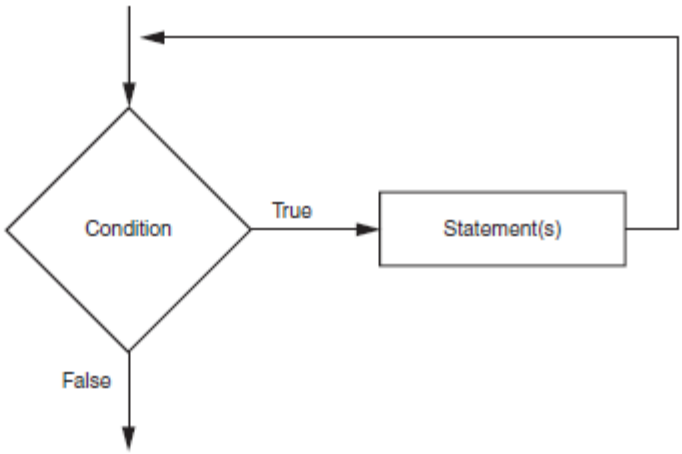
Week 3: Loops and Iterations

1. The while Loop: A Condition-Controlled Loop

A condition-controlled loop causes a statement or set of statements to repeat as long as a condition is true. In Python you use the *while* statement to write a condition-controlled loop. The while loop gets its name from the way it works: while a condition is true, do some task. The loop has two parts: (1) a condition that is tested for a true or false value, and (2) a statement or set of statements that is repeated as long as the condition is true. Figure 5-1 shows the logic of a while loop.

Figure The logic of a `while` loop



The general format of the while loop in Python:
while condition:
statement
statement
etc.

Using while loop with a condition

Print numbers from 1 to 5

```
# Print numbers from 1 to 5
count = 1
while count <= 5:
    print(f"Count: {count}")
    count += 1
```

Count: 1
Count: 2
Count: 3
Count: 4
Count: 5

while loop with else

Check if a number is prime

```
# Check if a number is prime
num = int(input("Enter a number: "))
divisor = 2

while divisor < num:
    if num % divisor == 0:
        print(f"{num} is not a prime number.")
        break
    divisor += 1
else:
    print(f"{num} is a prime number.")
```

Enter a number: 7

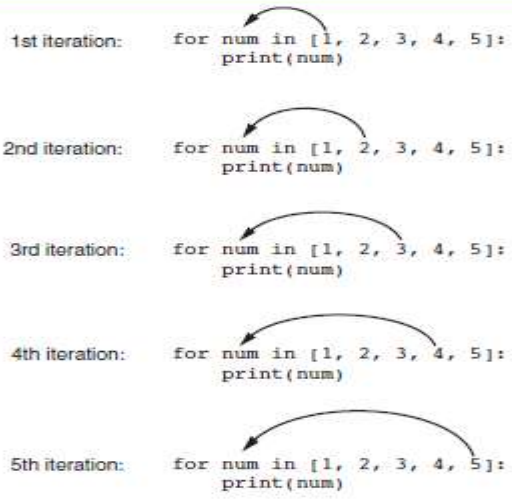
7 is a prime number.

2. The for Loop: A Count-Controlled Loop

A count-controlled loop iterates a specific number of times. In Python you use the for statement to write a count-controlled loop.
The general format:
for variable in [value1, value2, etc.]:
statement
statement
etc.

Using for loop with conditional checks

Figure The for loop



```
count = 1
for count in range(1, 6):
    print(f"Count: {count}")
```

Count: 1
Count: 2
Count: 3
Count: 4
Count: 5

```
for i in range(5, 0, -1):
  print(i)
```

5
4
3
2
1

```
for i in range(5):
  print(5 - i)
```

5
4
3
2
1

```
# Print only even numbers from 1 to 10
for num in range(1, 11):
    if num % 2 == 0:
        print(f"Even number: {num}")
```

Even number: 2
Even number: 4
Even number: 6
Even number: 8
Even number: 10

3. Using break and continue for conditional checks

#Find the First Divisible Number (Using break)

```
# Find the first number divisible by 7 in a range
for num in range(1, 21):
    if num % 7 == 0:
        print(f"The first number divisible by 7 is
{num}.")
        break
```

The first number divisible by 7 is 7.

#Skip Odd Numbers (Using continue)
Print only even numbers between 1 and 10

```
# Print only even numbers between 1 and 10
for num in range(1, 11):
    if num % 2 != 0:
        continue
    print(f"Even number: {num}")
```

Even number: 2
Even number: 4
Even number: 6
Even number: 8
Even number: 10

#Skip Specific Numbers (Using continue)
Skip printing the numbers 3 and 6

```
# Skip printing the numbers 3 and 6
for num in range(1, 10):
    if num == 3 or num == 6:
        continue
    print(f"Number: {num}")
```

Number: 1
Number: 2
Number: 4
Number: 5
Number: 7
Number: 8
Number: 9

```
# Skip printing the numbers 3 and 6 and 9
for num1 in range(1, 11):
    if num1 % 3 == 0:
     continue
    print(f"Number:{num1}")
```

Number:1
Number:2
Number:4
Number:5
Number:7
Number:8
Number:10

#Find Prime Numbers (Using break)
Check for prime numbers in a range

```
# Check for prime numbers in a range
for num in range(2, 20):
    is_prime = True
    for i in range(2, int(num ** 0.5) + 1):
        if num % i == 0:
            is_prime = False
            break
    if is_prime:
        print(f"{num} is a prime number.")
```

2 is a prime number.
3 is a prime number.
5 is a prime number.
7 is a prime number.
11 is a prime number.
13 is a prime number.
17 is a prime number.
19 is a prime number.

Print a right-angled triangle pattern

```
# Print a right-angled triangle pattern
rows = 5
for i in range(1, rows + 1):
   for j in range(1, i + 1):
      print("*", end="")
   print()  # New line
```

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Factorial Using for Loop

```
# Factorial calculation using a for loop
number = int(input("Enter a number: "))

if number < 0:
    print("Factorial is not defined for negative numbers.")
else:
    factorial = 1
    for i in range(1, number + 1):
        factorial *= i
    print(f"The factorial of {number} is {factorial}.")
```

Enter a number: 5
The factorial of 5 is 120.

Factorial Using while Loop

```
# Factorial calculation using a while loop
number = int(input("Enter a number: "))

if number < 0:
    print("Factorial is not defined for negative numbers.")
else:
    factorial = 1
    i = 1
    while i <= number:
        factorial *= i
        i += 1
    print(f"The factorial of {number} is {factorial}.")
```

Enter a number: 5
The factorial of 5 is 120.