Python Fundamentals: A Comprehensive Guide

1. Strings

Explanation: Strings are sequences of characters used to represent text. They are immutable, meaning their values cannot be changed once assigned.

Example:

Python

```python
greeting = "Hello"
name = "Alice"
full_greeting = greeting + ", " + name + "!"

# String methods:
print(full_greeting.lower())  # Converts to lowercase
print(full_greeting.upper())  # Converts to uppercase
print(full_greeting.replace("Alice", "Bob"))  # Replaces "Alice" with
"Bob"
```

2. Program Design and Development

Explanation: Program design involves planning the structure and flow of a program. Development involves translating the design into code, testing, and debugging.

Example:

Python

```python
def celsius_to_fahrenheit(celsius):
    return (celsius * 9/5) + 32

def categorize_temperature(fahrenheit):
    if fahrenheit > 86:
```

```python
        return "Hot"
    elif fahrenheit < 50:
        return "Cold"
    else:
        return "Moderate"

temperature_celsius = 30
temperature_fahrenheit = celsius_to_fahrenheit(temperature_celsius)
category = categorize_temperature(temperature_fahrenheit)

print(f"Temperature: {temperature_fahrenheit}°F - Category: {category}")
```

3. Iteration

Explanation: Iteration allows us to repeat actions in a program. for and while loops are commonly used for this purpose.

Example:

Python

```python
# Using a for loop:
fruits = ["apple", "banana", "cherry"]
for fruit in fruits:
    print("I like", fruit)

# Using a while loop:
countdown = 5
while countdown > 0:
    print("Countdown:", countdown)
    countdown -= 1
```

4. Conditionals

Explanation: Conditionals allow us to make decisions in a program based on certain conditions. if, elif, and else statements are used for this purpose.

Example:

Python

```python
age = 20
if age >= 18:
    print("You are an adult.")
elif age >= 13:
    print("You are a teenager.")
else:
    print("You are a child.")
```

5. Lists

Explanation: Lists are ordered collections of items. They are mutable, meaning their elements can be changed.

Example:

Python

```python
numbers = [5, 3, 8, 1]
numbers.append(10)   # Adds 10 to the list
numbers.remove(3)    # Removes the first occurrence of 3
numbers.sort()    # Sorts the list in ascending order
print(numbers)    # Output: [1, 5, 8, 10]
```

6. Nested Conditionals

Explanation: Nested conditionals occur when an if statement is inside another if statement.

Example:

Python

```python
temperature = 30
humidity = 80

if temperature > 25:
    if humidity > 70:
        print("It's hot and humid.")
    else:
```

```
        print("It's hot but not humid.")
else:
    print("It's not hot.")
```

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