

GCSE OCR

Computer Science
J277

2

Sequence and selection

Unit 7 Programming



PG ONLINE

Objectives

- Use selection and nested selection statements
- Use NOT, AND and OR when creating Boolean expressions
- Use random number generation

Starter

- What are the **three** basic control structures used in programming?
 - What are **three** operators used in Boolean expressions?



Starter

Answers

- What are the **three** basic control structures used in programming?
 - Sequence, selection and iteration
- What are **three** operators used in Boolean expressions?
 - AND, OR, NOT



Sequence

- The statements are executed one by one in the order they are written:

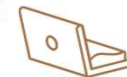
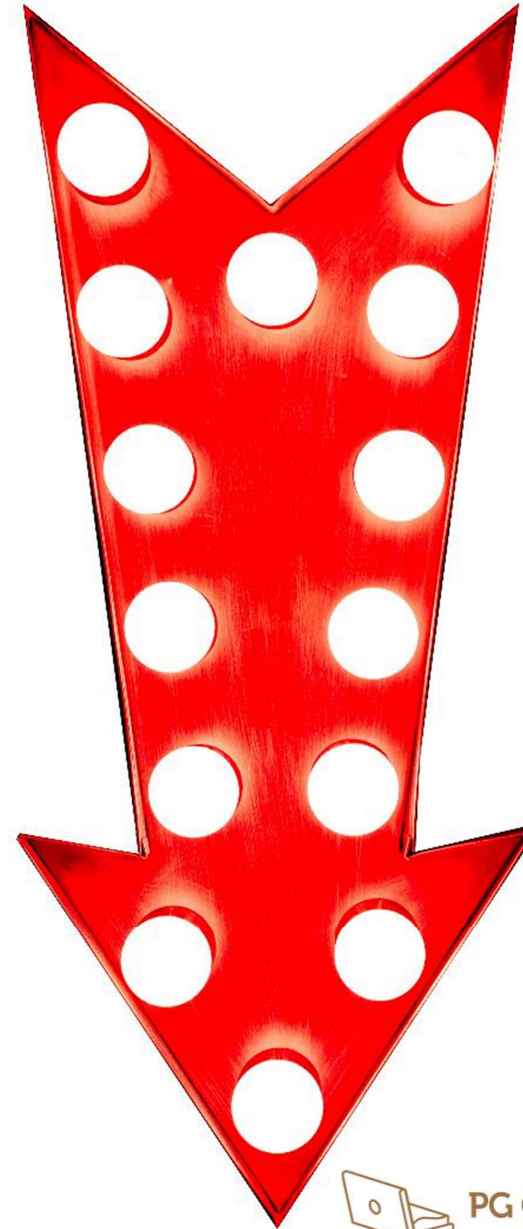
```
mark1 = 78
```

```
mark2 = 67
```

```
total = mark1 + mark2
```

```
average = total / 2
```

```
print(average)
```



Selection

- An IF statement is a **selection** statement
- The next statement to be executed depends on whether the condition being tested is True or False

```
if average >= 80 then  
    print("Distinction")  
else  
    print("Pass")  
endif
```



Comparison expressions

- The condition `average >= 80` is a Boolean expression
 - The outcome will always evaluate to TRUE or FALSE
- Comparison operators include
 - `==` equal to
 - `!=` not equal to
 - `>` greater than
 - `<` less than
- What are **two** other comparison operators?
 - Why is `=` not used to mean equal to?



Boolean expressions

- Here is a full list of comparison operators

Comparison operators	Meaning	Pseudocode example	Result	Notes
==	Equal to	5 == 5	True	Some languages use a single =
!=	Not equal to	5 != 5	False	Visual Basic uses <>
>	Greater than	5 > 5	False	
>=	Greater than or equal to	5 >= 5	True	
<	Less than	5 < 5	False	
<=	Less than or equal to	5 <= 5	True	

- A single = is used for assignment - e.g. age = 14



If statements

- If statements allow different branches to be executed based on the result of a Boolean expression

```
if average >= 80 then
    print("Distinction")
elseif average >= 60 then
    print("Merit")
elseif average >= 40
    print("Pass")
else
    print("Fail")
endif
```

Nested if statements

- If statements may be nested:

```
if member == "child" then
    if day == "Saturday" then
        swimPrice = 2.00
    else
        swimPrice = 2.50
    endif
else
    swimPrice = 4.00
endif
```

- What is the price for an adult on Saturday?
 - What is the price for a child on Sunday?



Nested if statements

Answers

```
if member == "child" then
    if day == "Saturday" then
        swimPrice = 2.00
    else
        swimPrice = 2.50
    endif
else
    swimPrice = 4.00
endif
```

- What is the price for an adult on Saturday? **4.00**
 - What is the price for a child on Sunday? **2.50**



Complex Boolean expressions

- Boolean expressions can include the Boolean operators AND, OR and NOT
- For example:

`if (mark < 0) OR (mark > 100) then ...`

Operator	Description
AND	Returns TRUE if both conditions are TRUE
OR	Returns TRUE if either of the conditions are TRUE
NOT	A TRUE expression becomes FALSE and vice versa

True or False?

- Complete the table:

Mark1	Mark2	Condition	True or False?
80	67	<code>(mark1 >= 80) AND (mark2 >= 80)</code>	
82	80	<code>(mark1 >= 80) OR (mark2 >= 80)</code>	
35		<code>(mark1 > 30) OR (mark1 < 50)</code>	
65		<code>(mark1 < 30) OR (mark1 > 80)</code>	
0	75	<code>NOT(mark1 > 50) AND (mark2 > 50)</code>	
65	85	<code>NOT(mark1 < 60) AND NOT (mark2 < 80)</code>	

True or False?

Answers

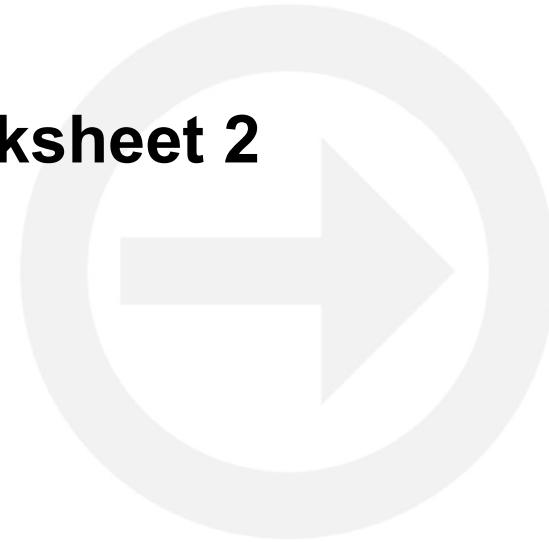
- Complete the table:

Mark1	Mark2	Condition	True or False?
80	67	<code>(mark1 >= 80) AND (mark2 >= 80)</code>	False
82	80	<code>(mark1 >= 80) OR (mark2 >= 80)</code>	True
35		<code>(mark1 > 30) OR (mark1 < 50)</code>	True
65		<code>(mark1 < 30) OR (mark1 > 80)</code>	False
0	75	<code>NOT(mark1 > 50) AND (mark2 > 50)</code>	True
65	85	<code>NOT(mark1 < 60) AND NOT (mark2 < 80)</code>	True



Worksheet 2

- Now complete **Task 1** on **Worksheet 2**



The switch/case statement

- This statement may be used when a selection is to be made from several alternatives, for example when choosing from a menu

```
switch menuChoice:  
    case "1":  
        print("You selected 1")  
    case "2":  
        print("You selected 2")  
    case "3":  
        print("You selected 3")  
    default:  
        print("This is not a valid choice")  
endswitch
```



Random numbers

- Programming languages will provide a number of built-in functions that can be used
 - To use them a library may need to be imported
 - For example, in Python, `import random` will import the random library of functions
- A random number between 0 and 100 can then be generated with a statement such as
`random(0, 100)`
In Python this would be `random.randint(0, 100)`
- How could you simulate the throw of a die?



Random numbers

Answers

- How could you simulate the throw of a die?
- Pseudocode:

```
die = random(0, 100)  
print(die)
```

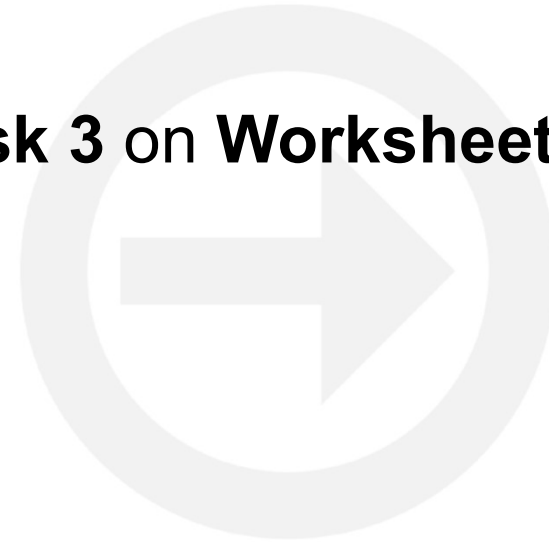
- Python:

```
import random  
die = random.randint(0, 100)  
print(die)
```



Worksheet 2

- Now complete **Task 2** and **Task 3** on **Worksheet 2**



Plenary

- Look at the following code:

```
hourlyRate = 15.50
hours = input("Type in hours worked this week: ")
if hours > 168 then
    print("That's impossible")
else
    totalPay = hours * hourlyRate
    print(totalPay)
endif
```

- With a partner, identify each of the following:
 - A comparison operator, a Boolean expression
a selection structure, a sequence, three assignment
operators, an output statement, one mathematical operator

Plenary

Answers

Sequence

```
hourlyRate = 15.50
```

Assignment operators

```
hours = input("Type in hours worked this week: ")
```

Selection structure

```
if hours > 168 then
```

Comparison operator

Boolean expression

```
    print("That's impossible")
```

```
else
```

Mathematical operator

```
    totalPay = hours * hourlyRate
```

```
    print(totalPay)
```

Output statements

```
endif
```

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