Programming for GCSE

Topic 4.1: While Loops
Aims

- Introduce the 'while' loop
- Consider the sequence of ideas
  - Repeat a statement, a fixed number of times
  - Repeat with variation, a fixed number of times
  - Repeat until you succeed, varying number of times
WHILE LOOPS
Simple ‘While’ Statement

- Execute statements repeatedly

counter = 1
while counter <= 5:
    print("Inside the loop")
    counter = counter + 1
Boxes

- A ‘while’ statement has an inside

```python
while condition A:
    Renter the box while 'A’ is true
```
Using a Counter

- Initialise, test, increment

```python
counter = 1
while counter <= 5:
    print("Inside the loop")
    counter = counter + 1
```
Quiz: Counter Values

• What is the sequence of counter values?

counter = 1
while counter <= 5:
    print("Inside the loop")
counter = counter + 1
Quiz: Counter Values

counter = 1
while counter <= 5:
    print("Inside the loop")
    counter = counter + 1

<table>
<thead>
<tr>
<th>Counter</th>
<th>Print</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&quot;Inside the loop&quot;</td>
</tr>
<tr>
<td>2</td>
<td>&quot;Inside the loop&quot;</td>
</tr>
<tr>
<td>3</td>
<td>&quot;Inside the loop&quot;</td>
</tr>
<tr>
<td>4</td>
<td>&quot;Inside the loop&quot;</td>
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<tr>
<td>5</td>
<td>&quot;Inside the loop&quot;</td>
</tr>
<tr>
<td>6</td>
<td>-</td>
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</tbody>
</table>
Quiz: Counter Values

- How many lines printed?

counter = 7
while counter <= 15:
    print("Inside the loop")
    counter = counter + 2
Quiz: Counter Values

counter = 7
while counter <= 15:
    print("Inside the loop")
counter = counter + 2

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<thead>
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<tbody>
<tr>
<td>7</td>
<td>&quot;Inside the loop&quot;</td>
</tr>
<tr>
<td>9</td>
<td>&quot;Inside the loop&quot;</td>
</tr>
<tr>
<td>11</td>
<td>&quot;Inside the loop&quot;</td>
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<tr>
<td>13</td>
<td>&quot;Inside the loop&quot;</td>
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<tr>
<td>15</td>
<td>&quot;Inside the loop&quot;</td>
</tr>
<tr>
<td>17</td>
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</tbody>
</table>
Varying the Code Repeated

- Previously, same code repeated
- Use counter to make it vary

counter = 1
while counter < 6:
    print("The counter is", counter)
    counter = counter + 1
counter = 1
while counter < 6:
    print("The counter is", counter)
    counter = counter + 1

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<tbody>
<tr>
<td>1</td>
<td>The counter is 1</td>
</tr>
<tr>
<td>2</td>
<td>The counter is 2</td>
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<tr>
<td>3</td>
<td>The counter is 3</td>
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<td>4</td>
<td>The counter is 4</td>
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<td>The counter is 5</td>
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</tbody>
</table>
Varying the Code Repeated

cntr = 1
while cntr < 6:
    if cntr % 2 == 0:
        print("The counter is", cntr)
    cntr = cntr + 1

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<tr>
<td>1</td>
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</tr>
<tr>
<td>2</td>
<td>The counter is 2</td>
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<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>The counter is 4</td>
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<td></td>
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<td>-</td>
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</table>
Order Matters

• These two programs differ
• Can you explain how?

counter = 1
while counter < 6:
    print("The counter is", counter)
    counter = counter + 1

counter = 1
while counter < 6:
    counter = counter + 1
    print("The counter is", counter)
Errors

• This program looks similar but it does not work
• Can you see why?

```
cntr = 1
while cntr < 6:
    if cntr % 2 == 0 :
        print("The counter is", cntr)
    cntr = cntr + 1
```
Counter Loops – Summary

• Counter
  • Initialise it
  • Test it
  • Change it
• The counter has a sequence of values in the loop body
• The counter value can be used to vary the statement executed each time through the loop
COMPARISONS
Loops in Scratch

- Scratch has 4 loops

**Loop without end**

**Loop fixed number of time**

**Condition**

**Loop while condition true**

**Condition**

**Loop until condition true**
‘While’ Language

• Many instructions have ‘loop’ language

Put the butter, sugar, fruit, zests, juice and 100ml/3½fl oz brandy in a large pan. Bring slowly to the boil, stirring until the butter has melted. Reduce the heat and bubble for 10 minutes, stirring occasionally.

while not (butter melted) :
    stir
    pause
**WHILE WITH CONDITION**

Not all loops have counters
Loop with a Condition

- The number of iterations can vary

```python
needAnswer = True
while needAnswer:
    ans = input("Answer Yes or No! ")
    if ans == "Yes" or ans == "No":
        needAnswer = False
```

Answer Yes or No! Not sure
Answer Yes or No! Ok
Answer Yes or No! Will do
Answer Yes or No! I said alright
Answer Yes or No! Yes
print("I can spell Mississippi")
goes = 0
ans = -1
while ans != 0 :
    ans = int(input("How many ‘s’ in it?"))
    goes = goes + 1

print("You answered in", goes, "goes")
Teaching Issues
Teaching Issue

• How many stages for loops
  • Counter: repeating the same statement
  • Counter: varying the statement
  • Vary number of iterations

• Python has other loops (like Scratch)
  • Are they needed?

• Loops are the most complex aspect of programming