CSCI 141

Lecture 7:
Conditionals:
`if, else, elif`

Announcements

- Slides, schedule, assignments, readings, etc. are posted on the course webpage (not Canvas).
- You can find the course webpage via a link on the Syllabus page of Canvas
- Or just go here: https://facultyweb.cs.wwu.edu/~wehrwes/courses/csci141_19s/
    - Click Schedule to jump to the schedule where materials are posted.

Goals

- Know how to use an `if` statement to conditionally execute a block of code.

- Know how to use an `if/else` statement to choose which of two code blocks to execute.

- Understand how conditional statements can be nested to make decisions among more than two possibilities.

- Know how to use `if/elif/else` statements.

Last Time

- New type: bool
- New operators:
  - comparison <, >, <=, >=, ==, `!=`
  - logical `not`, `and`, `or`
- Operator precedence

Operator Precedence, Updated Again

order of precedence

Parentheses

Exponentiation (right-to-left)

Unary + and –

Special case:

2**-1 = 0.5

Unspecial but surprising case:

-2**2 = -4

Multiplication and Division

Addition and Subtraction

Numerical comparisons `<, >, <=, >=, ==, !=`

`not`

`and`

`or`

order of evaluation

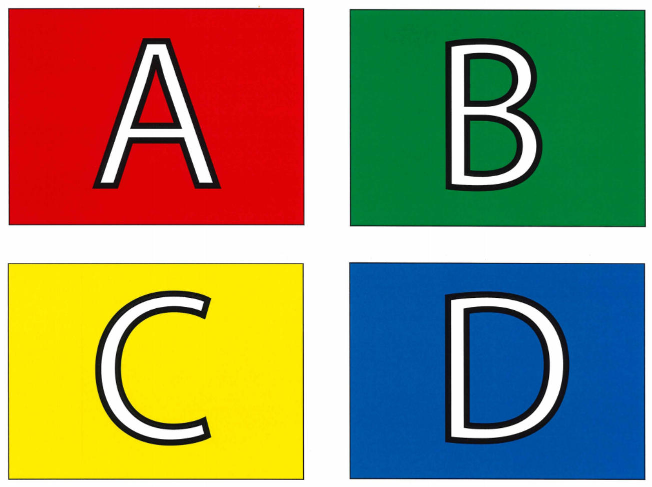
All are evaluated left to right except for exponentiation.

You can look up all the details: https://docs.python.org/3/reference/expressions.html#operator-precedence

Last Time:
Boolean Expressions

What does the following statement print?

```
print((3 == 5 or (3 != 5 and 5 != 7)) and 3 < 5)
```



A: True

B: False

C: true

D: false

Last Time:
Boolean Expressions

What does the following statement print?

```
print((3 == 5 or (3 != 5 and 5 != 7)) and 3 < 5)
print((3 == 5 or ( True  and  True )) and 3 < 5)
print((3 == 5 or         True       ) and 3 < 5)
print(( False  or        True       ) and 3 < 5)
print(           True                 and 3 < 5)
print(           True                 and True)
print(           True                         )
```

Today’s Quiz

- 3 minutes

Today’s Quiz

- 3 minutes
- Working with a neighbor: do your answers agree? (3 minutes)

Today

- Last week: everything you already knew how to do using a calculator.

- Last lecture: representing and manipulating boolean (true/false) expressions and values.

about **what** code to execute

- Today: Making **decisions** based on the value of a boolean expression.

- Also: a new kind of **statement**!

Let’s talk about the weather

- You wish to write a software system that recommends what to wear/bring based on the current weather conditions.

- In a later version, you will hook your software up to automated weather sensors that read temperature, wind, and precipitation data in real time.

- For now, we’ll just ask the user.

Let’s talk about the weather

Suppose we have `bool` variables `isRaining`

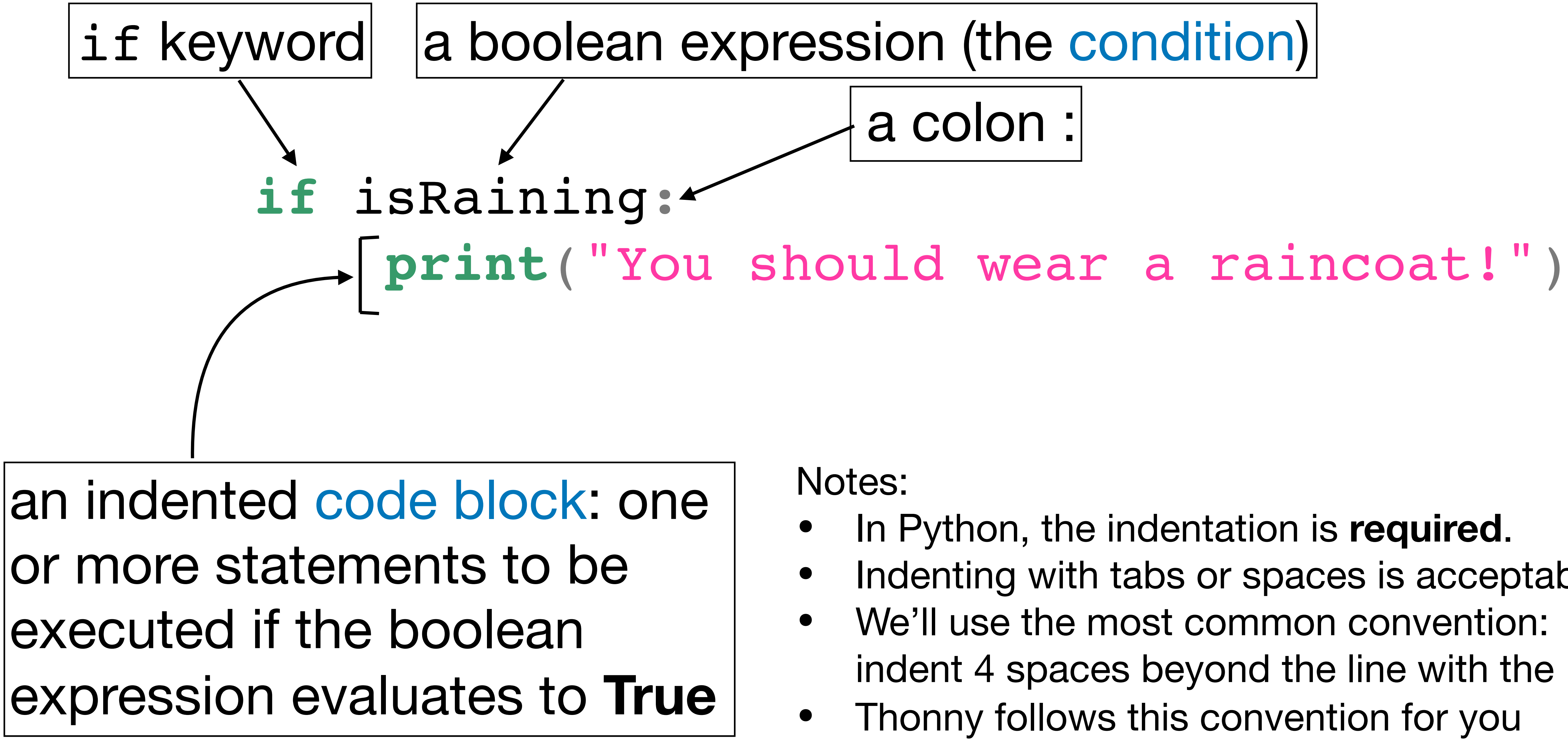
Here’s the logic (pseudocode):

- if it is raining, tell the user to bring a raincoat

Here’s the Python code:

```
if isRaining:
    print("You should wear a raincoat!")
```

The `if` statement



`if` keyword

a boolean expression (the condition)

a colon :

```
if isRaining:
    print("You should wear a raincoat!")
```

an indented code block: one or more statements to be executed if the boolean expression evaluates to **True**

Notes:

- In Python, the indentation is **required.**
- Indenting with tabs or spaces is acceptable.
- We'll use the most common convention: indent 4 spaces beyond the line with the `if`
- Thonny follows this convention for you

Demo

Demo

- if statement with a condition that evaluates to True vs False
- statements after the indented code block
- multiple lines in the code block

What if it’s not raining?

What if we want to also print something in case it’s **not raining?**

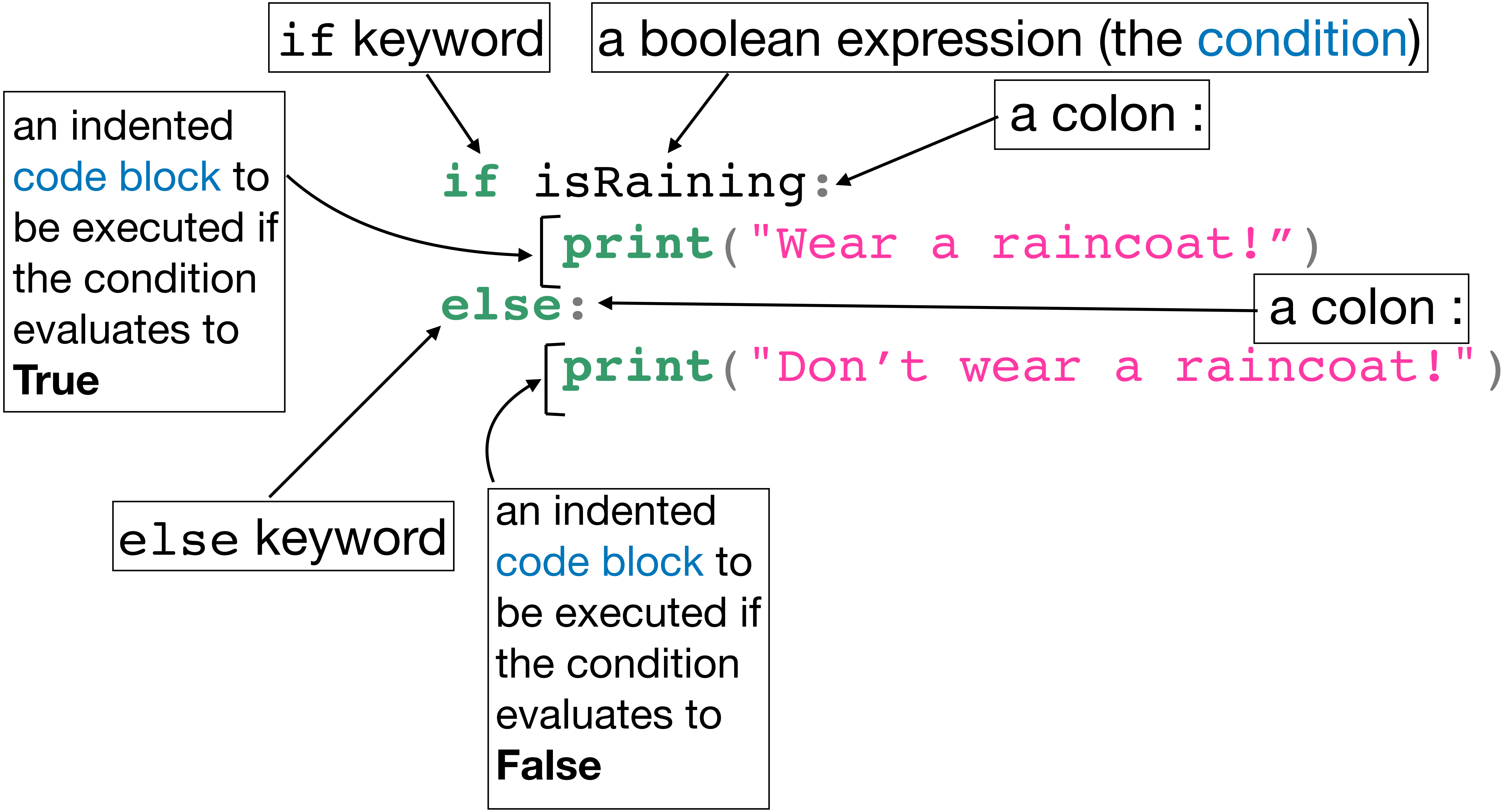
```
if isRaining:
    print("Wear a raincoat!”)
if not isRaining:
    print("Don’t wear a raincoat!")
```

How many times did we check the value of isRaining?

Could we do any better?

Yes: it’s a common use case to want to choose between two paths of execution (two code blocks).

The `if/else` Statement



```
if isRaining:
    print("Wear a raincoat!”)
else:
    print("Don’t wear a raincoat!")
```

`if` keyword

a boolean expression (the condition)

a colon :

an indented code block to be executed if the condition evaluates to **True**

a colon :

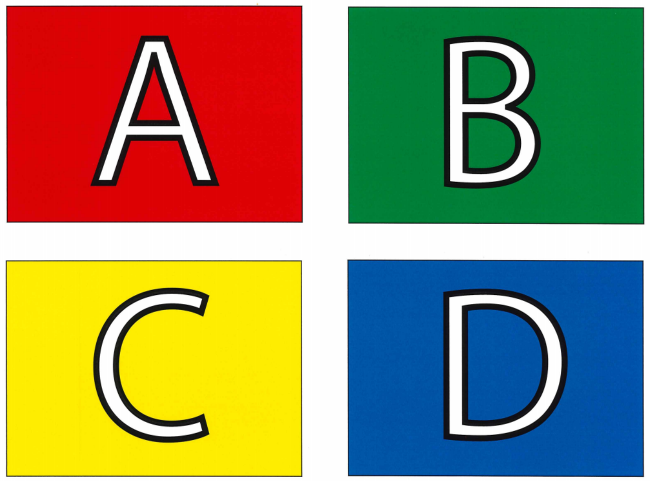
`else` keyword

an indented code block to be executed if the condition evaluates to **False**

Got it?

What does the following program print?

```
if 2 + 5 == 5
    print(2 + 5)
else:
    print("not equal")
```



A. 2 + 5

B. 7

C. 2 + 5 == 5

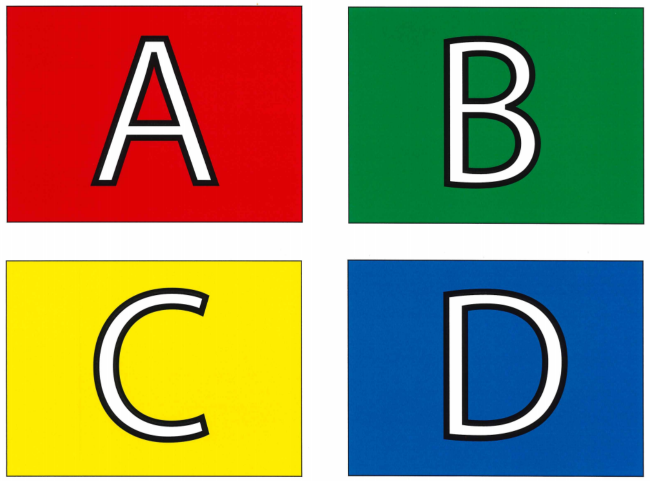
D. not equal

Got it?

What does the following program print?

```
a = 5
if a >= 5 and a <= 5:
    print(a)
else:
    print("nope")
```

Is there a better way to write the condition?



A. 5

B. a >= 5

C. a <= 5

D. nope

Aim for Simplicity

```
a = 5
if a >= 5 and a <= 5:
    print(a)
else:
    print("nope")
```

```
a = 5
if a == 5:
    print(a)
else:
    print("nope")
```

The program on the right does **exactly** the same thing, but is easier to read, and therefore is preferable.

Nested Conditionals

If/else lets you choose between two options.

What if there are more than two possibilities?

```
# assume x and y are numbers
if x < y:
    print("x is less than y")
else:
    if x > y:
        print("x is greater than y")
    else:
        print("x and y must be equal")
```

Note: the conditions still have to be boolean expressions (i.e., they evaluate to True or False)

the inner if/else statement is the indented code block for the else clause of the outer if/else statement.