Lecture 11 – if … else, if … elif statements, nested ifs
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
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
```
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()
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"
            price += 2.5
        else:
            message += ", in cup"
            price += 1.5
    else:
        if on_cone:
            message += ", on cone"
            price += 2
        else:
            message += ", in cup"
            price += 1
    print(message + " $" + str(price))

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

Three calls to the `ice_cream_info()` function

- scoops: 3, plus extras, in cup $6.0
- scoops: 2, in cup $4.0
- scoops: 4, plus extras, on cone $8.5
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 what_to_do_now():
    message = "Time to 
    user_choice = int(input("Enter selection (1, 2, or 3): "))

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

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

```
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: at most one option is executed in an if...elif statement.
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!")
```

Enter selection (1, 2, or 3): 2
Time to play
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"
    # Add your code here

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

Today's message: Romance is very likely
Today's message: Amazing day ahead
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
    if number >= 4 and number < 7:
        message = message2
    if number >= 7 and number < 8:
        message = message3
    if number >= 8 and number < 10:
        message = message4
    return message
```
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 < 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 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
```

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A fifth solution to the function on slide 17:

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!")
```