M03-HW-KEY

August 19, 2023

1 Metadata

```
Course:   DS 5100
Term:     Fall 2023
Module:   M03 Homework KEY
Author:   R.C. Alvarado
Date:     19 August 2023 (revised)
```

2 Student Info

- Name:
- Net ID:
- URL of this file in GitHub:

3 Instructions

In your **private course repo on Rivanna**, write a Jupyter notebook running Python that performs the numbered tasks below.

For each task, create a code cell to perform the task.

Save your notebook in the `M03` directory as `hw03.ipynb`.

Add and commit these files to your repo.

Then push your commits to your repo on GitHib.

Be sure to fill out the **Student Info** block above.

To submit your homework, save the notebook as a PDF and upload it to GradeScope, following the instructions.

12 points

4 Task 1

(6 points)

Using the **for** loop and **if** statement control structures, write a script that generates the integers from 1 to 100 and does the following things:

- If 3 is a factor of the number, print `Wahoo`.
- If 5 is a factor of the number, print `wah!`.
- If the number meets none of the above conditions, print nothing, not even a line break.
- If the number meets both of the conditions, print the above strings on the same line with no space between them.
- Make sure that the line printed for each iteration in which a condition is met ends with a line break.
- When the loop is finished, print the number of times either conidtion was met, i.e. the number of lines that were printed.

Hint: You may not need to use **elif** and **else** to accomplish these tasks.

[45]:
```
n = 0
for i in range(1, 101):
    a = i % 3 == 0
    b = i % 5 == 0
    if a:
        print("Wahoo", end='')
    if b:
        print("wah!", end='')
    if a or b:
        n += 1
        print()
print(n)
```

```
Wahoo
wah!
Wahoo
Wahoo
wah!
Wahoo
Wahoowah!
Wahoo
wah!
Wahoo
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wah!
Wahoo
Wahoowah!
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wah!
Wahoo
Wahoowah!
Wahoo
wah!
Wahoo
Wahoo
wah!
47
```

4.1 An alternate solution

[74]:
```
%%timeit
X = range(1, 101)
A = [(x % 3 == 0) * 'Wahoo' for x in X]
B = [(x % 5 == 0) * 'wah!' for x in X]
C = [a + b for a, b in zip(A, B) if a + b]
```

```
21.5 µs ± 183 ns per loop (mean ± std. dev. of 7 runs, 10,000 loops each)
```

[56]:
```
print('\n'.join(C))
print(len(C))
```

```
Wahoo
wah!
Wahoo
Wahoo
wah!
Wahoo
Wahoowah!
Wahoo
wah!
Wahoo
Wahoo
```

```
wah!
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Wahoowah!
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Wahoo
wah!
47
```

[75]:
```
%%timeit
X1 = range(1, 101)
A1 = [x % 3 == 0 for x in X1]
B1 = [x % 5 == 0 for x in X1]
C1 = [a * 'Wahoo' + b * 'wah!' for a, b in zip(A1, B1) if a or b]
```

```
18.5 µs ± 85.1 ns per loop (mean ± std. dev. of 7 runs, 100,000 loops each)
```

[76]:
```
print('\n'.join(C1))
print(len(C1))
```

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Wahoo
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Wahoo
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Wahoo
Wahoowah!
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Wahoo
Wahoowah!
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wah!
Wahoo
Wahoo
wah!
47
```

[1]:
```
# kfunc = lambda x, f, s: (x % f == 0) * s

def kfunc(x, f, s):
    return (x % f == 0) * s

X2 = range(1, 101)
A2 = [kfunc(x, 3, 'Wahoo') for x in X2]
B2 = [kfunc(x, 5, 'wah!') for x in X2]
C2 = [a + b for a, b in zip(A2, B2) if a + b]
```

[2]:
```
print('\n'.join(C2))
print(len(C2))
```

```
Wahoo
wah!
Wahoo
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wah!
Wahoo
Wahoowah!
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Wahoo
Wahoowah!
Wahoo
wah!
Wahoo
Wahoo
wah!
47
```

5 Task 2

(3 points)

Rewrite the `for` loop as a `while` loop.

This time, only print lines where both conditions are met.

Include a final line which prints the number of times both conditions are met.

[92]:
```
i = n = 0
while i < 100:
    i += 1
    a = i % 3 == 0
    b = i % 5 == 0
    if a and b:
        print("Wahoowah!")
        n += 1
print(n)
```

```
Wahoowah!
Wahoowah!
Wahoowah!
Wahoowah!
Wahoowah!
Wahoowah!
6
```

6 Task 3

(3 points)

Write a list comprehension that iterates through the integers from 1 to 100 and returns a list containing the sum of the boolean values of the two conditions described in Task 1.

[90]:
```
x = [(i % 3 == 0) + (i % 5 == 0) for i in range(1, 101)]
```

[91]:
```
x
```

[91]:
```
[0,
 0,
 1,
 0,
 1,
 1,
 0,
 0,
 1,
 1,
 0,
 1,
 0,
 0,
 2,
 0,
 0,
 1,
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2,
```

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    0,
    0,
    1,
    0,
    1,
    1,
    0,
    0,
    1,
    1]
```

[ ]: