner loop " )  
    x = x + 1
```

x = 1

→ **while** ⁽²⁾ **x < 3:** True

y = 1

while y < 4:

print (x , “ , ” , y)

y = y + 1

print ("end of inner loop ")

⁽²⁾
x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

x = 1

while ⁽²⁾ **x < 3:**

→ **y = 1**

while **y < 4:**

print (**x** , “ , ” , **y**)

y = y + 1

print ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

x = 1

while ⁽²⁾ **x < 3:**

y = 1

→ **while** ⁽¹⁾ **y < 4:** True

print (x , “ , ” , y)

y = y + 1

print ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

x = 1

while ⁽²⁾**x < 3:**

y = 1

while ⁽¹⁾**y < 4:**

→ **print** (⁽²⁾**x**, “,” , ⁽¹⁾**y**)

y = y + 1

print ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

x = 1

while ⁽²⁾**x < 3:**

y = 1

while ⁽¹⁾**y < 4:**

print (⁽²⁾**x**, “,” , ⁽¹⁾**y**)

→ y = ^(1 + 1)**y + 1**

print (“end of inner loop “)

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

x = 1

while ⁽²⁾**x < 3:**

y = 1

while y < 4:

print (x , “ , ” , y)

⁽²⁾ ← (1 + 1)
→ **y = y + 1**

print ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

x = 1

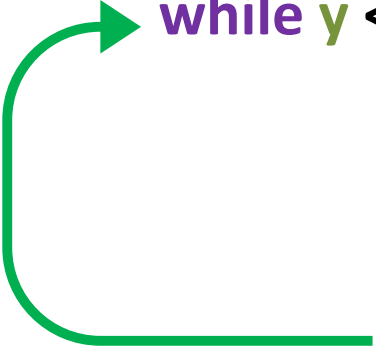
while ⁽²⁾ **x < 3:**

y = 1

while **y < 4:**

print (**x** , “ , ” , **y**)

⁽²⁾ **y = y + 1**



print ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

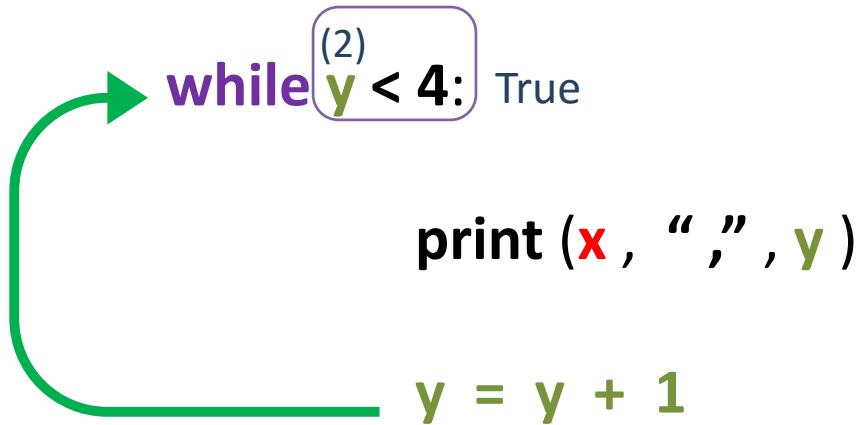
end of inner loop

2 , 1

x = 1

while ⁽²⁾**x < 3:**

y = 1



print ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

x = 1

while ⁽²⁾**x < 3:**

y = 1

while ⁽²⁾**y < 4:**

→ print ⁽²⁾**(x, “,” ,** ⁽²⁾**y)**

y = y + 1

print ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

2 , 2

x = 1

while ⁽²⁾**x < 3:**

y = 1

while ⁽²⁾**y < 4:**

print (⁽²⁾**x**, “,” , ⁽²⁾**y**)

→ y = ^(2 + 1)**y + 1**

print (“end of inner loop “)

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

2 , 2

x = 1

while ⁽²⁾ **x < 3:**

y = 1

while y < 4:

print (x , “ , ” , y)

⁽³⁾ ← (2 + 1)
→ **y = y + 1**

print ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

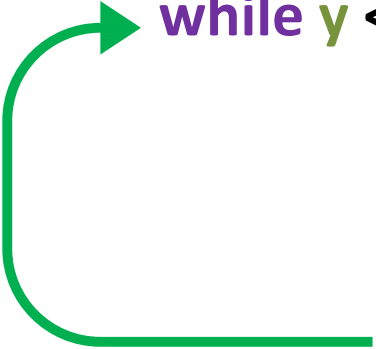
2 , 2

x = 1

while ⁽²⁾ **x < 3:**

y = 1

while **y < 4:**



print (**x** , “ , ” , **y**)

⁽³⁾ **y = y + 1**

print (“end of inner loop “)

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

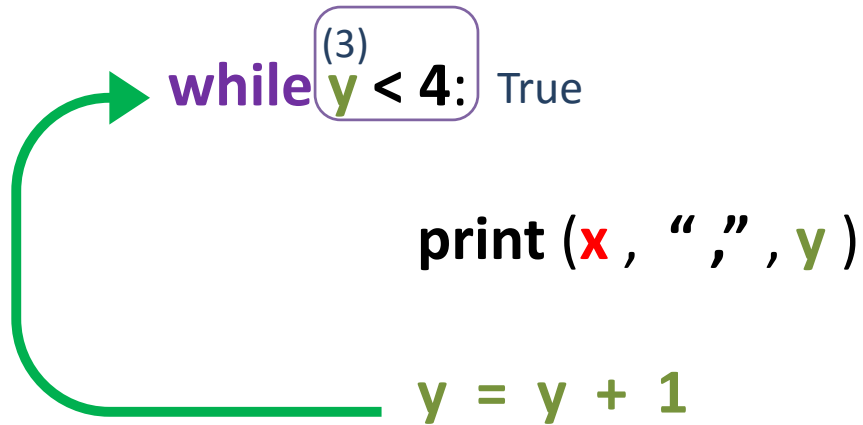
2 , 1

2 , 2

x = 1

while ⁽²⁾ **x < 3:**

y = 1



print ("end of inner loop ")

x = x + 1

Output:

1 , 1
1 , 2
1 , 3
end of inner loop
2 , 1
2 , 2

x = 1

while ⁽²⁾**x < 3:**

y = 1

while ⁽³⁾**y < 4:**

→ **print** (⁽²⁾**x**, “,” , ⁽³⁾**y**)

y = y + 1

print ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

2 , 2

2 , 3

x = 1

while ⁽¹⁾**x < 3:**

y = 1

while ⁽³⁾**y < 4:**

print ⁽²⁾**(x, “,” ,** ⁽³⁾**y)**

→ y = ^(3 + 1)**y + 1**

print ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

2 , 2

2 , 3

x = 1

while ⁽²⁾ **x < 3:**

y = 1

while y < 4:

print (x , “ , ” , y)

⁽⁴⁾ ← (3 + 1)
→ **y = y + 1**

print ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

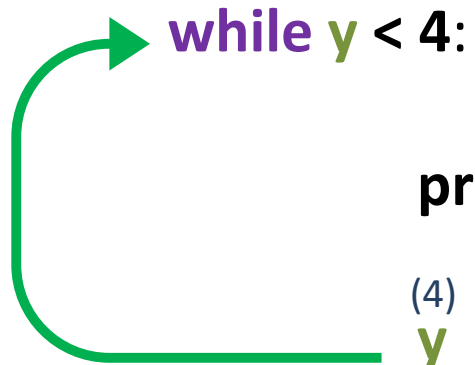
2 , 2

2 , 3

x = 1

while ⁽²⁾ **x < 3:**

y = 1



print (**x** , “ , ” , **y**)

⁽⁴⁾ **y = y + 1**

print (“end of inner loop “)

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

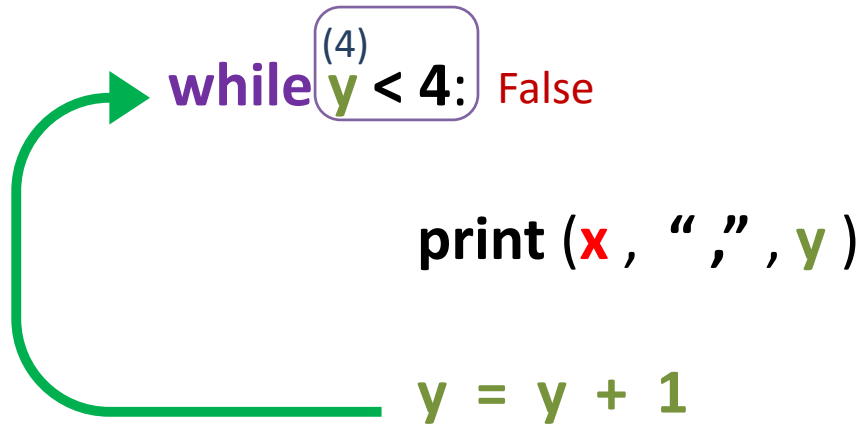
2 , 2

2 , 3

x = 1

while ⁽²⁾ **x < 3:**

y = 1



print ("end of inner loop ")

x = x + 1

Output:

1 , 1
1 , 2
1 , 3
end of inner loop
2 , 1
2 , 2
2 , 3

x = 1

while ⁽²⁾ **x < 3:**

y = 1

while ⁽⁴⁾ **y < 4:** False

~~**print (x , " , y)**~~

~~**y = y + 1**~~

print ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

2 , 2

2 , 3

x = 1

while ⁽²⁾ **x < 3:**

y = 1

while **y < 4:**

print (**x** , “ , ” , **y**)

y = y + 1

→ **print** ("end of inner loop ")

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

2 , 2

2 , 3

end of inner loop

x = 1

while ⁽²⁾ **x < 3:**

y = 1

while **y < 4:**

print (**x** , “ , ” , **y**)

y = y + 1

print ("end of inner loop ")

^(2 + 1)
x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

2 , 2

2 , 3

end of inner loop

x = 1

while ⁽²⁾ **x < 3:**

y = 1

while **y < 4:**

print (**x** , “ , ” , **y**)

y = y + 1

print ("end of inner loop ")

(3) ← (2 + 1)
x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

2 , 2

2 , 3

end of inner loop

x = 1

while ⁽³⁾ **x < 3:**

y = 1

while **y < 4:**

print (**x** , " , " , **y**)

y = y + 1

print ("end of inner loop ")

⁽³⁾ **x = x + 1**

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

2 , 2

2 , 3

end of inner loop

x = 1

while ⁽³⁾ **x < 3:** False

y = 1

while **x < 4:**

print **“,” , y)**

1

print **end of inner loop “)**

x = x + 1

Output:

1 , 1

1 , 2

1 , 3

end of inner loop

2 , 1

2 , 2

2 , 3

end of inner loop