Welcome to the CoGrammar Skills Bootcamp: Logical Programming - Operators

The session will start shortly...

Questions? Drop them in the chat. We'll have dedicated moderators answering questions.

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Cyber Security Session Housekeeping

- The use of disrespectful language is prohibited in the questions, this is a supportive, learning environment for all - please engage accordingly. **(Fundamental British Values: Mutual Respect and Tolerance)**
- No question is daft or silly - **ask them!**
- There are **Q&A sessions** midway and at the end of the session, should you wish to ask any follow-up questions. Moderators are going to be answering questions as the session progresses as well.
- If you have any questions outside of this lecture, or that are not answered during this lecture, please do submit these for upcoming Academic Sessions. You can submit these questions here: **Questions**

Cyber Security Session Housekeeping cont.

- For all **non-academic questions**, please submit a query: www.hyperiondev.com/support

- We would love your **feedback** on lectures: Feedback on Lectures

- Find all the lecture **content** in you Lecture Backpack on GitHub.

Safeguarding & Welfare

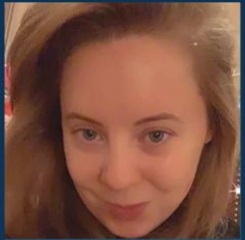
We are committed to all our students and staff feeling safe and happy; we want to make sure there is always someone you can turn to if you are worried about anything.

If you are feeling upset or unsafe, are worried about a friend, student or family member, or you feel like something isn't right, speak to our safeguarding team:

Ian Wyles
Designated Safeguarding Lead

Simone Botes

Rafiq Manan



Charlotte Witcher

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Learning Objectives & Outcomes

- Define various types of operators (Mathematical, Relational, Logical).
- Use operators in real-world programming tasks.
- Apply operators to solve simple to complex problems.
- Explain the order of precedence in operations.

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- Can you think of daily scenarios where you compare two things or perform calculations?

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- **Example**:
    - Comparing product prices or checking if a person is old enough to vote.

Introduction to Operators

- **What Are Operators?**
  - Operators are symbols that tell the program to perform specific mathematical, relational, or logical manipulations.
- Operators help create expressions that the computer can evaluate to make decisions or calculations.

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Main Types of Operators

- Mathematical Operators
- Relational Operators
- Logical Operators

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Mathematical (Arithmetic) Operators

- These operators are used to perform basic mathematical calculations like addition, subtraction, multiplication, and division.
- Common Operators:
  - + (Addition)
  - - (Subtraction)
  - * (Multiplication)
  - / (Division)
  - % (Modulo - returns the remainder of division)
  - ** (Exponentiation)
  - // (Floor Division - returns the largest integer smaller than the result)

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Mathematical (Arithmetic) Operators

❖ These operators behave similarly to the way we use them in mathematics, but in programming, they follow specific rules about how they're combined and evaluated.

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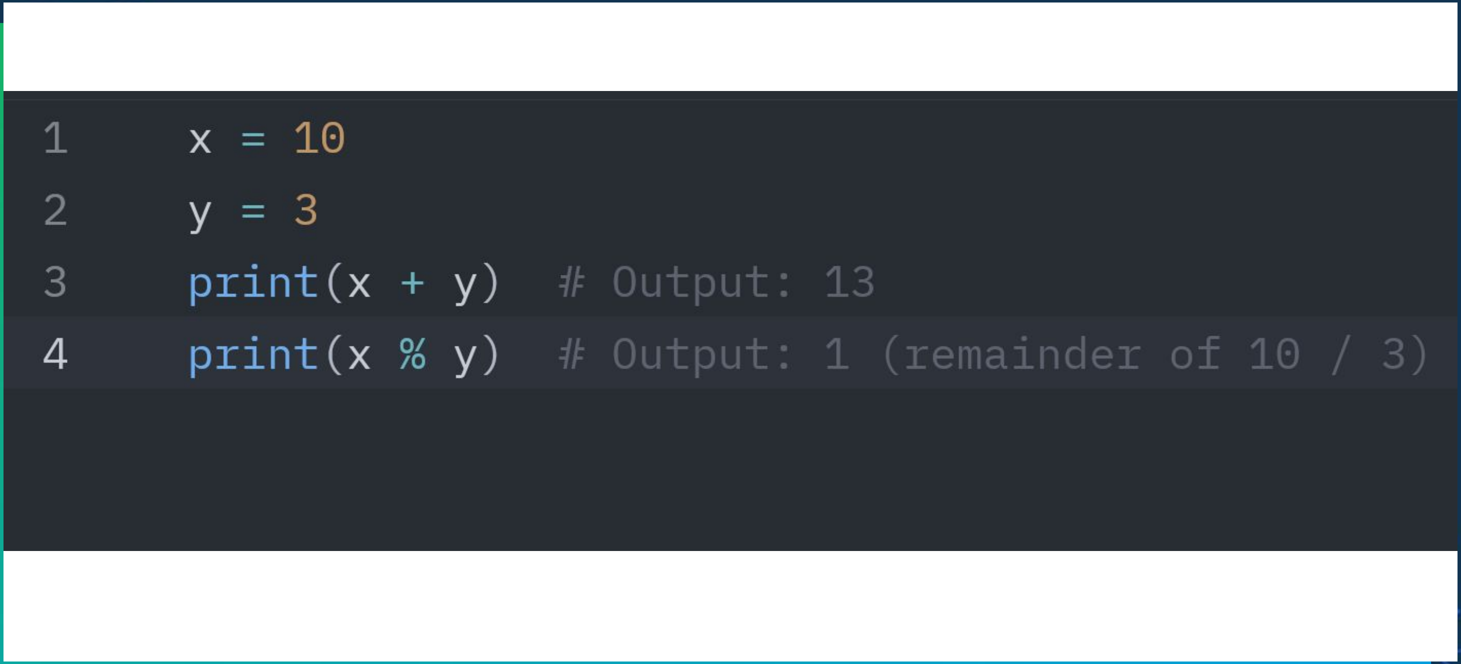
Example Code:



```python
x = 10
y = 3
print(x + y)  # Output: 13
print(x % y)  # Output: 1 (remainder of 10 / 3)
```

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Relational Operators(Comparison)

- Relational operators compare two values and return a Boolean (True or False) result based on whether a condition holds.
- Relational expressions are often used in conditional statements
- Common operators:
  - `==` (Equal to)
  - `!=` (Not equal to)
  - `>` (Greater than)
  - `<` (Less than)
  - `>=` (Greater than or equal to)
  - `<=` (Less than or equal to)

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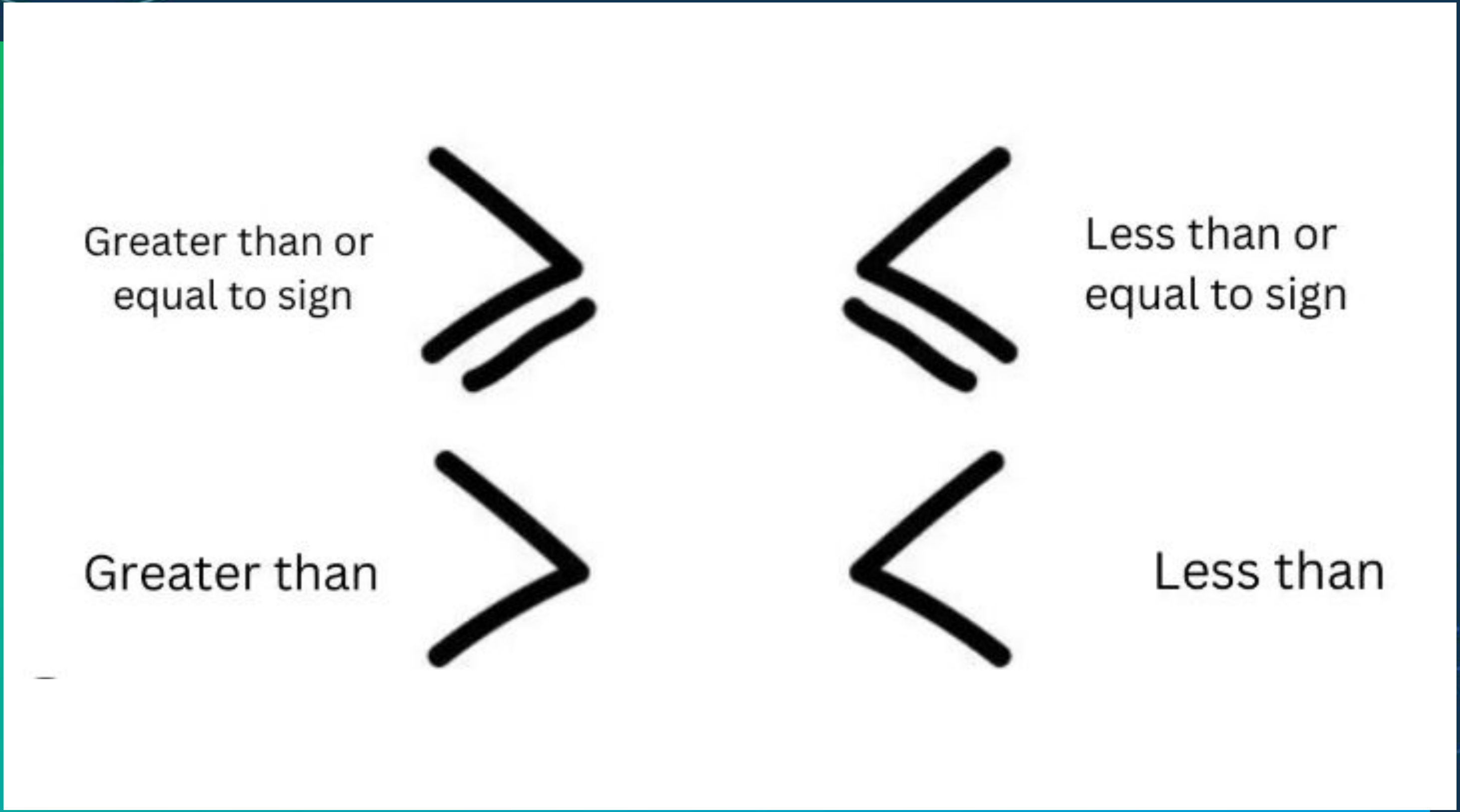
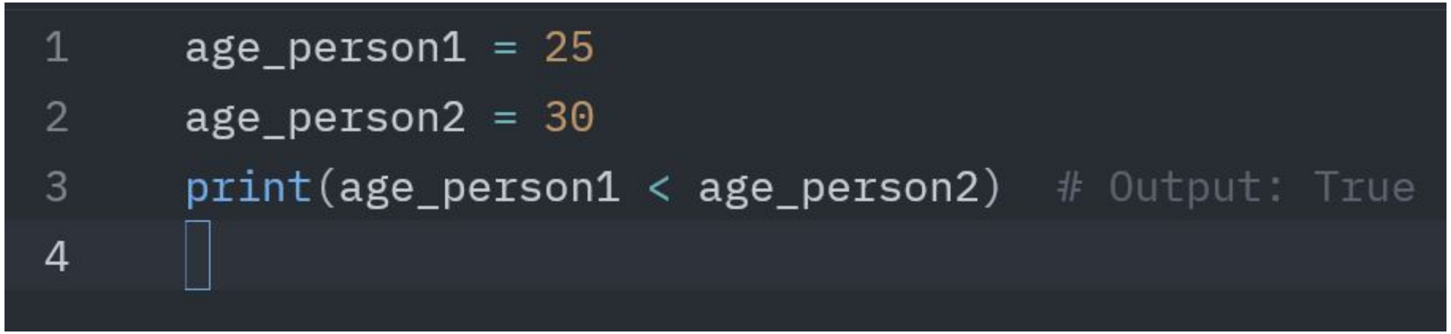

Greater than or equal to sign
Less than or equal to sign
Greater than
Less than

Application Example

- "If we compare the age of two people, we can decide who is older."



```python
age_person1 = 25
age_person2 = 30
print(age_person1 < age_person2)  # Output: True

```

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Let’s take a break
To stretch and relax

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Logical Operators

- Logical operators are used to combine conditional statements and return True or False.
- **Purpose**:
  - These operators are essential in controlling program flow, especially in decision-making processes.
- Common operators:
  - and (True if both operands are true)
  - or (True if at least one operand is true)
  - not (True if the operand is false, and vice versa)
- Logical operators form the backbone of decision-making in complex situations where multiple conditions need to be checked simultaneously.

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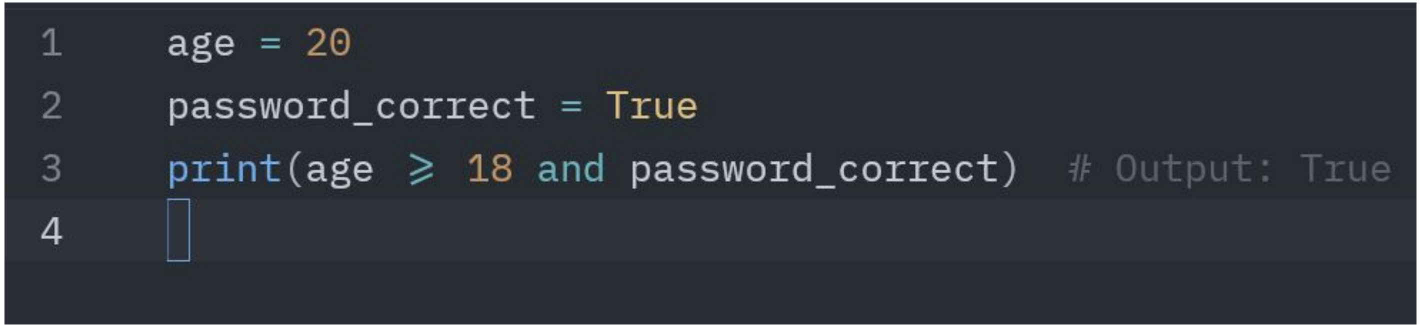
Example:

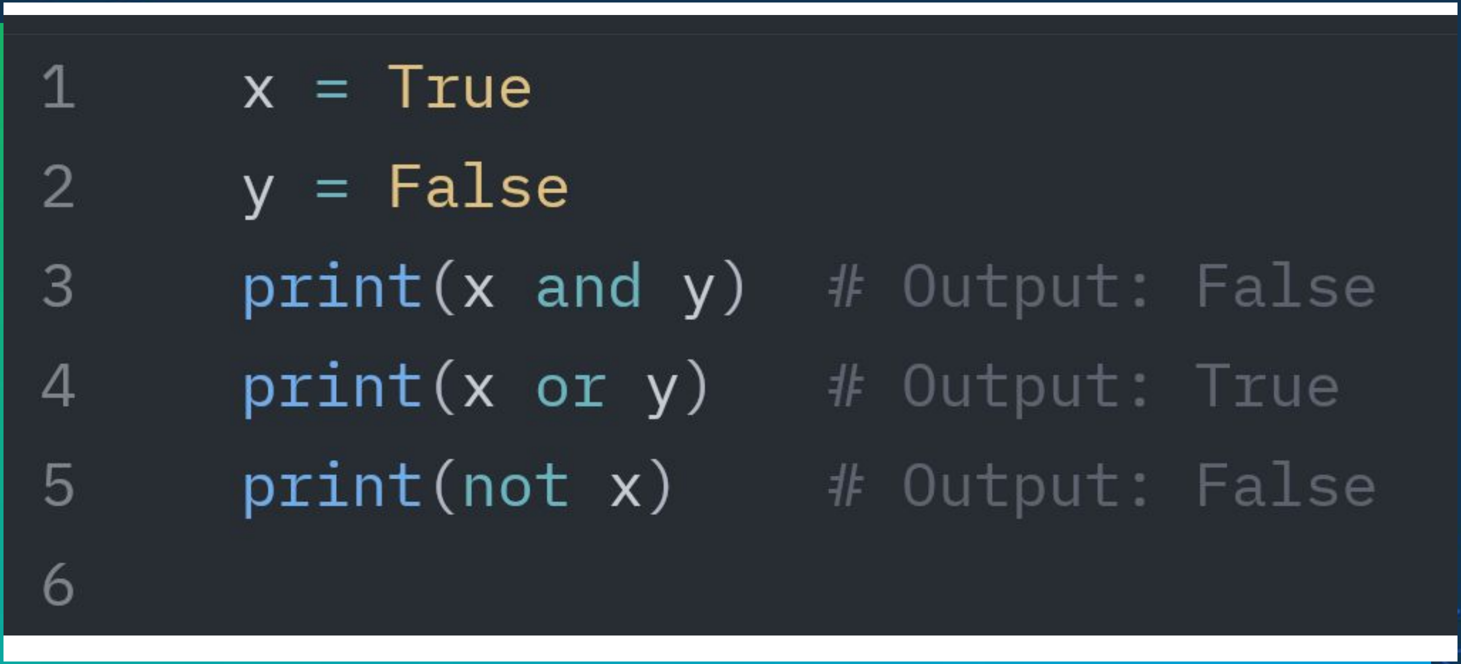
- Consider checking if a user has the right age and the correct password before logging in.



```python
age = 20
password_correct = True
print(age >= 18 and password_correct)  # Output: True

```

Example:



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

```

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Operator Precedence and Associativity

- **Precedence**:
  - Determines which operator is evaluated first in expressions that have multiple operators.
- **Associativity:**
  - When operators of the same precedence level appear, associativity determines the order of operations.
- **Importance:**
  - Misunderstanding precedence can lead to incorrect program logic, so understanding it ensures accuracy in calculations and comparisons.

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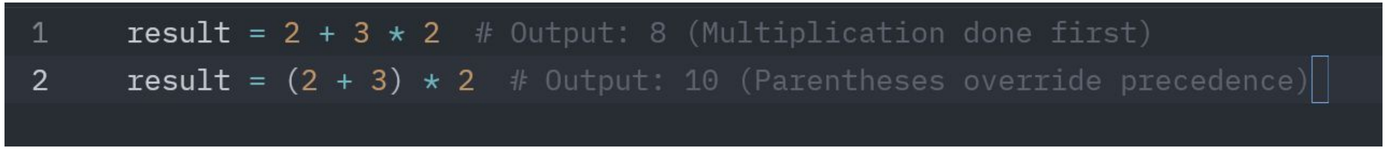
Precedence Table(from highest to lowest)

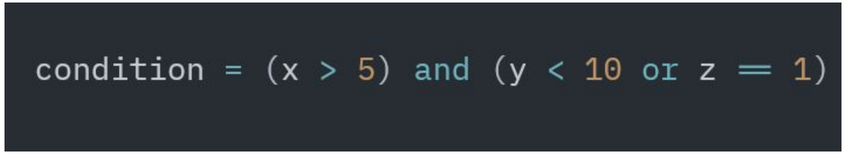
- ** (Exponentiation)
- *, /, //, % (Multiplication, Division, Floor division, Modulus)
- +, - (Addition, Subtraction)
- Relational operators: <, >, <=, >=, ==, !=
- Logical operators: not, and, or



```python
result = 2 + 3 * 2  # Output: 8 (Multiplication done first)
result = (2 + 3) * 2  # Output: 10 (Parentheses override precedence)
```

Operator Precedence in Decision Making

- Operator precedence directly influences the way expressions are evaluated in conditional logic.
- **Practical Implication:**
  - When writing if conditions in a program, knowing how operators are evaluated ensures that the program behaves as expected.
- **Example**:
  - When evaluating complex logical expressions, parentheses are often used to override natural precedence and control the flow.



```
condition = (x > 5) and (y < 10 or z == 1)
```

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Problem Solving with Operators

- Operators are the backbone of problem-solving in programming. They allow us to manipulate data and make decisions.
- Arithmetic and relational operators are often combined in real-world applications to compute values based on conditions. For example, when calculating tax.

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Summary of Operator Types

- **Mathematical Operators:**
  - Perform basic arithmetic.
- **Relational Operators:**
  - Compare values.
- **Logical Operators:**
  - Combine multiple conditions.
- **Key Point:**
  - Operators form the backbone of logical programming, allowing decisions and calculations to be made automatically by the program.

Questions and Answers

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Thank you for attending

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