**Learning outcomes**

- At the end of this lecture, students should:
  - be able to use conditional statements which contain an else block (if...else statements)
  - be able to use nested if's
  - be able to use if...elif statements

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**Python syntax for an if...else statement**

In an **if**...**else** statement the code in the 'if block' is executed if the condition evaluates to true and the code in the 'else block' is executed if the condition evaluates to false.

```python
if boolean_expression:
    statement1
    statement2
else:
    statement3
    statement4
```

---

**if...else statement - example**

```python
def what_to_wear(temperature):
    if temperature > 25:
        print("Wear shorts.")
    else:
        print("Not hot today!")
        print("Wear long pants.")
        print("Enjoy yourself.")

def main():
    what_to_wear(20)
    print()
    what_to_wear(30)
    main()
```

Not hot today!
Wear long pants.
Enjoy yourself.
Wear shorts.
Enjoy yourself.
Nested if's - example

Any statements, including other if statements, can be used inside if statements. For example:

```python
def ice_cream_info(scoops, with_extras, on_cone):
    price = scoops * 1.50
    message = "scoops: " + str(scoops)
    if with_extras:
        message += ", plus extras"
        if on_cone:
            message += ", on cone"
        else:
            message += ", in cup"
        price += 2.5
    else:
        message += ", in cup"
        price += 1.5
    print(message + "$" + str(price))
```

Three calls to the `ice_cream_info()` function

```python
def main():
    ice_cream_info(3, True, False)
    ice_cream_info(2, False, False)
    ice_cream_info(4, True, True)
main()
```

Python syntax of an if...elif statement

The `if...elif` statement allows at most one option (only one) to be executed out of many options. The else option (as the last block) is optional.

```python
if boolean_expression1:
    statement1
    statement2
elif boolean_expression2:
    statement4
    statement5
elif boolean_expression3:
    statement6
    statement7
elif boolean_expression4:
    statement8
    statement9
else:
    statement10
    statement11
```

As soon as a match is found, the corresponding block of code is executed, then the if...elif statement is exited.

Note: at most one option is executed in an if...elif statement.

Python syntax for an if...elif statement

The following diagram shows an if...elif situation. As soon as a match is found, the corresponding block of code is executed, then the if...elif statement is exited.

Note how the indentation increases at every nested if and this moves the code further and further to the right hand side.

```python
def what_to_do_now():
    message = "Time to "
    user_choice = int(input("Enter selection (1, 2, or 3): "))
    if user_choice == 1:
        print(message, "eat")
    elif user_choice == 2:
        print(message, "play")
    elif user_choice == 3:
        print(message, "sleep")
    else:
        print("incorrect selection!")
```

Note how the indentation increases at every nested if and this moves the code further and further to the right hand side.

```python
Enter selection (1, 2, or 3): 2
Time to play
```

Sometimes you have a situation when you wish to execute one block of code from many options. For example, if you wish to print one statement depending on the number entered by the user.

```python
def main():
    ice_cream_info(3, True, False)
    ice_cream_info(2, False, False)
    ice_cream_info(4, True, True)
main()
```

```python
scoops: 3, plus extras, in cup $6.0
scoops: 2, in cup $4.0
scoops: 4, plus extras, on cone $8.5
```
An if...elif statement - example

A clearer way of writing the previous program (from slide 10) is to use an if...elif statement:

```python
def what_to_do_now():
    message = "Time to 
    prompt = "Enter selection (1, 2, or 3): 
    user_choice = int(input(prompt))

    if user_choice == 1:
        print(message, "eat")
    elif user_choice == 2:
        print(message, "play")
    elif user_choice == 3:
        print(message, "sleep")
    else:
        print("incorrect selection!")
```

If statements – example

Complete the get_random_horoscope() function which returns a random message. The function has 4 chances in 10 of returning "Amazing day ahead", 3 chances in 10 of returning "Romance is very likely", 1 chance in 10 of returning "Proceed with caution" and 2 chances in 10 of returning "Lucky lucky you"

```python
def get_random_horoscope():
    message1 = "Amazing day ahead"
    message2 = "Romance is very likely"
    message3 = "Proceed with caution"
    message4 = "Lucky lucky you"
    number = random.randrange(0, 10)
    if number < 4:
        message = message1
    elif number < 7:
        message = message2
    elif number < 8:
        message = message3
    else:
        message = message4
    return message

def main():
    print("Today's message:", get_random_horoscope())
    print("Today's message:", get_random_horoscope())
main()
```

get_random_horoscope() – a solution

A solution to the function on the previous slide:

```python
def get_random_horoscope():
    message1 = "Amazing day ahead"
    message2 = "Romance is very likely"
    message3 = "Proceed with caution"
    message4 = "Lucky lucky you"
    message = ""
    number = random.randrange(0, 10)
    if number >= 0 and number < 4:
        message = message1
    elif number >= 4 and number < 7:
        message = message2
    elif number >= 7 and number < 8:
        message = message3
    else:
        message = message4
    return message
```

get_random_horoscope() – solution 2

A solution to the function on slide 17:

```python
def get_random_horoscope():
    message1 = "Amazing day ahead"
    message2 = "Romance is very likely"
    message3 = "Proceed with caution"
    message4 = "Lucky lucky you"
    number = random.randrange(0, 10)
    if number < 4:
        message = message1
    elif number < 7:
        message = message2
    elif number < 8:
        message = message3
    else:
        message = message4
    return message
```
A third solution to the function on on slide 17:

```python
def get_random_horoscope():
    message1 = "Amazing day ahead"
    message2 = "Romance is very likely"
    message3 = "Proceed with caution"
    message4 = "Lucky lucky you"
    message = message4
    number = random.randrange(0, 10)
    if number < 4:
        message = message1
    elif number < 7:
        message = message2
    elif number < 8:
        message = message3
    return message
```

A fourth solution to the function on slide 17:

```python
def get_random_horoscope():
    message1 = "Amazing day ahead"
    message2 = "Romance is very likely"
    message3 = "Proceed with caution"
    message4 = "Lucky lucky you"
    number = random.randrange(0, 10)
    if number < 4:
        return message1
    elif number < 7:
        return message2
    elif number < 8:
        return message3
    else:
        return message4
```

A fifth solution to the function on slide 17:

```python
def get_random_horoscope():
    message1 = "Amazing day ahead"
    message2 = "Romance is very likely"
    message3 = "Proceed with caution"
    message4 = "Lucky lucky you"
    number = random.randrange(0, 10)
    if number < 4:
        return message1
    elif number < 7:
        return message2
    elif number < 8:
        return message3
    return message4
```

Why is the following code not a correct solution?

```python
def get_random_horoscope():
    message1 = "Amazing day ahead"
    message2 = "Romance is very likely"
    message3 = "Proceed with caution"
    message4 = "Lucky lucky you"
    if random.randrange(0, 10) < 4:
        return message1
    elif random.randrange(0, 10) < 7:
        return message2
    elif random.randrange(0, 10) < 8:
        return message3
    return message4
```
In a Python program:
- the if block of an if...else statement is executed only if the boolean expression evaluates to True, otherwise the else block is executed.
- if statements can be nested inside other if statements.
- if...elif statements are useful if there is a situation where at most one option is to be selected from many options. The if...elif statement has an optional final else part.

Examples of Python features used in this lecture

```python
if temperature > 25:
    print("Wear shorts.")
else:
    print("Not hot today!")
    print("Wear long pants.")

message = "Time to ">
user_choice = int(input("Enter selection (1, 2, or 3): "))

if user_choice == 1:
    print(message, "eat")
elif user_choice == 2:
    print(message, "play")
elif user_choice == 3:
    print(message, "sleep")
else:
    print("incorrect selection!")
```