Introduction to:
Computers & Programming:
Exception Handling

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Summary

• What kind of error raises an exception?
• Preventing errors
• How to raise an exception on purpose
• How to catch an exception and what to do with one once you caught it
Errors that Raise Exceptions

• These are errors that cause the program to halt.
• Special 'error' messages are printed to the screen.
• Examples
  – TypeError: if a function or operator is called with the wrong type of argument
    • 'The book' * 'The book'
    • len(5)
  – ValueError: similar to TypeError, except the argument is the correct type but inappropriate for another reason:
    • int('hello')
      – Argument cannot be converted to an integer
  – IOError: if a file or path doesn't exist
    • Instream = read('abc','r')
  – IndexError: An index refers to a nonexistent position in a sequence
    • 'hello'[5]
Preventing Errors

- while answer != 'yes' and answer != 'no':
  answer = input('Answer yes or no: ')

- The function isinstance(object, type)
  - Possible types: int, str, list, tuple, dict...
  - Can be used to prevent type errors
  - if (not isinstance(input_string,str)):
    print('The variable “input_string” is',input_string)
    print('This is not a string')
    input_string = 'invalid_string'

- The functions: os.path.isfile(path), os.path.isdir(path)
  - Can be used to prevent IOError

- And so on
Raising Exceptions

• If you decide that a certain situation warrants an error message, you can put it in your code.
• The syntax is as follows:
  ```python
def foul_language(string):
    if string in ['chicken','turkey','pheasant']:
      raise Exception('Foul Language')
```
• You can use a more specific type of exception as well:
  – IOError(string), TypeError(string), etc.
Catching Exceptions

• If you are aware of possible exceptions, you can:
  – Let your program crash OR
  – Design your code to elegantly handle each type of possible exception
    • *** Preferred if other people are going to use your program

• try & except
  – Put your code in a block under 'try:'
  – Put what to do for each exception in blocks of code under 'except:' statement.
For any Type of Exception

• def get_an_integer():
    while True:
        try:
            number = int(input('Pick an integer: '))
            return(number)
        except:
            print('That wasn\'t an integer!')

• This will continually ask the user for an integer until they put one in. Note that the return statement causes the function to end.
For Specific Types of Exceptions

def divide_10_by_an_integer ():
    while True:
        try:
            number = int(input('Pick an integer: '))
            output = 10/number
            return(output)
        except ValueError:
            print('That wasn\'t an integer!')
        except ZeroDivisionError:
            print('You can\'t divide by zero!')
        except:
            print('Something is wrong! Try again!')
Using Default Error Messages

def divide_10_by_an_integer2 ():
    while True:
        try:
            number = int(input('Pick an integer: '))
            output = 10/number
            return(output)
        except ValueError as err:  ### using default message
            print(err)
        except ZeroDivisionError:  ### using my message
            print('You can\'t divide by zero!')
        except:
            print('Something is wrong! Try again!')
Else: Executes if there is no Exception

def divide_10_by_an_integer3 ():
    while True:
        try:
            number = int(input('Pick an integer: '))
            output = 10/number
        except ValueError:
            print('That wasn\'t an integer!')
        except ZeroDivisionError:
            print('You can\'t divide by zero!')
        except:
            print('Something is wrong! Try again!')
        else:
            return(output)  ## equivalent to putting the return statement last in the try block
'finally' statements: execute at the end (unless a return statement precedes)

def divide_10_by_an_integer4():
    while True:
        try:
            number = int(input('Pick an integer: '))
            output = 10/number
            return(output)
        except ValueError:
            print('That wasn\'t an integer!')
        except ZeroDivisionError:
            print('You can\'t divide by zero!')
        except:
            print('Something is wrong! Try again!')
    finally:
        print('''This program was sponsored by NYU\'s CS Division. It is being released 'as is' and NYU is not responsible for any bugs.'''
Summary

• Exception or Error Handling is a necessary part of writing code, particularly if it is going to be used by people other than yourself.

• Python's exception handling system is very similar syntactically to `if/elif/else` statements

• `try:` – used before main block of code

• `except Exception:` – like `elif:` statement conditioned on `Exception` (a particular type of exception)

• `except:` – all other types of exceptions

• `raise Exception('ABC')` – to raise exception of your own
  – If you “catch” an exception and don't raise one, the program will not halt

• `else` – at the end, if no exception is raised

• `finally` – at the end, whether an exception is raised or not.

• [http://docs.python.org/release/3.0.1/c-api/exceptions.html](http://docs.python.org/release/3.0.1/c-api/exceptions.html)
Homework 8– Due 25th Class

- http://cs.nyu.edu/courses/spring16/CSCI-UA.0002-004/hw8.html