

# Using context managers

WRITING FUNCTIONS IN PYTHON



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# What is a context manager?

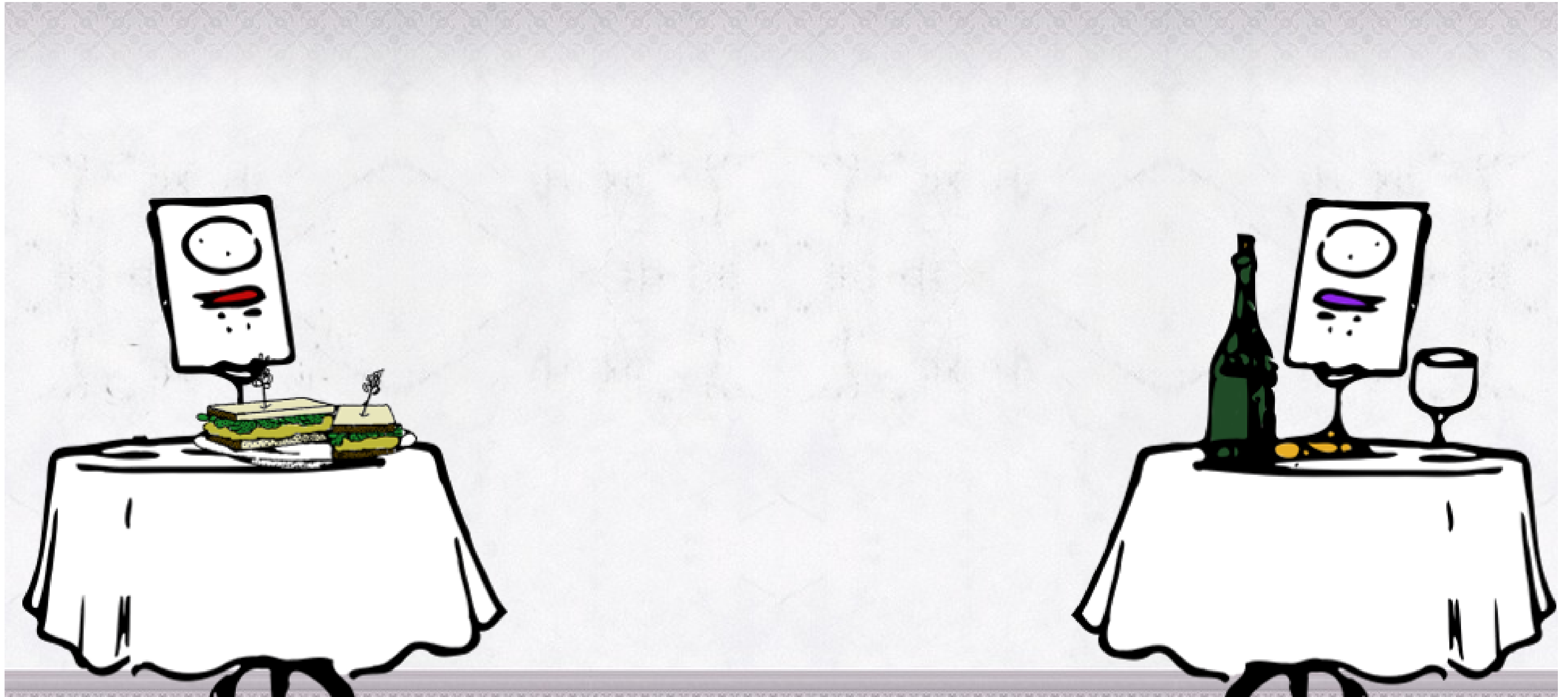
A context manager:

- Sets up a context
- Runs your code
- Removes the context

# A catered party



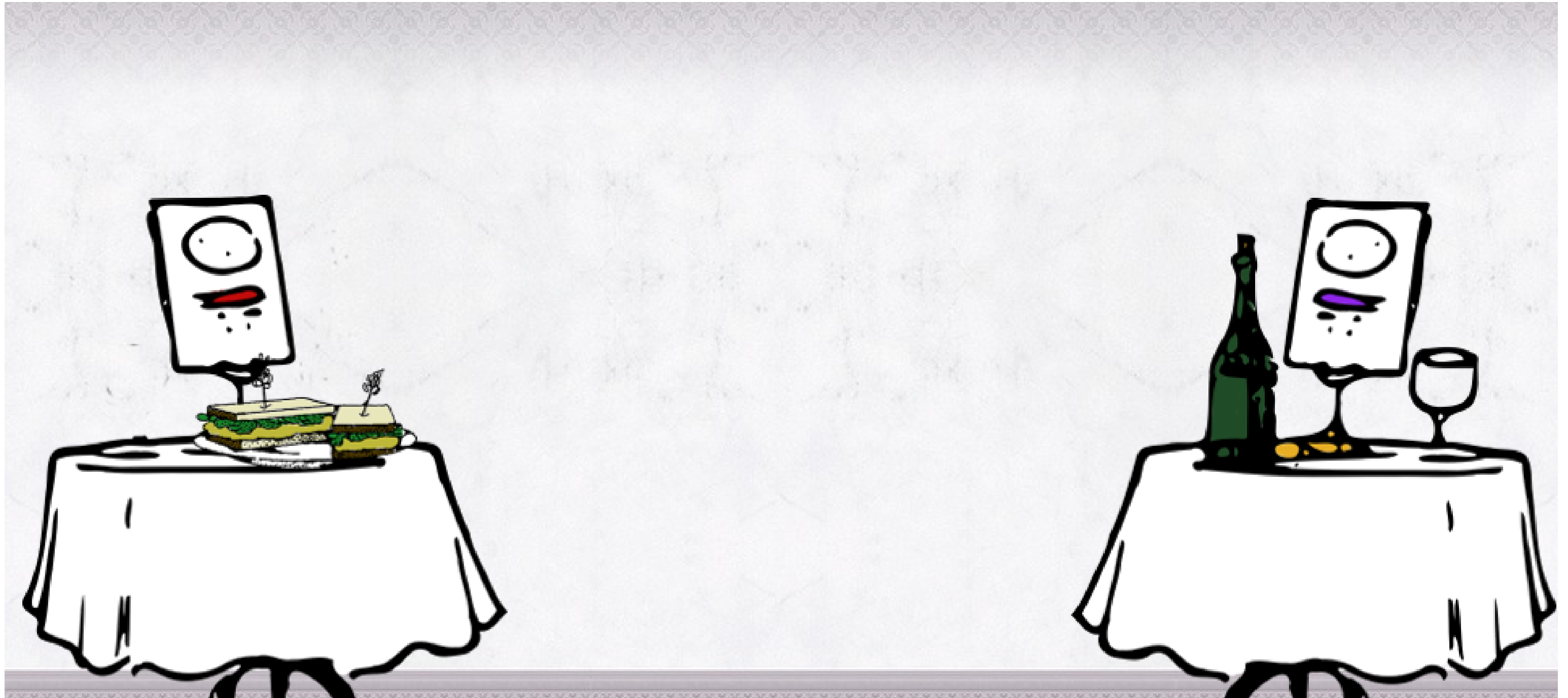
# A catered party



# A catered party



# A catered party



# A catered party



# Catered party as context

Context managers:

- Set up a context
- Run your code
- Remove the context

Caterers:

- Set up the tables with food and drink
- Let you and your friends have a party
- Cleaned up and removed the tables



# A real-world example

```
with open('my_file.txt') as my_file:  
    text = my_file.read()  
    length = len(text)  
  
print('The file is {} characters long'.format(length))
```

`open()` does three things:

- Sets up a context by opening a file
- Lets you run any code you want on that file
- Removes the context by closing the file

# Using a context manager

```
with
```

# Using a context manager

```
with <context-manager>():
```

# Using a context manager

```
with <context-manager>(<args>)
```

# Using a context manager

```
with <context-manager>(<args>):
```

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```
with <context-manager>(<args>):  
    # Run your code here  
    # This code is running "inside the context"
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# Using a context manager

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with <context-manager>(<args>):  
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    # This code is running "inside the context"  
  
# This code runs after the context is removed
```

# Using a context manager

```
with <context-manager>(<args>) as <variable-name>:  
    # Run your code here  
    # This code is running "inside the context"  
  
# This code runs after the context is removed
```

```
with open('my_file.txt') as my_file:  
    text = my_file.read()  
    length = len(text)  
  
print('The file is {} characters long'.format(length))
```



# Let's practice!

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# Writing context managers

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# Two ways to define a context manager

- Class-based
- Function-based

# Two ways to define a context manager

- Class-based
- **Function-based \***

# How to create a context manager

```
def my_context():  
    # Add any set up code you need  
    yield  
    # Add any teardown code you need
```

1. Define a function.
2. (optional) Add any set up code your context needs.
3. Use the "yield" keyword.
4. (optional) Add any teardown code your context needs.

# How to create a context manager

```
@contextlib.contextmanager
def my_context():
    # Add any set up code you need
    yield
    # Add any teardown code you need
```

1. Define a function.
2. (optional) Add any set up code your context needs.
3. Use the "yield" keyword.
4. (optional) Add any teardown code your context needs.
5. Add the `@contextlib.contextmanager` decorator.

# The "yield" keyword

```
@contextlib.contextmanager
def my_context():
    print('hello')
    yield 42
    print('goodbye')
```

```
with my_context() as foo:
    print('foo is {}'.format(foo))
```

```
hello
foo is 42
goodbye
```

# Setup and teardown

```
@contextlib.contextmanager
def database(url):
    # set up database connection
    db = postgres.connect(url)

    yield db

    # tear down database connection
    db.disconnect()
```

```
url = 'http://datacamp.com/data'
with database(url) as my_db:
    course_list = my_db.execute(
        'SELECT * FROM courses'
    )
```





# Setup and teardown

```
@contextlib.contextmanager
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```
url = 'http://datacamp.com/data'
with database(url) as my_db:
    course_list = my_db.execute(
        'SELECT * FROM courses'
    )
```

# Yielding a value or None

```
@contextlib.contextmanager
def database(url):
    # set up database connection
    db = postgres.connect(url)

    yield db

    # tear down database connection
    db.disconnect()
```

```
url = 'http://datacamp.com/data'
with database(url) as my_db:
    course_list = my_db.execute(
        'SELECT * FROM courses'
    )
```

```
@contextlib.contextmanager
def in_dir(path):
    # save current working directory
    old_dir = os.getcwd()

    # switch to new working directory
    os.chdir(path)

    yield

    # change back to previous
    # working directory
    os.chdir(old_dir)
```

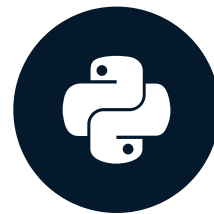
```
with in_dir('/data/project_1/'):
    project_files = os.listdir()
```

# Let's practice!

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# Advanced topics

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# Nested contexts

```
def copy(src, dst):  
    """Copy the contents of one file to another.  
  
    Args:  
        src (str): File name of the file to be copied.  
        dst (str): Where to write the new file.  
    """  
  
    # Open the source file and read in the contents  
    with open(src) as f_src:  
        contents = f_src.read()  
  
    # Open the destination file and write out the contents  
    with open(dst, 'w') as f_dst:  
        f_dst.write(contents)
```

# Nested contexts

```
with open('my_file.txt') as my_file:  
    for line in my_file:  
        # do something
```

# Nested contexts

```
def copy(src, dst):  
    """Copy the contents of one file to another.  
  
    Args:  
        src (str): File name of the file to be copied.  
        dst (str): Where to write the new file.  
    """  
    # Open both files  
    with open(src) as f_src:  
        with open(dst, 'w') as f_dst:  
            # Read and write each line, one at a time  
            for line in f_src:  
                f_dst.write(line)
```



# Handling errors

```
def get_printer(ip):  
    p = connect_to_printer(ip)  
  
    yield  
  
    # This MUST be called or no one else will  
    # be able to connect to the printer  
    p.disconnect()  
    print('disconnected from printer')  
  
doc = {'text': 'This is my text.'}  
  
with get_printer('10.0.34.111') as printer:  
    printer.print_page(doc['txt'])
```

```
Traceback (most recent call last):  
  File "<stdin>", line 1, in <module>  
    printer.print_page(doc['txt'])  
KeyError: 'txt'
```

# Handling errors

```
try:  
    # code that might raise an error  
except:  
    # do something about the error  
finally:  
    # this code runs no matter what
```

# Handling errors

```
def get_printer(ip):  
    p = connect_to_printer(ip)  
  
    try:  
        yield  
    finally:  
        p.disconnect()  
        print('disconnected from printer')  
  
doc = {'text': 'This is my text.'}  
  
with get_printer('10.0.34.111') as printer:  
    printer.print_page(doc['txt'])
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```
disconnected from printer  
Traceback (most recent call last):  
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KeyError: 'txt'
```

# Context manager patterns

Open	Close
Lock	Release
Change	Reset
Enter	Exit
Start	Stop
Setup	Teardown
Connect	Disconnect

<sup>1</sup> Adapted from Dave Brondsema's talk at PyCon 2012: <https://youtu.be/cSbD5SKwak0?t=795>

# Let's practice!

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