Lecture 1: Introduction to Python and Variables

Part 1: Introduction to Python (30 minutes)

1. **Overview of Python**:
    - What is Python?
    - History of Python
    - Applications of Python
    - Features of Python
2. **Setting up the Development Environment**:
    - Installing Python (Windows)
    - Setting up Jupyter Notebooks
3. **Running Python Code**:
    - Using the Python interactive shell
    - Writing and executing Python scripts

Example Code:

```
# Running Python code in the interactive shell
print("Hello, World!")

# Saving Python code in a script (hello.py)
print("Hello, World!")
```

Part 2: Variables and Data Types (45 minutes)

1. **Variables**:
    - Definition and importance of variables
    - Rules for naming variables
    - Assigning values to variables
2. **Basic Data Types**:
    - Integers
    - Floats
    - Strings
    - Booleans
3. **Type Checking and Type Conversion**:
    - Checking the type of a variable using `type()`
    - Converting between data types (int, float, str)

Example Code:

```
# Variables and assignment
x = 5
y = 3.14
name = "Alice"
is_student = True

# Checking types
print(type(x))  # Output: <class 'int'>
print(type(y))  # Output: <class 'float'>
print(type(name))  # Output: <class 'str'>
print(type(is_student))  # Output: <class 'bool'>

# Type conversion
a = "123"
b = int(a)
print(type(b))  # Output: <class 'int'>
```

Exercises:

1. Create variables of different types and print their values and types.
2. Convert a float to an integer and observe the result.
3. Write a script that takes a user's name as input and prints a greeting.

Part 3: Basic Input and Output (30 minutes)

1. **Basic Output**:
    - Using the `print()` function
    - Printing multiple items
    - Using separators and end characters
2. **Basic Input**:
    - Using the `input()` function
    - Converting input data to the required type

Example Code:

```
# Basic output
print("Hello, World!")
print("Hello", "World", sep=", ", end="!\n")

# Basic input
```

```
name = input(“Enter your name”)
print("Hello, " + name)

# Converting input data
age = input("Enter your age: ")
age = int(age)
print(f"Next year, you will be {age + 1} years old.")
```
print(age)

Exercises:

1. Write a script that takes two numbers as input and prints their sum.
2. Write a script that asks the user for their favorite color and prints a message including their input.

Part 4: Type Conversion and Operations (45 minutes)

1. **Type Conversion**:
    - Implicit type conversion
    - Explicit type conversion
2. **Basic Operations**:
    - Arithmetic operations (+, -, *, /, %, //, **)
    - Comparison operations (==, !=, >, <, >=, <=)
    - Logical operations (and, or, not)

Example Code:

```
# Implicit type conversion
result = 5 + 3.14
print(result)  # Output: 8.14

# Explicit type conversion
num_str = "123"
num_int = int(num_str)
print(num_int + 1)  # Output: 124

# Arithmetic operations
a = 10
b = 3
print(a + b)  # Output: 13
print(a - b)  # Output: 7
print(a * b)  # Output: 30
```

```
a = 10
b = 3

print(a / b)
print(a % b)  # Output: 1
print(a // b)  # Output: 3
print(a ** b)  # Output: 1000

# Comparison operations
print(a == b)  # Output: False
print(a != b)  # Output: True
print(a > b)  # Output: True
print(a < b)  # Output: False
print(a >= b)  # Output: True
print(a <= b)  # Output: False

# Logical operations
x = True
y = False
print(x and y)  # Output: False
print(x or y)  # Output: True
print(not x)  # Output: False
```

Exercises:

1. Write a script that converts a temperature from Celsius to Fahrenheit.

Celsius to Fahrenheit formula is

$°F = °C \times (9/5) + 32.$

2. Create a script that asks the user for two numbers and prints the result of various arithmetic operations on them.
3. Write a program that compares two user inputted numbers and prints the result of each comparison operation.

Part 5: Putting It All Together (30 minutes)

1. **Comprehensive Example**:
    - Write a complete program that incorporates variables, input, output, type conversion, and basic operations

Comprehensive Example Code:

```
# Comprehensive example program

# Greet the user
name = input("Enter your name: ")
print(f"Hello, {name}!")

# Ask for age and calculate next year's age
age = input("Enter your age: ")
age = int(age)
print(f"Next year, you will be {age + 1} years old.")

# Ask for two numbers and perform arithmetic operations
num1 = float(input("Enter the first number: "))
num2 = float(input("Enter the second number: "))

sum_result = num1 + num2
diff_result = num1 - num2
prod_result = num1 * num2
div_result = num1 / num2
mod_result = num1 % num2

print(f"The sum of {num1} and {num2} is {sum_result}.")
print(f"The difference between {num1} and {num2} is {diff_result}.")
print(f"The product of {num1} and {num2} is {prod_result}.")
print(f"The division of {num1} by {num2} gives {div_result}.")
print(f"The remainder when {num1} is divided by {num2} is
{mod_result}.")
```