# GCSE

Practical programming skills in Python

# Selection and iteration

Topic 2





#### **Objectives**

- Describe the different comparison operators
- Be able to use selection statements
- Be able to use counter controlled (for) loops
- Be able to use condition controlled (while) loops

## **Starter activity**

- Which of these statements are true?
  - 15 == 12
  - 17 != 14
  - 12 < 8
  - 26 >= 10
  - 3 <= 3
  - 3 < 3
  - "Five" == 5



## **Starter activity Answers**

- Which of these statements are true?
  - 15 == 12 False
  - 17 != 14 True
  - 12 < 8 False
  - 26 >= 10 True
  - 3 <= 3 True
  - 3 < 3 False
  - "Five" == 5 False



## **Relational operators**

- There are six comparison operators commonly used in Python:
  - Equal to
  - Not equal to
  - Less than
  - Less than or equal to
  - Greater than
  - Greater than or equal to



## **Relational operators**

• There are six comparison operators commonly used in Python:

 $\geq =$ 

- Equal to ==
  Not equal to !=
  Less than < <</li>
  Less than or equal to <=</li>
  Greater than >
- Greater than or equal to



# Equality = / ==

- The 'assignment' operator (=) assigns a new value
- The 'equals' operator (==) checks if two items have the same value
- Try this code:

```
userName = "Dave"
targetName = "Dave"
if userName == targetName:
    print("Names match")
```

Change the userName and test the result



# Inequality !=

- The 'not equals' operator (!=) checks if two items have a different value
- Try this code:

```
userName = "Bob"
targetName = "Dave"
if userName != targetName:
    print("Names don't match")
```

Change the userName and test the result



## **Greater than >**

- The 'greater than' operator (>) checks if the first item is bigger than the second
- Try this code:

```
numOne = 12
numTwo = 5
```

```
if numOne > numTwo:
    print("Number one is bigger")
```

Change the numbers and test the result

What happens if the numbers are equal?



## Greater than or equal >=

- The 'greater than or equal' operator (>=) checks if the first item is bigger than or equal to the second
- Try this code:

```
numOne = 5
numTwo = 5
```

```
if numOne >= numTwo:
    print("Number one not smaller than Number two")
```

Change the numbers and test the result



# Less than < (... or equal <=)

- The 'less than' operator (<) checks if the first item is less than the second
- The 'less than or equal' operator (<=) checks if the first item is smaller than or equal to the second
- Try this code:

```
numOne = 3
numTwo = 5
if numOne < numTwo:
    print("Number one is smaller")</pre>
```



## **Greater than / Less than**

- To help remember which is which, read from left to right. If the left side has a bigger opening
  - 12 is greater than 6
  - 12 > 6
- If the left side has a smaller opening
  - 5 < 8
  - 5 is less than 8



# Data types

- When comparing two different data types, the values will always be different
- Try this code:

```
numOne = 3
numTwo = "3"
if numOne != numTwo:
    print("Values are different")
```



# **Comparing strings**

- Using greater than or less than on strings will compare them alphabetically
- Try this code:

```
animalOne = "aardvark"
animalTwo = "bird"
```

if animalOne < animalTwo:
 print("Animal one is earlier in the alphabet")</pre>



### **Comparison operators**

• Remember the six comparison operators:

==	- Equal to
!=	- Not equal to
>	- Greater than
>=	- Greater than or equal to
<	- Less than
<=	- Less than or equal to





## Worksheet 2a

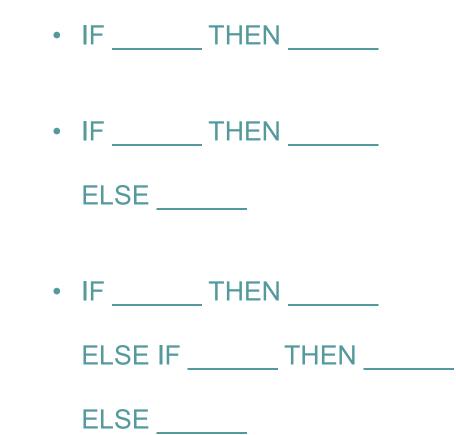
Complete Questions 1 & 2



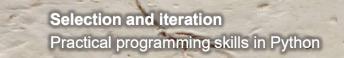


## **Selection statements**

• Selection statements come in three main types:







### if ...

```
lives = 0
```

```
if lives < 1:</pre>
```

```
print("Game Over")
```

- Change lives to 1 and test the program
- The print statement only runs if lives is less than 1
- If the value is bigger then nothing happens



## if ... else ...

- Try this code:
  - lives = 0

```
if lives < 1:</pre>
```

```
print("Game Over")
```

```
else:
```

```
print("Carry on")
```

- Now there are two possible outcomes
- There is always some response printed to the screen



## if ... elif ... else ...

```
lives = 10

if lives < 1:
    print("Game Over")
elif lives >= 10:
    print("Bonus Round!")
else:
    print("Carry on")
```

- Now there are many possible outcomes
- Keep testing different values for lives



```
    Try this code:
        score = 92
        if score >= 90:
            print("Grade 8!")
        if score >= 80:
            print("Grade 7!")
        if score >= 70:
            print("Grade 6!")
```



```
    Try this code:
```

```
score = 92
```

```
if score >= 90:
    print("Grade 8!")
if score >= 80:
    print("Grade 7!")
if score >= 70:
    print("Grade 6!")
```

- The program prints out all three possible grades
  - Why?



```
    Try this code:
```

```
score = 92
```

```
if score >= 90:
    print("Grade 8!")
if score >= 80:
    print("Grade 7!")
if score >= 70:
    print("Grade 6!")
```

- The program prints out all 3 possible grades
  - Why? All three if statements are true



- Try this code:
  - score = 92

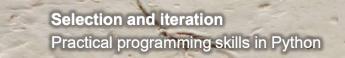
```
if score >= 90:
    print("Grade 8!")
elif score >= 80:
    print("Grade 7!")
elif score >= 70:
    print("Grade 6!")
```

• Try different values for score



- When using if ... elif ..., the selection statement stops checking when it finds a positive match
  - This means fewer unnecessary responses
  - This also means a faster program (fewer comparisons need to be made)
- It is a good habit to always include an else statement to catch any unexpected results





## Worksheet 2a

Complete Questions 3 and 4





## Count controlled loops (for)

• Try this code:

for count in range(5):
 print("Repeat:", count)



# Count controlled loops (for)

```
for count in range(5):
    print("Repeat:", count)
```

- for loops are useful when you know how many times you want to repeat a block of code
- The number in brackets controls how many repetitions there are
- count increases from 0 to 4, so the loop is repeated 5 times



## Count controlled loops (for)

```
for count in range(1,5):
    print("Repeat:", count)
```

- count starts at 1 and ends at 4 (not 5)
- Try:
  - Making the loop repeat 8 times
  - Displaying the numbers 1 to 8, instead of 0 to 7



# **Running Total**

```
total = 0
for count in range(5):
    newValue = int(input("New number: "))
    total = total + newValue
print("Total:", total)
```

- Notice:
  - The total must be set **before** the loop starts
  - Printing the total happens only after the loop has completed





## Worksheet 2b

Complete Questions 1 and 2





#### Condition controlled loops (while)

• Try this code:

```
target = 8
guess = 0
while guess != target:
    guess = int(input("Guess a number: "))
print("You got it right!")
```

• What would happen if guess was assigned the value 8 instead of 0 in the second line?



#### Condition controlled loops (while)

```
target = 8
guess = 0
while guess != target:
    guess = int(input("Guess a number: "))
print("You got it right!")
```

- While loops are useful when you don't know how many times to repeat a block of code
- Set a value so that the loop runs at least once



# **Running total**

```
total = 0
while total < 10:
    newValue = int(input("New number: "))
    total = total + newValue
print("Total:", total)</pre>
```

- Notice:
  - Total is set to 0 so the loop will run at least once
  - Printing the total happens only after the loop has completed

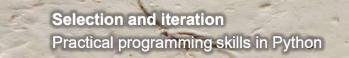


# **Running total**

```
total = 0
newValue = 999
while newValue != 0:
    newValue = int(input("New number: "))
    total = total + newValue
print("Total:", total)
```

- Notice:
  - newValue is set to 999 so the loop will run at least once





## Worksheet 2b

Complete Questions 3 and 4





# Plenary

- Identify the right construct for each option:
  - Collecting cricket scores (6 balls to an over)

• Collecting snooker scores (play until someone wins 3 frames)

• Deciding which team has won a match after 90 minutes

# Plenary

- Identify the right construct for each option:
  - Collecting cricket scores (6 balls to an over)
    - For loop (must repeat 6 times)
  - Collecting snooker scores (play until someone wins 3 frames)
    - While loop (repeat while frames won < 3)</li>
  - Deciding which team has won a match after 90 minutes
    - If statement (if teamAScore > teamBScore)

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