Beginner's Python Cheat Sheet

Variables and Strings

Variables are used to store values. A string is a series of characters, surrounded by single or double quotes.

Hello world

```
print("Hello world!")
```

Hello world with a variable

```
msg = "Hello world!"
print(msg)
```

Concatenation (combining strings)

```
first_name = 'albert'
last_name = 'einstein'
full_name = first_name + ' ' + last_name
print(full_name)
```

Lists

A list stores a series of items in a particular order. You access items using an index, or within a loop.

Make a list

```
bikes = ['trek', 'redline', 'giant']
```

Get the first item in a list

```
first_bike = bikes[0]
```

Get the last item in a list

```
last_bike = bikes[-1]
```

Looping through a list

```
for bike in bikes:
    print(bike)
```

Adding items to a list

```
bikes = []
bikes.append('trek')
bikes.append('redline')
bikes.append('giant')
```

Making numerical lists

```
squares = []
for x in range(1, 11):
    squares.append(x**2)
```

Lists (cont.)

List comprehensions

```
squares = [x**2 for x in range(1, 11)]
```

Slicing a list

```
finishers = ['sam', 'bob', 'ada', 'bea']
first_two = finishers[:2]
```

Copying a list

```
copy_of_bikes = bikes[:]
```

Tuples

Tuples are similar to lists, but the items in a tuple can't be modified.

Making a tuple

```
dimensions = (1920, 1080)
```

If statements

If statements are used to test for particular conditions and respond appropriately.

Conditional tests

```
equals            x == 42
not equal         x != 42
greater than      x > 42
  or equal to     x >= 42
less than         x < 42
  or equal to     x <= 42
```

Conditional test with lists

```
'trek' in bikes
'surly' not in bikes
```

Assigning boolean values

```
game_active = True
can_edit = False
```

A simple if test

```
if age >= 18:
    print("You can vote!")
```

If-elif-else statements

```
if age < 4:
    ticket_price = 0
elif age < 18:
    ticket_price = 10
else:
    ticket_price = 15
```

Dictionaries

Dictionaries store connections between pieces of information. Each item in a dictionary is a key-value pair.

A simple dictionary

```
alien = {'color': 'green', 'points': 5}
```

Accessing a value

```
print("The alien's color is " + alien['color'])
```

Adding a new key-value pair

```
alien['x_position'] = 0
```

Looping through all key-value pairs

```
fav_numbers = {'eric': 17, 'ever': 4}
for name, number in fav_numbers.items():
    print(name + ' loves ' + str(number))
```

Looping through all keys

```
fav_numbers = {'eric': 17, 'ever': 4}
for name in fav_numbers.keys():
    print(name + ' loves a number')
```

Looping through all the values

```
fav_numbers = {'eric': 17, 'ever': 4}
for number in fav_numbers.values():
    print(str(number) + ' is a favorite')
```

User input

Your programs can prompt the user for input. All input is stored as a string.

Prompting for a value

```
name = input("What's your name? ")
print("Hello, " + name + "!")
```

Prompting for numerical input

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

pi = input("What's the value of pi? ")
pi = float(pi)
```


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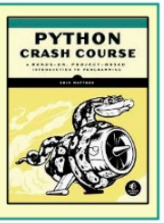

While loops

A while loop repeats a block of code as long as a certain condition is true.

A simple while loop

```
current_value = 1
while current_value <= 5:
    print(current_value)
    current_value += 1
```

Letting the user choose when to quit

```
msg = ''
while msg != 'quit':
    msg = input("What's your message? ")
    print(msg)
```

Functions

Functions are named blocks of code, designed to do one specific job. Information passed to a function is called an argument, and information received by a function is called a parameter.

A simple function

```
def greet_user():
    """Display a simple greeting."""
    print("Hello!")

greet_user()
```

Passing an argument

```
def greet_user(username):
    """Display a personalized greeting."""
    print("Hello, " + username + "!")

greet_user('jesse')
```

Default values for parameters

```
def make_pizza(topping='bacon'):
    """Make a single-topping pizza."""
    print("Have a " + topping + " pizza!")

make_pizza()
make_pizza('pepperoni')
```

Returning a value

```
def add_numbers(x, y):
    """Add two numbers and return the sum."""
    return x + y

sum = add_numbers(3, 5)
print(sum)
```

Classes

A class defines the behavior of an object and the kind of information an object can store. The information in a class is stored in attributes, and functions that belong to a class are called methods. A child class inherits the attributes and methods from its parent class.

Creating a dog class

```
class Dog():
    """Represent a dog."""

    def __init__(self, name):
        """Initialize dog object."""
        self.name = name

    def sit(self):
        """Simulate sitting."""
        print(self.name + " is sitting.")

my_dog = Dog('Peso')

print(my_dog.name + " is a great dog!")
my_dog.sit()
```

Inheritance

```
class SARDog(Dog):
    """Represent a search dog."""

    def __init__(self, name):
        """Initialize the sardog."""
        super().__init__(name)

    def search(self):
        """Simulate searching."""
        print(self.name + " is searching.")

my_dog = SARDog('Willie')

print(my_dog.name + " is a search dog.")
my_dog.sit()
my_dog.search()
```

Infinite Skills

If you had infinite programming skills, what would you build?

As you're learning to program, it's helpful to think about the real-world projects you'd like to create. It's a good habit to keep an "ideas" notebook that you can refer to whenever you want to start a new project. If you haven't done so already, take a few minutes and describe three projects you'd like to create.

Working with files

Your programs can read from files and write to files. Files are opened in read mode ('r') by default, but can also be opened in write mode ('w') and append mode ('a').

Reading a file and storing its lines

```
filename = 'siddhartha.txt'
with open(filename) as file_object:
    lines = file_object.readlines()

for line in lines:
    print(line)
```

Writing to a file

```
filename = 'journal.txt'
with open(filename, 'w') as file_object:
    file_object.write("I love programming.")
```

Appending to a file

```
filename = 'journal.txt'
with open(filename, 'a') as file_object:
    file_object.write("\nI love making games.")
```

Exceptions

Exceptions help you respond appropriately to errors that are likely to occur. You place code that might cause an error in the try block. Code that should run in response to an error goes in the except block. Code that should run only if the try block was successful goes in the else block.

Catching an exception

```
prompt = "How many tickets do you need? "
num_tickets = input(prompt)

try:
    num_tickets = int(num_tickets)
except ValueError:
    print("Please try again.")
else:
    print("Your tickets are printing.")
```

Zen of Python

Simple is better than complex

If you have a choice between a simple and a complex solution, and both work, use the simple solution. Your code will be easier to maintain, and it will be easier for you and others to build on that code later on.

More cheat sheets available at
ehmatthes.github.io/pcc/

Beginner's Python Cheat Sheet — If Statements and While Loops

What are if statements? What are while loops?

If statements allow you to examine the current state of a program and respond appropriately to that state. You can write a simple if statement that checks one condition, or you can create a complex series of if statements that idenitfy the exact conditions you're looking for.

While loops run as long as certain conditions remain true. You can use while loops to let your programs run as long as your users want them to.

Conditional Tests

A conditional test is an expression that can be evaluated as True or False. Python uses the values True and False to decide whether the code in an if statement should be executed.

Checking for equality

A single equal sign assigns a value to a variable. A double equal sign (==) checks whether two values are equal.

```
>>> car = 'bmw'
>>> car == 'bmw'
True
>>> car = 'audi'
>>> car == 'bmw'
False
```

Ignoring case when making a comparison

```
>>> car = 'Audi'
>>> car.lower() == 'audi'
True
```

Checking for inequality

```
>>> topping = 'mushrooms'
>>> topping != 'anchovies'
True
```

Numerical comparisons

Testing numerical values is similar to testing string values.

Testing equality and inequality

```
>>> age = 18
>>> age == 18
True
>>> age != 18
False
```

Comparison operators

```
>>> age = 19
>>> age < 21
True
>>> age <= 21
True
>>> age > 21
False
>>> age >= 21
False
```

Checking multiple conditions

You can check multiple conditions at the same time. The and operator returns True if all the conditions listed are True. The or operator returns True if any condition is True.

Using and to check multiple conditions

```
>>> age_0 = 22
>>> age_1 = 18
>>> age_0 >= 21 and age_1 >= 21
False
>>> age_1 = 23
>>> age_0 >= 21 and age_1 >= 21
True
```

Using or to check multiple conditions

```
>>> age_0 = 22
>>> age_1 = 18
>>> age_0 >= 21 or age_1 >= 21
True
>>> age_0 = 18
>>> age_0 >= 21 or age_1 >= 21
False
```

Boolean values

A boolean value is either True or False. Variables with boolean values are often used to keep track of certain conditions within a program.

Simple boolean values

```
game_active = True
can_edit = False
```

If statements

Several kinds of if statements exist. Your choice of which to use depends on the number of conditions you need to test. You can have as many elif blocks as you need, and the else block is always optional.

Simple if statement

```
age = 19

if age >= 18:
    print("You're old enough to vote!")
```

If-else statements

```
age = 17

if age >= 18:
    print("You're old enough to vote!")
else:
    print("You can't vote yet.")
```

The if-elif-else chain

```
age = 12

if age < 4:
   price = 0
elif age < 18:
    price = 5
else:
    price = 10

print("Your cost is $" + str(price) + ".")
```

Conditional tests with lists

You can easily test whether a certain value is in a list. You can also test whether a list is empty before trying to loop through the list.

Testing if a value is in a list

```
>>> players = ['al', 'bea', 'cyn', 'dale']
>>> 'al' in players
True
>>> 'eric' in players
False
```


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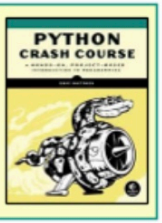

Conditional tests with lists (cont.)

Testing if a value is not in a list

```
banned_users = ['ann', 'chad', 'dee']
user = 'erin'

if user not in banned_users:
    print("You can play!")
```

Checking if a list is empty

```
players = []

if players:
    for player in players:
        print("Player: " + player.title())
else:
    print("We have no players yet!")
```

Accepting input

You can allow your users to enter input using the input() statement. In Python 3, all input is stored as a string.

Simple input

```
name = input("What's your name? ")
print("Hello, " + name + ".")
```

Accepting numerical input

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

if age >= 18:
    print("\nYou can vote!")
else:
    print("\nYou can't vote yet.")
```

Accepting input in Python 2.7

Use raw_input() in Python 2.7. This function interprets all input as a string, just as input() does in Python 3.

```
name = raw_input("What's your name? ")
print("Hello, " + name + ".")
```

While loops

A while loop repeats a block of code as long as a condition is True.

Counting to 5

```
current_number = 1

while current_number <= 5:
    print(current_number)
    current_number += 1
```

While loops (cont.)

Letting the user choose when to quit

```
prompt = "\nTell me something, and I'll "
prompt += "repeat it back to you."
prompt += "\nEnter 'quit' to end the program. "

message = ""
while message != 'quit':
    message = input(prompt)

    if message != 'quit':
        print(message)
```

Using a flag

```
prompt = "\nTell me something, and I'll "
prompt += "repeat it back to you."
prompt += "\nEnter 'quit' to end the program. "

active = True
while active:
    message = input(prompt)

    if message == 'quit':
        active = False
    else:
        print(message)
```

Using break to exit a loop

```
prompt = "\nWhat cities have you visited?"
prompt += "\nEnter 'quit' when you're done. "

while True:
    city = input(prompt)

    if city == 'quit':
        break
    else:
        print("I've been to " + city + "!")
```

Accepting input with Sublime Text

Sublime Text doesn't run programs that prompt the user for input. You can use Sublime Text to write programs that prompt for input, but you'll need to run these programs from a terminal.

Breaking out of loops

You can use the break statement and the continue statement with any of Python's loops. For example you can use break to quit a for loop that's working through a list or a dictionary. You can use continue to skip over certain items when looping through a list or dictionary as well.

While loops (cont.)

Using continue in a loop

```
banned_users = ['eve', 'fred', 'gary', 'helen']

prompt = "\nAdd a player to your team."
prompt += "\nEnter 'quit' when you're done. "

players = []
while True:
    player = input(prompt)
    if player == 'quit':
        break
    elif player in banned_users:
        print(player + " is banned!")
        continue
    else:
        players.append(player)

print("\nYour team:")
for player in players:
    print(player)
```

Avoiding infinite loops

Every while loop needs a way to stop running so it won't continue to run forever. If there's no way for the condition to become False, the loop will never stop running.

An infinite loop

```
while True:
    name = input("\nWho are you? ")
    print("Nice to meet you, " + name + "!")
```

Removing all instances of a value from a list

The remove() method removes a specific value from a list, but it only removes the first instance of the value you provide. You can use a while loop to remove all instances of a particular value.

Removing all cats from a list of pets

```
pets = ['dog', 'cat', 'dog', 'fish', 'cat',
        'rabbit', 'cat']
print(pets)

while 'cat' in pets:
    pets.remove('cat')

print(pets)
```

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Beginner's Python Cheat Sheet — Functions

What are functions?

Functions are named blocks of code designed to do one specific job. Functions allow you to write code once that can then be run whenever you need to accomplish the same task. Functions can take in the information they need, and return the information they generate. Using functions effectively makes your programs easier to write, read, test, and fix.

Defining a function

The first line of a function is its definition, marked by the keyword def. The name of the function is followed by a set of parentheses and a colon. A docstring, in triple quotes, describes what the function does. The body of a function is indented one level.

To call a function, give the name of the function followed by a set of parentheses.

Making a function

```
def greet_user():
    """Display a simple greeting."""
    print("Hello!")

greet_user()
```

Passing information to a function

Information that's passed to a function is called an argument; information that's received by a function is called a parameter. Arguments are included in parentheses after the function's name, and parameters are listed in parentheses in the function's definition.

Passing a single argument

```
def greet_user(username):
    """Display a simple greeting."""
    print("Hello, " + username + "!")

greet_user('jesse')
greet_user('diana')
greet_user('brandon')
```

Positional and keyword arguments

The two main kinds of arguments are positional and keyword arguments. When you use positional arguments Python matches the first argument in the function call with the first parameter in the function definition, and so forth.

With keyword arguments, you specify which parameter each argument should be assigned to in the function call. When you use keyword arguments, the order of the arguments doesn't matter.

Using positional arguments

```
def describe_pet(animal, name):
    """Display information about a pet."""
    print("\nI have a " + animal + ".")
    print("Its name is " + name + ".")

describe_pet('hamster', 'harry')
describe_pet('dog', 'willie')
```

Using keyword arguments

```
def describe_pet(animal, name):
    """Display information about a pet."""
    print("\nI have a " + animal + ".")
    print("Its name is " + name + ".")

describe_pet(animal='hamster', name='harry')
describe_pet(name='willie', animal='dog')
```

Default values

You can provide a default value for a parameter. When function calls omit this argument the default value will be used. Parameters with default values must be listed after parameters without default values in the function's definition so positional arguments can still work correctly.

Using a default value

```
def describe_pet(name, animal='dog'):
    """Display information about a pet."""
    print("\nI have a " + animal + ".")
    print("Its name is " + name + ".")

describe_pet('harry', 'hamster')
describe_pet('willie')
```

Using None to make an argument optional

```
def describe_pet(animal, name=None):
    """Display information about a pet."""
    print("\nI have a " + animal + ".")
    if name:
        print("Its name is " + name + ".")

describe_pet('hamster', 'harry')
describe_pet('snake')
```

Return values

A function can return a value or a set of values. When a function returns a value, the calling line must provide a variable in which to store the return value. A function stops running when it reaches a return statement.

Returning a single value

```
def get_full_name(first, last):
    """Return a neatly formatted full name."""
    full_name = first + ' ' + last
    return full_name.title()

musician = get_full_name('jimi', 'hendrix')
print(musician)
```

Returning a dictionary

```
def build_person(first, last):
    """Return a dictionary of information
    about a person.
    """
    person = {'first': first, 'last': last}
    return person

musician = build_person('jimi', 'hendrix')
print(musician)
```

Returning a dictionary with optional values

```
def build_person(first, last, age=None):
    """Return a dictionary of information
    about a person.
    """
    person = {'first': first, 'last': last}
    if age:
        person['age'] = age
    return person

musician = build_person('jimi', 'hendrix', 27)
print(musician)

musician = build_person('janis', 'joplin')
print(musician)
```

Visualizing functions

Try running some of these examples on pythontutor.com.

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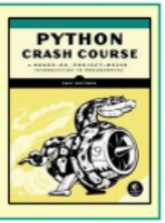

Passing a list to a function

You can pass a list as an argument to a function, and the function can work with the values in the list. Any changes the function makes to the list will affect the original list. You can prevent a function from modifying a list by passing a copy of the list as an argument.

Passing a list as an argument

```
def greet_users(names):
    """Print a simple greeting to everyone."""
    for name in names:
        msg = "Hello, " + name + "!"
        print(msg)

usernames = ['hannah', 'ty', 'margot']
greet_users(usernames)
```

Allowing a function to modify a list

The following example sends a list of models to a function for printing. The original list is emptied, and the second list is filled.

```
def print_models(unprinted, printed):
    """3d print a set of models."""
    while unprinted:
        current_model = unprinted.pop()
        print("Printing " + current_model)
        printed.append(current_model)

# Store some unprinted designs,
#  and print each of them.
unprinted = ['phone case', 'pendant', 'ring']
printed = []
print_models(unprinted, printed)

print("\nUnprinted:", unprinted)
print("Printed:", printed)
```

Preventing a function from modifying a list

The following example is the same as the previous one, except the original list is unchanged after calling print_models().

```
def print_models(unprinted, printed):
    """3d print a set of models."""
    while unprinted:
        current_model = unprinted.pop()
        print("Printing " + current_model)
        printed.append(current_model)

# Store some unprinted designs,
#  and print each of them.
original = ['phone case', 'pendant', 'ring']
printed = []

print_models(original[:], printed)
print("\nOriginal:", original)
print("Printed:", printed)
```

Passing an arbitrary number of arguments

*Sometimes you won't know how many arguments a function will need to accept. Python allows you to collect an arbitrary number of arguments into one parameter using the * operator. A parameter that accepts an arbitrary number of arguments must come last in the function definition.*

*The ** operator allows a parameter to collect an arbitrary number of keyword arguments.*

Collecting an arbitrary number of arguments

```
def make_pizza(size, *toppings):
    """Make a pizza."""
    print("\nMaking a " + size + " pizza.")
    print("Toppings:")
    for topping in toppings:
        print("- " + topping)

# Make three pizzas with different toppings.
make_pizza('small', 'pepperoni')
make_pizza('large', 'bacon bits', 'pineapple')
make_pizza('medium', 'mushrooms', 'peppers',
        'onions', 'extra cheese')
```

Collecting an arbitrary number of keyword arguments

```
def build_profile(first, last, **user_info):
    """Build a user's profile dictionary."""
    # Build a dict with the required keys.
    profile = {'first': first, 'last': last}

    # Add any other keys and values.
    for key, value in user_info.items():
        profile[key] = value

    return profile

# Create two users with different kinds
#   of information.
user_0 = build_profile('albert', 'einstein',
        location='princeton')
user_1 = build_profile('marie', 'curie',
        location='paris', field='chemistry')

print(user_0)
print(user_1)
```

What's the best way to structure a function?

As you can see there are many ways to write and call a function. When you're starting out, aim for something that simply works. As you gain experience you'll develop an understanding of the more subtle advantages of different structures such as positional and keyword arguments, and the various approaches to importing functions. For now if your functions do what you need them to, you're doing well.

Modules

You can store your functions in a separate file called a module, and then import the functions you need into the file containing your main program. This allows for cleaner program files. (Make sure your module is stored in the same directory as your main program.)

Storing a function in a module

File: pizza.py

```
def make_pizza(size, *toppings):
    """Make a pizza."""
    print("\nMaking a " + size + " pizza.")
    print("Toppings:")
    for topping in toppings:
        print("- " + topping)
```

Importing an entire module

File: making_pizzas.py
Every function in the module is available in the program file.

```
import pizza

pizza.make_pizza('medium', 'pepperoni')
pizza.make_pizza('small', 'bacon', 'pineapple')
```

Importing a specific function

Only the imported functions are available in the program file.

```
from pizza import make_pizza

make_pizza('medium', 'pepperoni')
make_pizza('small', 'bacon', 'pineapple')
```

Giving a module an alias

```
import pizza as p

p.make_pizza('medium', 'pepperoni')
p.make_pizza('small', 'bacon', 'pineapple')
```

Giving a function an alias

```
from pizza import make_pizza as mp

mp('medium', 'pepperoni')
mp('small', 'bacon', 'pineapple')
```

Importing all functions from a module

Don't do this, but recognize it when you see it in others' code. It can result in naming conflicts, which can cause errors.

```
from pizza import *

make_pizza('medium', 'pepperoni')
make_pizza('small', 'bacon', 'pineapple')
```

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Beginner's Python Cheat Sheet — Files and Exceptions

What are files? What are exceptions?

Your programs can read information in from files, and they can write data to files. Reading from files allows you to work with a wide variety of information; writing to files allows users to pick up where they left off the next time they run your program. You can write text to files, and you can store Python structures such as lists in data files.

Exceptions are special objects that help your programs respond to errors in appropriate ways. For example if your program tries to open a file that doesn't exist, you can use exceptions to display an informative error message instead of having the program crash.

Reading from a file

To read from a file your program needs to open the file and then read the contents of the file. You can read the entire contents of the file at once, or read the file line by line. The with statement makes sure the file is closed properly when the program has finished accessing the file.

Reading an entire file at once

```
filename = 'siddhartha.txt'

with open(filename) as f_obj:
    contents = f_obj.read()

print(contents)
```

Reading line by line

Each line that's read from the file has a newline character at the end of the line, and the print function adds its own newline character. The rstrip() method gets rid of the the extra blank lines this would result in when printing to the terminal.

```
filename = 'siddhartha.txt'

with open(filename) as f_obj:
    for line in f_obj:
        print(line.rstrip())
```

Reading from a file (cont.)

Storing the lines in a list

```
filename = 'siddhartha.txt'

with open(filename) as f_obj:
    lines = f_obj.readlines()

for line in lines:
    print(line.rstrip())
```

Writing to a file

Passing the 'w' argument to open() tells Python you want to write to the file. Be careful; this will erase the contents of the file if it already exists. Passing the 'a' argument tells Python you want to append to the end of an existing file.

Writing to an empty file

```
filename = 'programming.txt'

with open(filename, 'w') as f:
    f.write("I love programming!")
```

Writing multiple lines to an empty file

```
filename = 'programming.txt'

with open(filename, 'w') as f:
    f.write("I love programming!\n")
    f.write("I love creating new games.\n")
```

Appending to a file

```
filename = 'programming.txt'

with open(filename, 'a') as f:
    f.write("I also love working with data.\n")
    f.write("I love making apps as well.\n")
```

File paths

When Python runs the open() function, it looks for the file in the same directory where the program that's being excuted is stored. You can open a file from a subfolder using a relative path. You can also use an absolute path to open any file on your system.

Opening a file from a subfolder

```
f_path = "text_files/alice.txt"

with open(f_path) as f_obj:
    lines = f_obj.readlines()

for line in lines:
    print(line.rstrip())
```

File paths (cont.)

Opening a file using an absolute path

```
f_path = "/home/ehmatthes/books/alice.txt"

with open(f_path) as f_obj:
    lines = f_obj.readlines()
```

Opening a file on Windows

Windows will sometimes interpret forward slashes incorrectly. If you run into this, use backslashes in your file paths.

```
f_path = "C:\Users\ehmatthes\books\alice.txt"

with open(f_path) as f_obj:
    lines = f_obj.readlines()
```

The try-except block

When you think an error may occur, you can write a try-except block to handle the exception that might be raised. The try block tells Python to try running some code, and the except block tells Python what to do if the code results in a particular kind of error.

Handling the ZeroDivisionError exception

```
try:
    print(5/0)
except ZeroDivisionError:
    print("You can't divide by zero!")
```

Handling the FileNotFoundError exception

```
f_name = 'siddhartha.txt'

try:
    with open(f_name) as f_obj:
        lines = f_obj.readlines()
except FileNotFoundError:
    msg = "Can't find file {0}.".format(f_name)
    print(msg)
```

Knowing which exception to handle

It can be hard to know what kind of exception to handle when writing code. Try writing your code without a try block, and make it generate an error. The traceback will tell you what kind of exception your program needs to handle.

Python Crash Course

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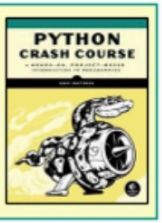

The else block

The try block should only contain code that may cause an error. Any code that depends on the try block running successfully should be placed in the else block.

Using an else block

```
print("Enter two numbers. I'll divide them.")

x = input("First number: ")
y = input("Second number: ")

try:
    result = int(x) / int(y)
except ZeroDivisionError:
    print("You can't divide by zero!")
else:
    print(result)
```

Preventing crashes from user input

Without the except block in the following example, the program would crash if the user tries to divide by zero. As written, it will handle the error gracefully and keep running.

```
"""A simple calculator for division only."""

print("Enter two numbers. I'll divide them.")
print("Enter 'q' to quit.")

while True:
    x = input("\nFirst number: ")
    if x == 'q':
        break
    y = input("Second number: ")
    if y == 'q':
        break

    try:
        result = int(x) / int(y)
    except ZeroDivisionError:
        print("You can't divide by zero!")
    else:
        print(result)
```

Deciding which errors to report

Well-written, properly tested code is not very prone to internal errors such as syntax or logical errors. But every time your program depends on something external such as user input or the existence of a file, there's a possibility of an exception being raised.

It's up to you how to communicate errors to your users. Sometimes users need to know if a file is missing; sometimes it's better to handle the error silently. A little experience will help you know how much to report.

Failing silently

Sometimes you want your program to just continue running when it encounters an error, without reporting the error to the user. Using the pass statement in an else block allows you to do this.

Using the pass statement in an else block

```
f_names = ['alice.txt', 'siddhartha.txt',
        'moby_dick.txt', 'little_women.txt']

for f_name in f_names:
    # Report the length of each file found.
    try:
        with open(f_name) as f_obj:
            lines = f_obj.readlines()
    except FileNotFoundError:
        # Just move on to the next file.
        pass
    else:
        num_lines = len(lines)
        msg = "{0} has {1} lines.".format(
            f_name, num_lines)
        print(msg)
```

Avoid bare except blocks

Exception-handling code should catch specific exceptions that you expect to happen during your program's execution. A bare except block will catch all exceptions, including keyboard interrupts and system exits you might need when forcing a program to close.

If you want to use a try block and you're not sure which exception to catch, use Exception. It will catch most exceptions, but still allow you to interrupt programs intentionally.

Don't use bare except blocks

```
try:
    # Do something
except:
    pass
```

Use Exception instead

```
try:
    # Do something
except Exception:
    pass
```

Printing the exception

```
try:
    # Do something
except Exception as e:
    print(e, type(e))
```

Storing data with json

The json module allows you to dump simple Python data structures into a file, and load the data from that file the next time the program runs. The JSON data format is not specific to Python, so you can share this kind of data with people who work in other languages as well.

Knowing how to manage exceptions is important when working with stored data. You'll usually want to make sure the data you're trying to load exists before working with it.

Using json.dump() to store data

```
"""Store some numbers."""

import json

numbers = [2, 3, 5, 7, 11, 13]

filename = 'numbers.json'
with open(filename, 'w') as f_obj:
    json.dump(numbers, f_obj)
```

Using json.load() to read data

```
"""Load some previously stored numbers."""

import json

filename = 'numbers.json'
with open(filename) as f_obj:
    numbers = json.load(f_obj)

print(numbers)
```

Making sure the stored data exists

```
import json

f_name = 'numbers.json'

try:
    with open(f_name) as f_obj:
        numbers = json.load(f_obj)
except FileNotFoundError:
    msg = "Can't find {0}.".format(f_name)
    print(msg)
else:
    print(numbers)
```

Practice with exceptions

Take a program you've already written that prompts for user input, and add some error-handling code to the program.

More cheat sheets available at
ehmatthes.github.io/pcc/