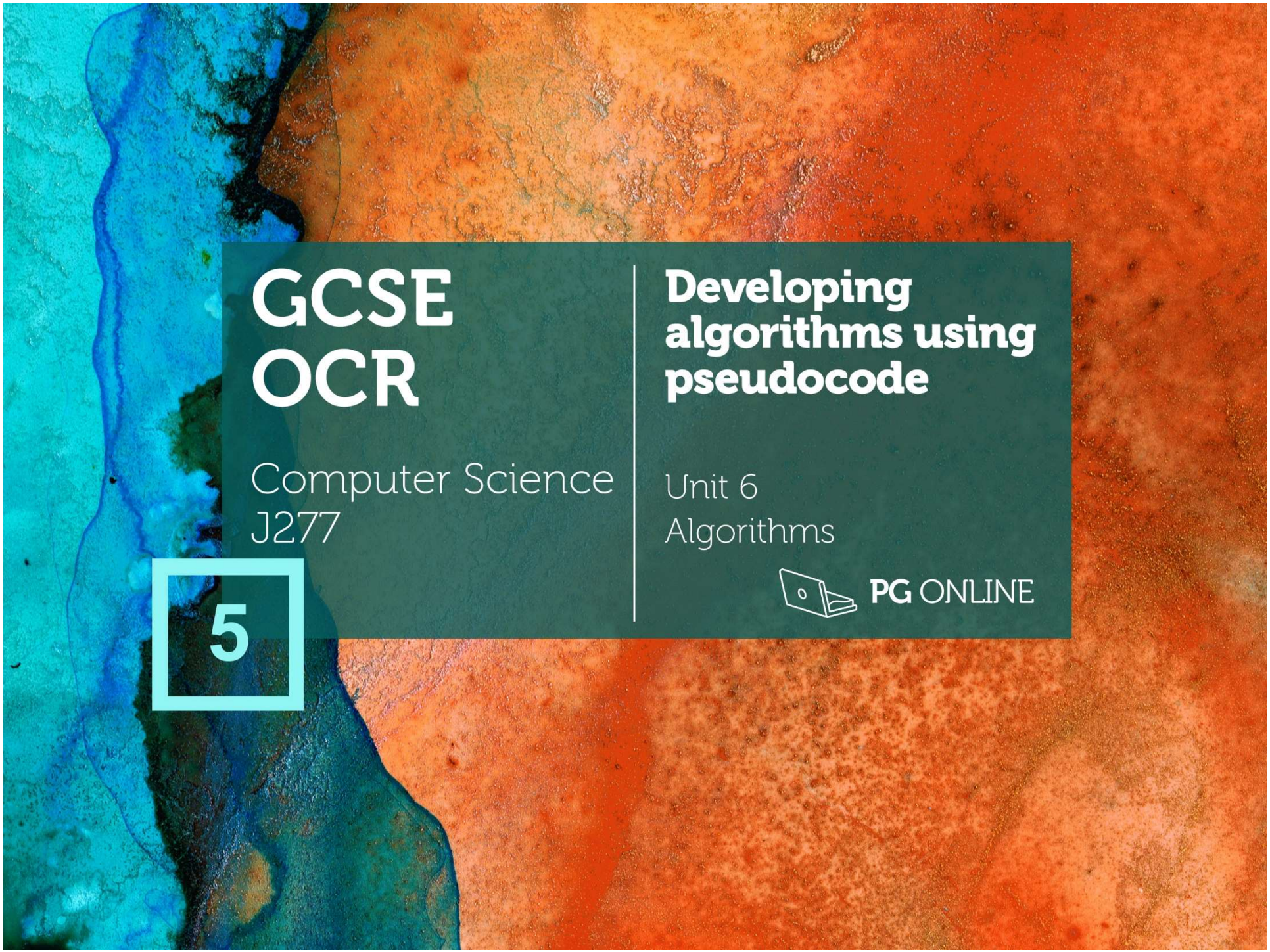

GCSE
OCR
Computer Science
J277
5
Developing algorithms using pseudocode
Unit 6
Algorithms
PG ONLINE

Objectives

- Define the data types integer, real, Boolean, character, string
- Be able to use Boolean operators
- Write algorithms in pseudocode involving sequence, selection and iteration

Starter

- Look at the symbols and keywords below
  - What do you think each one means?

Symbol / keyword	Meaning	Symbol / keyword	Meaning
<		+	
<=		if elseif else	
>		switch case default	
>=		input()	
==		print()	
=		for	
!=		while	
*		do until	
^		str()	
+		int()	

Starter

Answers

- Look at the symbols and keywords below
  - What do you think each one means?

Symbol / keyword	Meaning	Symbol / keyword	Meaning
<	Less than	+	Concatenation
<=	Less than or equal to	if elseif else	Branch depending on condition
>	Greater than	switch case default	Branch depending on case
>=	Greater than or equal to	input()	Get user input
==	Equal to	print()	Output to the user
=	Assignment	for	Repeat a set number of times
!=	Not equal to	while	Repeat while a condition is true
*	Multiply	do until	Do a loop until a condition is true
^	Exponent	str()	Convert to a string
+	Addition	int()	Convert to an integer

Data types

- You will use the following data types in your algorithms:

Data type	Description	Example
INTEGER	A whole number	1475, 0, -5
REAL	A number with a decimal point	56.75, 6.0, -2.456, 0.0
BOOLEAN	Either TRUE or FALSE	TRUE, FALSE
CHARACTER	A single alphabetic or numeric character	'a', 'K', '4', '@', '%'
STRING	A sequence of one or more characters	"Jo Hobson", "123"

Boolean operators

- The following operators are used to compare two values

>	greater than
>=	greater than or equal to
<	less than
<=	less than or equal to
==	equal to
!=	not equal to

Boolean expressions

- A Boolean expression evaluates to TRUE or FALSE
- What do each of the following expressions evaluate to?

(i) 35 >= 5 * 7

(ii) 'A' < 'B'

(iii) 100 > 10^2

(iv) 25 <= 2 * 5

(v) 2^4 == 16

(vi) n^2 == n * n

Boolean expressions

Answers

- A Boolean expression evaluates to TRUE or FALSE
- What do each of the following expressions evaluate to?

(i)	35 >= 5 * 7	True
(ii)	'A' < 'B'	True
(iii)	100 > 10^2	False
(iv)	25 <= 2 * 5	False
(v)	2^4 == 16	True
(vi)	n^2 == n * n	True

Worksheet 5

- Now complete **Task 1** and **Task 2** on **Worksheet 5**

Introducing pseudocode

- Pseudocode is a kind of structured English for describing algorithms
  - It allows a programmer to focus on the logic of the algorithm without being distracted by the exact syntax of the programming language
  - You will see pseudocode statements written in a consistent style in exam questions, but you can use alternative statements so long as the meaning is clear
  - You may see the exam board style of pseudocode referred to as *OCR Exam Reference Language* or *ERL*

Programming constructs

- Last lesson we covered three basic ways of controlling the flow of a program:
  - Sequence
  - Selection
  - Iteration
- What do each of these mean?

Sequence

- The statements are executed one by one, in the order they are written
  - An example in pseudocode would be:


```
mealCost = 4.00

drinkCost = 2.00

total = mealCost + drinkcost
```

Selection

- An **IF** statement is a type of selection statement
- The next statement to be executed depends on whether the condition being tested is TRUE or FALSE

```
hoursPerNight = int(input("How many hours a night do
                          you sleep?"))

if hoursPerNight < 8 then
      print("That's not enough!")
else
      print("That's plenty!")
endif
```

Execute this if TRUE

Execute this if FALSE

The switch/case statement

- The switch/case statement is used if there are several possible options to be tested

```
switch optionChosen:
   case 1:
     print("You chose option 1")
   case 2:
     print("You chose option 2")
   case 3:
     print("You chose option 3")
   default:
     print("Please select a valid choice")
endswitch
```

Execute if optionChosen is 1

Execute if optionChosen is 2

Execute if optionChosen is 3

Execute if no cases match

Assignment pseudocode

- To assign a value to a variable, you can write statements such as

```
total = 0
cost = adult * 2 + child * 3
counter = counter + 1
```

1. Write a statement of pseudocode to subtract discount from markedPrice to give salePrice
2. Write a statement of pseudocode to change the value stored in total to include VAT (at 20%)

Assignment pseudocode

Answers

1. Write a statement of pseudocode to subtract discount from markedPrice to give salePrice
   - salePrice = markedPrice - discount
2. Write a statement of pseudocode to change the value stored in total to include VAT (at 20%)
   - total = total * 0.2 + total
     OR
   - total = total * 1.2
     OR
   - const VAT = 0.2
     total = total * (1 + VAT)

Simple correct solution

Rewritten to require fewer operations

Rewritten to make use of a constant

Pseudocode for input/output

- Most programs that you will write will ask the user to enter some data, and then accept the user input and assign it to a variable
- The pseudocode used in an exam will look like this:

```
firstName = input("Please enter your name")
```

- This is equivalent to two statements:

```
print("Please enter your name")
firstName = input()
```

Inputting data – examples

Write a single statement to do each of the following:

- Display a prompt "How old are you?"
  Accept an answer from the user
  Assign the answer to a variable called age

- Display a prompt "Press Enter to continue"
  When the user presses Enter, continue to the next statement

Inputting

Answers

Write a single statement to do each of the following:

- Display a prompt "How old are you?"
  Accept an answer from the user
  Assign the answer to a variable called age

```
age = input("How old are you?")
```

- Display a prompt "Press Enter to continue"
  When the user presses Enter, continue to the next statement

```
input("Press Enter to continue")
```

Writing pseudocode

- Write pseudocode for a program which asks the user to enter the cost of two items, adds the two costs and if the cost is greater than £10.00, displays a message “Sorry, too much”.
  Otherwise it displays the change due from £10.00

Pseudocode solution

Answers

```
item1 = input("Please enter price of first item:")
item2 = input("Please enter price of second item:")
total = item1 + item2
if total > 10 then
   print("Sorry, too much")
else
   change = 10 – item1 - item2
   print("Change from £10.00 is £" + str(change))
endif
```

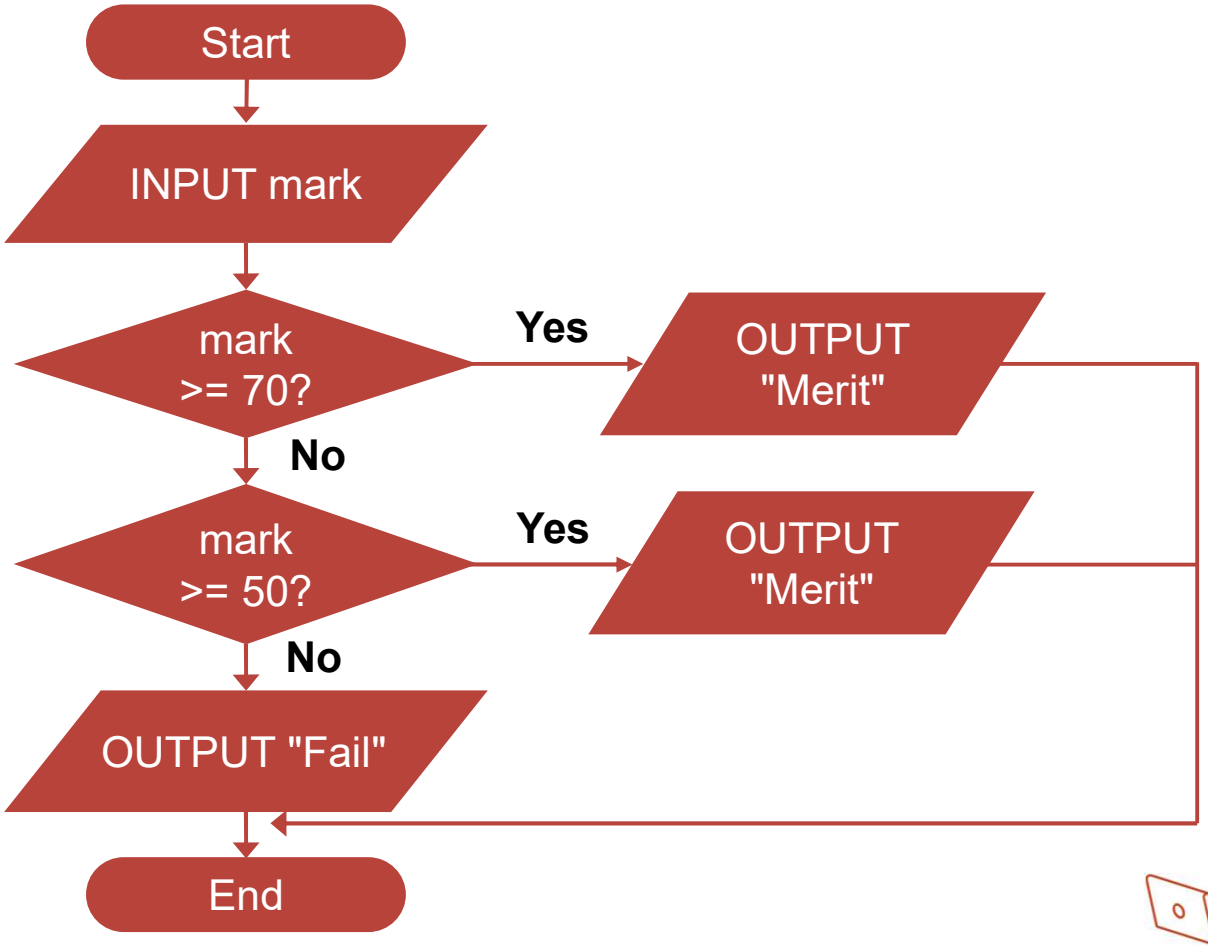
Execute if total > 10 is TRUE

Execute if total > 10 is FALSE

str(change) converts change into a string

Flowchart or pseudocode?

- Write pseudocode corresponding to this flowchart:



Iteration

- Iteration means repetition
- There are three types of iteration statement that you need to know
  - for … next
  - while … endwhile
  - do … until
- Some languages such as Python do not have the do … until statement but you still need to know it

for … next loop

- Use this when you want to execute the loop a specific number of times

```
total = 0
for counter from 1 to 7
    maxTemperature = input("Enter max temperature: ")
    total = total + maxTemperature
next counter
averageWeeksTemp = total / 7
print("This week's average is:")
print(averageWeeksTemp)
```

Repeat the loop 7 times

for … next loop with step

- For loops usually increase a counter by 1 each time an iteration occurs
  - It is possible to increase the counter by any number using the step keyword. For example:

```
For i = 0 to 6 step 2
      print(i)
next i
```

Output: 0,2,4,6

```
for i = 10 to 0 step -3
      print(i)
next i
```

Output: 10,7,4,1

while … end while

- Use this when you want to execute the loop **while** a certain condition is true.

```
password = ""
while password != "rE5Bh9dP"
   password = input("Enter password")
endwhile
print("Correct password")
```

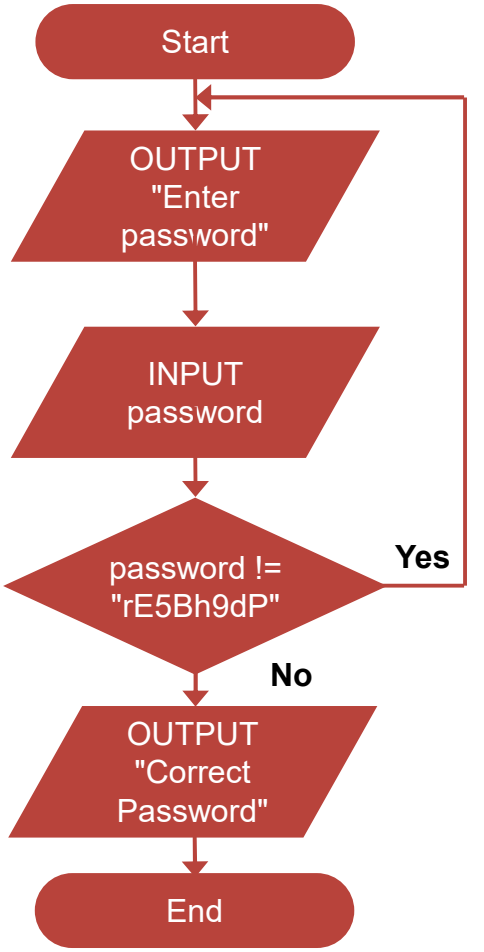
Repeat while password is not equal to “rE5Bh9dP”

Runs when password equals “rE5Bh9dP”

- The condition is tested at the beginning of the loop
- How many times will the loop execute if "rE5Bh9dP" is entered the first time the user is asked?

Flowchart while … end while

```
password = ""
while password != "rE5Bh9dP"
    password = input("Enter password")
endwhile
print("Correct password")
```



do … until

- Use this when you want to keep on executing a loop **until** a certain condition is TRUE
- The condition is tested at the **end** of the loop
- Rewrite this algorithm using a **do while** loop instead of a **while** loop?

```
password = ""
while password != "rE5Bh9dP"
   password = input("Enter password")
endwhile
print("Correct password")
```

Using do … until

- The condition is not tested until the end of the loop
  - It is always executed at least once

```
password = ""
do
   password = input("Enter password")
until password == "rE5Bh9dP"
print("Correct password")
```

Worksheet 5

- Now complete **Task 3** on **Worksheet 5**

Plenary

- Look at the symbols and keywords below
  - What do each of them mean?

Symbol / keyword	Meaning	Symbol / keyword	Meaning
<		+	
<=		if elseif else	
>		switch case default	
>=		input()	
==		print()	
=		for	
!=		while	
*		do until	
^		str()	
+		int()	

Plenary

Answers

- Look at the symbols and keywords below
  - How many more do you know than at the start of the lesson?

Symbol / keyword	Meaning	Symbol / keyword	Meaning
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