Control: loops

⏪ Recap

- `if` / `elif` / `else`
- comparison operators (`>` , `>=` , ...)
- logical operators (`and` , `or` , `not`)
- boolean values & expressions (`2 > 1` , `True` , `False`)
- control flow usign `return`

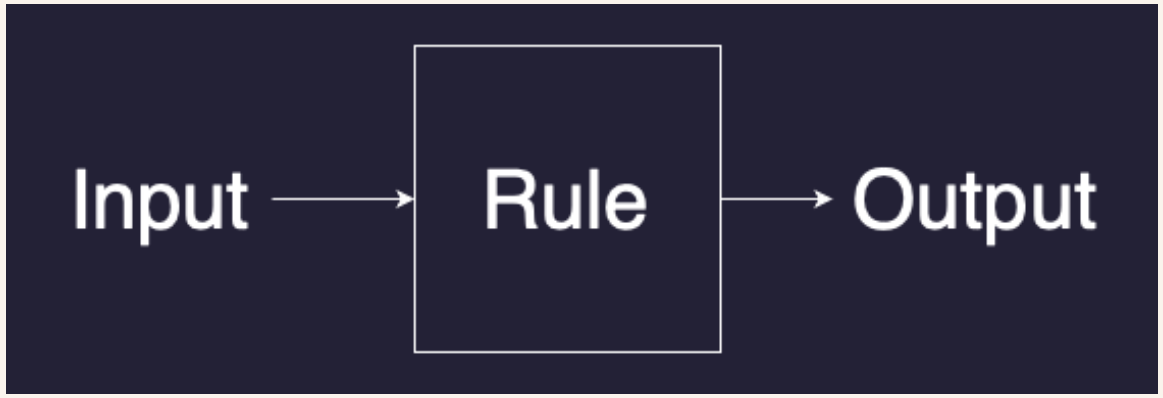
⏪ Recap

```
if x < 10:
    print('A')
elif x >= 13:
    print('B')
elif x >= 20:
    print('C')
else:
    print('D')
```

- `x = 1` ?
- `x = 13` ?
- `x = 10` ?
- `x = 11` ?
- `x = 20` ?

Control

- conditionals: branching
- **loops**: repetition



1. Meow

Don't Repeat Yourself (DRY)

```
print("meow")
print("meow")
print("meow")
```

Loop

`while`

`for`

`while`: conditionally repeated

```
i = 3
while i > 0:
    print("meow")
    i = i - 1
```

`while` using `-=` for assignment

```
i = 3
while i > 0:
    print("meow")
    i -= 1          # i = i - 1
```

Assignment operators

- `=` : `x = 1`
- `+=` : `x += 1` (same as `x = x + 1`)
- `-=` : `x -= 1` (same as `x = x - 1`)
- `*=` : `x *= 2` (same as `x = x * 2`)
- `/=` : `x /= 2` (same as `x = x / 2`)

...

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https://python-reference.readthedocs.io/en/latest/docs/operators/

`for`: repeat over a sequence (list, string, ...)

```
for i in [0, 1, 2]:
    print("meow")

for i in [0, 0, 0]:
    print("meow")

for i in "abc":
    print("meow")
```

`range()`

```
for i in range(3):
    print("meow")
```

_: throwaway variable

```
for _ in range(3):
    print("meow")
```

`range(start, end)`

```
for i in range(0, 3):   # same as range(3)
    print(i)

for i in range(start=5, end=9):
    print(i)
```

🖥️ 2. Printing even numbers between 1 and 20

- Use a `for` loop and the `range` function to iterate from 1 to 20 (inclusive).
- Inside the loop, use an `if` statement to check if the current number is even.
  - To check for evenness, use the modulo operator `%`.
- If the number is even, print it.

```
2
4
6
8
10
12
14
16
18
20
```

3. Interactive meow

```
Enter a positive number: -3
Enter a positive number: -1
Enter a positive number: 4
meow
meow
meow
meow
```

Infinite loop to repeat forever

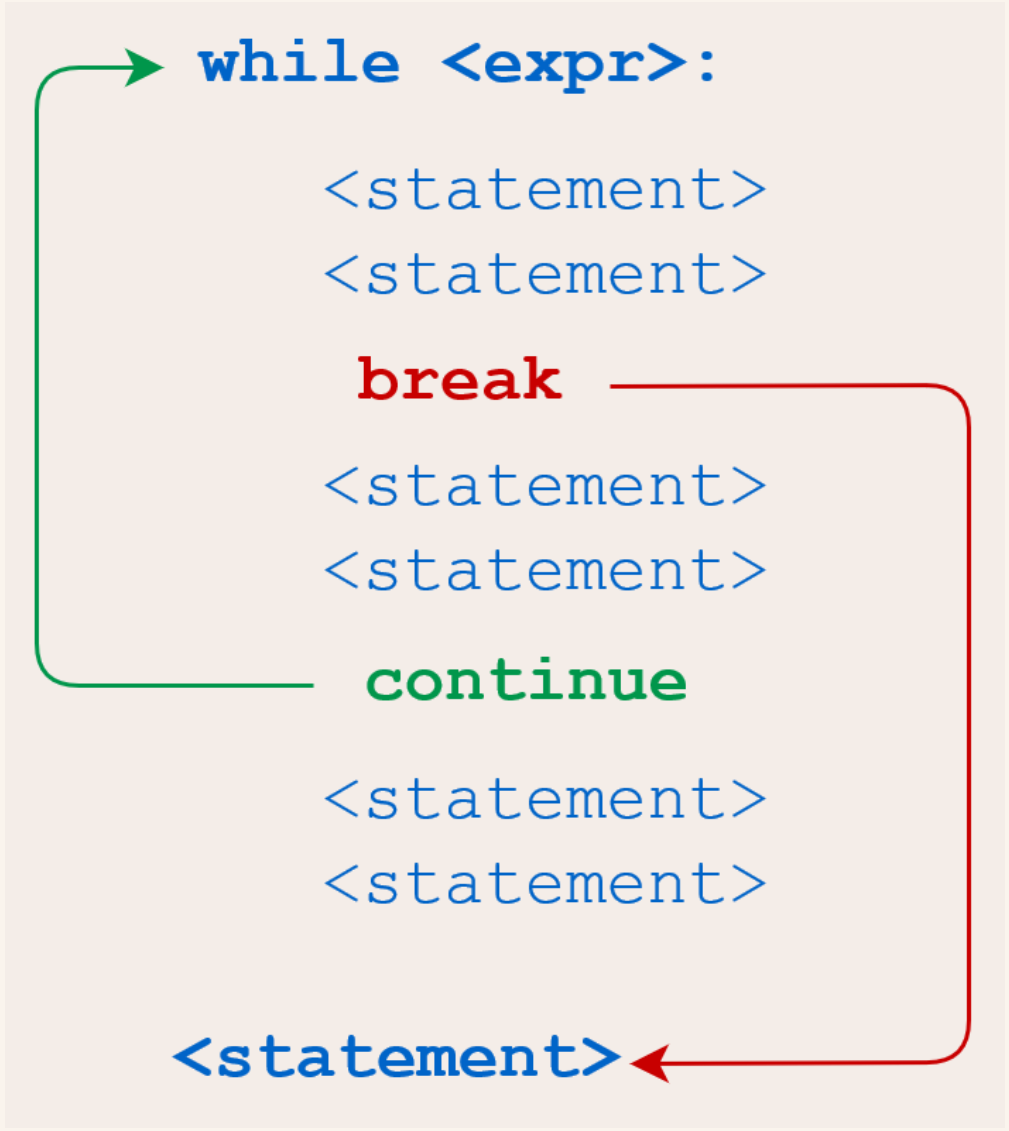
```
while True:
    print("meow")
```

How to escape a loop? `continue`, `break`

```
while True:           # infinite loop
    n = int(input("Enter a positive number: "))

    if n < 0:         # if n is negative
        continue      # continue to the next iteration
    else:             # if n is non-negative
        break         # break out of the loop

for _ in range(n):
    print("meow")
```


while <expr>:
<statement>
<statement>
break
<statement>
<statement>
continue
<statement>
<statement>
<statement>

infinite loop continues without `continue`

```
while True: # infinite loop
    n = int(input("Enter a positive number: "))

    if n > 0:   # if n is positive
        break   # break out of the loop

for _ in range(n):
    print("meow")
```

How to escape a loop?

```
def main():
    # Ask the user to enter a positive number
    n = get_positive_number()

    # Print "meow" n times
    meow(n)

main()
```

`return` to break out of a loop

```
def main():
    n = get_positive_number()
    meow(n)

def get_positive_number():
    while True:
        n = int(input("Enter a positive number: "))
        if n > 0:
            return n # return the number

def meow(n):
    for _ in range(n):
        print("meow")

main()
```

What will be printed? 🤔

```
for i in range(5):
    if i == 2:
        continue
    print(i)
```

What will be printed? 🤔

```
for i in range(5):
    if i == 2:
        break
    print(i)
```

What will be printed? 🤔

```
def mystery():
    for i in range(5):
        if i == 2:
            return i
        print(i)
    return -1

print(mystery())
```

What will be printed? 🤔

```
for i in range(5):
    if i % 2 == 0:
        continue
    if i > 2:
        break
    print(i)
```

4. Input Validation for Even Numbers

- Use a `while True` loop to prompt the user to enter a number until an even number is entered.
- Write a function `is_even(n)` that takes an integer `n` and returns `True` if `n` is even and `False` otherwise.
- Use an `if` statement to check whether the entered number is even.
    - If the number is even, return it and break out of the loop.
- Calculate the square of the returned even number and print it.

```
Enter an even number: 3
3 is not an even number. Try again.
Enter an even number: 5
5 is not an even number. Try again.
Enter an even number: 8
64
```