

# Conditionals and booleans

Idea: Express different options

Real Life Examples:

If it's cold, wear a sweater. Otherwise, wear a t-shirt

If you're happy and you know it, clap your hands

Requires two language features

booleans - allow us to express whether something is true or false

conditionals - statements that do one thing or another

# Booleans

bool data type (similar to int, str, and float)

possible values: True or False

booleans are often used as **flags** or **flag variables**

Metaphor: setting a ref flag if you see a problem

Ex. isHappy = True

isCold = temp < 45 # isCold = True if temp < 45; False otherwise

# Relational operators return booleans

$a < b \leftarrow$  returns True if  $a$  is less than  $b$ ; otherwise returns False

$a \leq b \leftarrow$  returns True if  $a$  is less than or equal to  $b$ ; otherwise returns False

$a > b \leftarrow$  returns True if  $a$  is greater than  $b$ ; otherwise returns False

$a \geq b \leftarrow$  returns True if  $a$  is greater than or equal to  $b$ ; otherwise returns False

$a == b \leftarrow$  returns True if  $a$  is equal to  $b$ ; otherwise returns False

**WARNING: Don't confuse  $==$  with assignment operator  $=$**


$a != b \leftarrow$  returns True if  $a$  is not equal to  $b$ , otherwise returns False

# Conditional statements

Idea: make a decision based on a boolean statement, e.g. conditional

if <condition>:

<body>



<body> runs if  
<condition> is true

# Conditional statement example

```
temp = int(input("Enter a temperature: "))
```

```
if temp < 45:
```

```
    print("Wear a coat for goodness sake!")
```

# Conditional two-way statements

Idea: specify what happens when a condition is True and False

if <condition>:

<body1>

else:

<body2>

<body1> runs if  
<condition> is true

<body2> runs if  
<condition> is false

# Conditional two-way statement example

```
temp = int(input("Enter a temperature: "))
```

```
if temp < 45:
```

```
    print("Wear a coat for goodness sake!")
```

```
else:
```

```
    print("Don't wear a coat")
```

# Example - even or odd

Write a program that checks if a given integer is even or odd

Hint: Use % to check whether the number is even or odd

```
$ python3 evenodd.py
```

```
Enter an integer: 11
```

```
11 is odd
```

```
$ python3 evenodd.py
```

```
Enter an integer: 12
```

```
12 is even
```



# Conditional multi-way statements

Idea: Handle multiple possibilities

if <condition1>:

    <body1>

elif <condition2>:

    <body2>

else:

    <body3>

<body1> runs if  
<condition1> is true

<body2> runs if  
<condition2> is true

<body3> runs if neither  
<condition1> nor  
<condition2> is True

# Conditional multi-way statements

Idea: Handle multiple possibilities

if <condition1>:

    <body1>

elif <condition2>:

    <body2>

...

else:

    <body3>

You can have as many conditions as you like!

Each condition is checked in order

Only one body is ever executed

# Conditional multi-way statement example

```
temp = int(input("Enter a temperature: "))
```

```
if temp < 45:
```

```
    print("Wear a coat for goodness sake!")
```

```
elif temp < 65:
```

```
    print("Wear a light jacket")
```

```
else:
```

```
    print("Wear a t-shirt")
```

# Exercise - Compute a grade

Write a program, `grade.py`, that outputs a grade given a value between 0 and 100

A	90-100
B	80-89
C	70-79
D	60-69
F	0-59

```
$ python3 grade.py  
Enter a value between 0 and 100: 46  
Grade: F
```

```
$ python3 grade.py  
Enter a value between 0 and 100: 78  
Grade: C
```

# Nested Blocks

Statements with the same indentation are called **blocks**

Blocks can be nested inside of other blocks

- if statements in other if statements

- if statements in a loop

- loops within if statements

- loops within loops

# Exercise - Do these produce the same input?

```
if temp >= 60:  
    print("No coat  
needed")  
if temp >= 40:  
    print("Spring jacket")
```

```
if temp >= 60:  
    print("No coat needed")  
elif temp >= 40:  
    print("Spring jacket")
```

```
if temp >= 40:  
    if temp >= 60:  
        print("No coat needed")  
    else:  
        print("Spring jacket")
```

# Logical operators

and - True if both operands are True

Ex. If you are a citizen and over 18, you can vote

or - True if either operand is true

Ex. If you have a ticket or you are a member, you can enter

not - Takes the opposite value

Ex. You are not wrong

# Logical operators examples

```
if citizen == "Yes" and age >= 18:  
    print("You can vote")
```

```
if membership == "Yes" or hasTicket == True:  
    print("You may enter")
```

```
isWrong = False  
if not isWrong:  
    print("You are right!")
```



For variables x and y of type bool

x	y	x and y	x or y	not x
True	True	True	True	False
False	True	False	True	True
True	False	False	True	
False	False	False	False	

# Logical operator precedence

()

Relational operators (>, <, ==, etc)

not

and

or

Use () to make code clearer!!!