Coding For Beginners

Objectives

Welcome to the workshop! I'm very excited that you've chosen to learn more about computers and programming with me, and it's my sincere hope that you leave knowing more than you came with, fully prepared to learn more on your own about programming languages.

My primary objective is to give everyone in the workshop a set of mental "tools" and computer programming knowledge that will help with solving problems elegantly and efficiently. By the time we're done today, you should be able to:

1. Understand and explain the basics of how computers work
2. Use operating system user commands via the command line interface
3. Install and configure programming tools and third party software libraries
4. Learn how to perform research on the Internet to find further tutorials and references
5. Consider all the variables of a problem in a methodical and logical way
6. Break large problems into smaller problems that can be solved in incremental steps
7. Apply the fundamental programming concepts learned to any other programming language

This may sound like a lot, but don't worry — we will cover it all! Feel free to interrupt and ask questions and for elaboration on anything and everything. There are no embarrassing questions, and there is no judgement! Everyone starts at the same place with computers, knowing nothing about them or about programming. Nobody is "born with it" and everyone can learn, it just takes determination, patience, and practice.

Think of learning how to read and write software as the same as learning how to read and write your native language. People start by learning how to speak, then they learn letters, then words, then sentences, and eventually they can write or read anything and become literate. That is exactly what you are doing today, you are taking the first steps towards becoming literate in another language - a language that will help you process information and solve problems!

Materials

In order to hit the ground running, I recommend fulfilling the following computer requirements:

- A MacBook of any hardware specification, running Mac OS X (10.7 or greater strongly recommended)

Apple computers running the Mac OS X operating system already have every software tool needed to start learning how to program right away! The Homebrew package manager is only used with Mac OS X. The code editor we will be using, Sublime Text, is available in both Mac OS X and Windows.

PLEASE NOTE: If you choose to use a Windows computer, you will not be able to follow along with any of the open source UNIX command or package manager instructions.

If you have a Windows PC, the self-installing Python version you need to download can be found here: https://www.python.org/ftp/python/2.7.8/python-2.7.8.msi

Next you will need to follow the instructions appropriate for your Windows OS version to set your Windows PATH:

Windows 7/8

- Select Computer from the Start menu
- Choose System Properties from the context menu
- Click Advanced system settings > Advanced tab
- Click on Environment Variables, under System Variables, find PATH, and click on it.
- In the Edit windows, modify PATH by adding:

  `C:\Python27\;C:\Python27\Scripts;`

  to the value for PATH. If you do not have the item PATH, you may add a new variable with `PATH` as the name and `C:\Python27\;C:\Python27\Scripts;` as the value.

- Reopen Command prompt window, and type in `python` to check if the PATH variable is set correctly.

Windows XP

- <u>Start</u> -> <u>Control Panel</u> -> <u>System</u> -> <u>Advanced</u>
- Click on <u>Environment Variables</u>, under <u>System Variables</u>, find PATH, and click on it.
- In the <u>Edit</u> windows, modify PATH by adding:

  `C:\Python27\;C:\Python27\Scripts;`

  to the value for PATH. If you do not have the item PATH, you may add a new variable with **PATH** as the name and `C:\Python27\;C:\Python27\Scripts;` as the value.
- Reopen Command prompt window, and type in **python** to check if the PATH variable is set correctly.

Windows Vista

- Right click <u>My Computer</u> icon
- Choose <u>Properties</u> from the context menu
- Click <u>Advanced</u> tab (Advanced system settings link in Vista)
- In the <u>Edit</u> windows, modify PATH by adding:

  `C:\Python27\;C:\Python27\Scripts;`

  to the value for PATH. If you do not have the item PATH, you may add a new variable with **PATH** as the name and `C:\Python27\;C:\Python27\Scripts;` as the value.
- Reopen Command prompt window, and type in **python** to check if the PATH variable is set correctly.

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Slide Notes

Each paragraph of text below represents a single slide in the presentation. These slide notes are for the Prezi presentation located online at:
http://prezi.com/osccgmctm16i/a-conceptual-history-of-computing/

I'm here to tell you: you don't need to be a wizard to learn how to program.

You don't need to go to some school for witchcraft and wizardry for years and years...

Where you're going to learn all kinds of strange incantations...

And you end up working for Google making balls levitate.

So the first step: Tell me what you already know about computers so we can clear up misconceptions and see what our baseline is.

What a lot of people don't know is that computers have existed for thousands and thousands of years.

People made calculations with other kinds of machines, what we call "analog computers"

The Abacus - this device was developed nearly 5,000 years ago for rapidly adding numbers together for all kinds of purposes: accounting, inventory, anything that we need to calculate today. It spread all over the ancient world, across the cradle of civilization and Asia. Interestingly, today's computers function in a similar way. In fact even up until just a few decades ago, a human computer with an abacus could beat a modern digital computer.

The Antikythera mechanism: this was discovered at the bottom of the Mediterranean last century. It was later realized this was an ancient Grecian device over 2000 years old, which was designed to predict astronomical events and ceremonial dates such as when the Olympics should be held.

The Difference Engine - as recently as two centuries ago, we had Charles Babbage and Ada Lovelace of England and their calculating engines. Unfortunately, they never received the funding to produce their masterpiece. This is what they would have built if they had the resources, it was commissioned by Nathan Myhrvold, a former Microsoft CTO who has made a fortune exploiting software patents.

The future was written during the Second World War, when the Germans created a calculating machine codenamed "Enigma" for encoding their secret communications. British mathematician Alan Turing cracked the Enigma, and in the process began his work on the fundamental theories of computer science.

Contemporaneously with Alonzo Church, Turing devised the theory that anything a mechanical calculator could do, could also be done using a new kind of device called an electro-mechanical or digital computer.

Today's modern computers are all digital computers, meaning they use electricity to compute; just think of the difference between an analog watch and a digital watch. Fundamentally, all a digital computer does is add numbers together using electricity.

A number is represented by turning a circuit on or off, which translates to 1 or 0 respectively. A number system that has two digits is called "binary"; we're used to using 10 digits in our number system, so we call them "decimal" numbers. A number system with 16 digits is "hexadecimal". The ancient Mayans used a "vigesimal" number system that had 20 digits, and the Babylonians used a "sexagesimal" system with 60 digits!

Binary digits, or "bits" are added together by a computer; a collection of 8 bits is 1 byte. Binary numbers can be represented by collections of circuits, which is all a computer really is, and any binary number can be translated into any number.

The important thing to take away from this is that ANYTHING can be a number. File, photo, music - just a big number.

But how do the components of a modern digital computer work? The best way I can think of to describe it is that it is like a kitchen.

First, note that CPUs are measured in "Hertz" or instructions per second. Giga means "billion". The CPU is like a chef: it performs the steps of a recipe.

The Hard Drive is like the fridge: it's the place for long term storage that you fetch ingredients from. Hard drives and memory are measured in "bytes" so we can measure the size of the numbers they store.

The Memory is like the counter: the working area that is "closest" to the chef where stuff is done. The bigger the counter, the more working area you have and the more you can done at once.

And now the genius who created computers as we know them today!

No, not him. He wasn't really that inventive, he just knew how to hire smart people & license technology, like Thomas Edison.

Douglas Engelbart @ Stanford - most modern interface elements invented in the 1960s

XEROX PARC - improved the GUI
IBM - disc drives, databases, DRAM
AT&T Bell Labs - many technology advances, created languages, communications

Still one problem: computers could only do one thing at a time. 1 terminal -> 1 program

Bell Labs worked on MULTICS so multiple users could perform tasks on a single computer system, it failed, and then the underground project Unix was born

Dennis Ritchie, inventor of C language and Unix co-creator — deserves our remembrance and respect

Unix led to creation of MS-DOS (later MS Windows) and then Mac OS X. GNU/ Linux is derived from Unix and runs on more devices and computers than any other operating system.

Operating system takes care of all tasks for multiple hardware and software entities on a system

Hardware at the lowest level can talk to each other but nothing coordinates them

System level, or kernel, has drivers so devices can communicate, other utilities for performing tasks on devices

Applications level is where user programs run, they are organized into jobs by the kernel, they time-share the processor and other hardware. The user can communicate directly with the operating system by running a shell, and that is where we will begin today.

Setting Your Computer Up For Programming

Most computers and laptops are sold with an operating system already installed. In the case of Apple computers, that operating system is Mac OS X, which happens to be a Unix derived system also known as Darwin. Apple's version of Unix is "slimmed down" and doesn't contain every piece of software that comes with a more standard version of Unix. Windows PCs and laptops run the Microsoft Windows OS, which does not resemble Unix very much any more; therefore most of these set up instructions have to do with Apple computers. Windows computers require a great deal more set up and configuration to be made to work like computers running Unix.

On Mac OS, you will be using the application called Terminal to input commands and run python. Terminal is in the Applications / Utilities folder; drag it to your dock and open it.

On Windows, you will be using a Command Prompt to input commands and run python.

Installing The Code Editor, Sublime Text

Writing your own programs is a lot easier when you use an application specifically designed to make programming easier, much like writing and formatting reports and essays is easier in a word processor application. The editor called Sublime Text is a standard coding tool in the industry, and even though it costs money to use after a trial period, it is well worth trying out. You can go to the Sublime Text official website, visit Downloads, and get the appropriate version for your computer: http://www.sublimetext.com

Mac OS Specific Instructions

Now that you have installed Sublime Text, you will need to edit certain configuration files (known as "dot files") on your system that Apple initially has set to "hidden". In Terminal, run the following commands:

```
defaults write com.apple.finder AppleShowAllFiles -boolean
true ; killall Finder
```

You will now be able to see a file in your user home directory called .bash_profile; if it is not there, create it, and add the line:

```
alias rm='rm -i'
```

Next you will be installing the Homebrew package manager. Visit the web site http://brew.sh and follow the instructions there to install Homebrew. When you are prompted to install the XCode command line tools, agree to do so and let the install continue. Follow all the instructions that Homebrew displays, then run **brew update** and **brew upgrade** and **brew doctor** and keep following instructions. You will also run **brew install python** to create your own local version of Python to program with.

Standard UNIX Commands

Nearly every system based on Unix (GNU/Linux, Mac OS X, HPux, AIX, Solaris, to name a couple) has these basic commands available to users in the shell of their choice. If have access to a terminal or command line prompt (usually signified by a **$** symbol), you can probably enter any of these commands at the shell's prompt and expect similar results. You'll need to know all of these at some point to properly navigate a Unix based system. If you ever need help for a command, just run the "man" command with a command name, as described later.

A command is just a special word that you enter at your shell prompt that the operating system recognizes. Commands can also perform specialized functions when you give them a "flag" as an argument; a flag is just a dash or minus sign followed by a letter (or sometimes a flag is two dashes and a word). In many cases, when multiple options (a.k.a. flags) for a command are available, you can combine them together after a single dash, as seen in the command below to list all files and directories in long format.

```
$ ls –la
```

The very first thing a new shell user should do is edit their user configuration file and create an alias for the rm command. On Mac OS X, the default shell is the "bash" or "Bourne Again" SHell - you previously edited or create a file called .bash_profile and added the line:

```
alias rm='rm –i'
```

Which substitutes the word "rm" for the command "rm" with the flag "i". This (as explained later) will ask you for confirmation every time you try to delete a file. To activate this alias in your shell, simply type in the command:

```
$ source .bash_profile
```

A couple of other tips: using the "up" cursor arrow will display previous commands that you've entered since you started the shell. You can also use the Tab key to "autocomplete" commands or filenames; get in the habit of always hitting the Tab key. Very useful!

Command: `ls`

Options: -l for long format, -a for all files, many more options

Description: This command lists all the files in your present working directory. Can optionally specify a partial filename with wildcard as in: **`*.py`** or **`test*`** to list files with certain names.

Command: `cd (path/directoryname)`

Options: none usually needed

Description: This command changes your current directory to the specified path and directory. In UNIX, the topmost directory in the file system is the "root" directory and is referred to as a single forward slash, like so: `/` . Your user home directory is referred to as "tilde" or `~` . Typing just **cd** will always return you to your home directory. The directory you are currently in can be referred to as a single dot: `.` and you would use this to run a script or executable, like so: `./ script.sh` . If you want to go "up" one directory level, you can just type: `cd ..`

Command: `pwd`

Options: none usually needed

Description: This command tells you current directory path: "present working directory".

Command: `more (path/filename)`

Options: none usually needed

Description: Displays the contents of a file to the screen. Use 'b' keystroke to move back, spacebar to move forward, cursor keys to move line by line, 'q' to quit.

Command: `mv (path/filename) (path/filename)`

Options: none usually needed

Description: This will move a file from one directory to another if you specify a directory name, or, it will rename a file in place if the second argument is a new name that is not an already existing file or directory. NOTE: If another file exists with the same name, it will overwrite it!

Command: `cp (path/filename) (path/filename)`

Options: none usually needed

Description: This command lists all the files in your present working directory.

Command: `rm (path/filename)`

Options: -i to prompt yes or no to confirm

Description: This command lists all the files in your present working directory. It is best practice to alias rm to rm -i in your shell configuration files to always prompt when deleting; always check to make sure rm is rm -i on any new system you log on to!

Command: `mkdir (path/ directoryname)`

Options: none usually needed

Description: This allows you to create a new, empty directory in your current directory.

Command: `rmdir (path/ directoryname)`

Options: none usually needed

Description: Removes a directory.

Command(s): `gzip, gunzip (path/filename)`

Options: none usually needed

Description: One particular pair of commands which will compress and decompress files respectively. Files will end in .gz extension when compressed.

Command: `tar (path/filename)`

Options: usually specified with -xvf for extracting

Description: Another compression/decompression utility, often used when distributing software packages for installation. Most times you will merely be running `tar -xvf (path/ filename)` to extract a series of files and directories.

Command: `Ctrl-c`

Options: none

Description: This keystroke command will "interrupt" whatever job you are currently running in the shell and return you to a command prompt. The execution will stop completely.

Command: `Ctrl-z`

Options: none

Description: Sometimes a job will run for a long time, and you want to pause it to return to a command prompt; this command "suspends" the job you are running and returns to a prompt.

Command: `fg`

Options: none

Description: When there is a suspended job, typing this at the command prompt will return it to the "foreground".

Command: `man (commandname)`

Options: none usually needed

Description: Displays the exhaustively comprehensive help file for the command, listing usage, options, and verbose descriptions of what the command can do. It works with all the same keystrokes that the more command does! You can learn more about how man works by entering

`man man`

Code Examples (type these in; disregard the first line with filename in parentheses)

```
(guess_comments.py)


# Choose a random number


# Keep prompting for input until the game is over


    # Check to see if input is a number


        # Convert number to an integer


        # Check to see if it is an integer between 1 and 100 inclusive


        # If it is a good number guess, but not the right number, give hints


            # Give lower hint


            # Give higher hint


            # The number equals the guess!


    # Return an error
```

```python
(guess.py)
#!/usr/bin/env python

"""This code plays a number guessing game with the user. It randomly generates
a number then continuously prompts the user to enter a number; each time it
compares the guess to the generated number and gives a hint back to the user
until the user guesses the number."""

import random

# Choose a random number
the_number = random.randint(1, 100)

# Keep prompting for input until the game is over
while True:
    number_guess = raw_input("Guess an integer between 1 and 100: ")

    # Check to see if input is a number
    if number_guess.isdigit():
        # Convert number to an integer
        number_guess = int(number_guess)

        # Check to see if it is an integer between 1 and 100 inclusive
        if number_guess < 1 or number_guess > 100:
            print "Bad guess! Must be a number between 1 and 100."
            continue
        else:
            # If it is a good number guess, but not the right number, give hints
            if the_number < number_guess:
                # Give lower hint
                print "Guess lower!"
            elif number_guess < the_number:
                # Give higher hint
                print "Guess higher!"
            else:
                # The number equals the guess!
                print "You got it!!"
                break
    else:
        # Return an error
        print "Bad guess! Must be an INTEGER NUMBER between 1 and 100."
        continue
```

```python
(craps_comments.py)
# Get the bet from the player - pass or don't pass

# Keep prompting for rolls until the game is over

    # Let the player hit return to roll the dice

    # Roll two dice

    # It is the first roll

        # Check to see if roll is a natural

            # If it is 7 or 11 and player bet pass, they win

            # If it is 7 or 11 and player bet don't pass, they lose

        # Check to see if roll is craps

            # If it is 2, 3, or 12 and player bet pass, they lose

            # Player bets don't pass

                # If it is 2 or 3 and player bet don't pass, they win

                # Check to see if roll is a push / tie on a 12

        # Set the point

    # Else

        # Check the roll to see if it matches

            # Check to see if the roll is a 7

                # If it is 7 and player bet pass, they lose

                # If it is 7 and player bet don't pass, they win

            # The roll matches the point

                # The player makes the point and bet pass - a win

                # The player makes the point and bet don't pass - they lose

            # No result matches point or is 7 yet - keep rolling!
```

(craps.py)

```python
#!/usr/bin/env python
"""This code plays a craps game with the user. It follows all the basic
rules of the dice throwing game."""

import random

from termcolor import colored

DIE_FACE = {1 : unichr(0x2680),
            2 : unichr(0x2681),
            3 : unichr(0x2682),
            4 : unichr(0x2683),
            5 : unichr(0x2684),
            6 : unichr(0x2685)}

# Get the bet from the player - pass or don't pass
while True:
    player_bet = raw_input(colored("Would you like to bet pass or don't pass? \
(enter p or dp): ", 'green'))

    if player_bet == "p" or player_bet == "dp":
        break

player_point = 0

# Keep prompting for rolls until the game is over
while True:
    # Let the player hit return to roll the dice
    discard_input = raw_input(colored(u"\nPress Return to roll...", 'cyan'))

    # Roll two dice
    die_1 = random.randint(1, 6)
    die_2 = random.randint(1, 6)

    result = die_1 + die_2

    if player_point == 0:
        # It is the first roll
        if result == 7 or result == 11:
            # Check to see if roll is a natural
            if player_bet == "p":
                # If it is 7 or 11 and player bet pass, they win
                print colored("You rolled %d - you win!", 'green') % (result, )
            elif player_bet == "dp":
                # If it is 7 or 11 and player bet don't pass, they lose
                print colored("Ouch, you rolled %d and bet \"don't pass\" - \
you lose. Game Over.", 'red') % (result, )

            break
        elif result in (2, 3, 12):
            # Check to see if roll is craps
            if player_bet == "p":
                # If it is 2, 3, or 12 and player bet pass, they lose
                print colored("Ouch, you rolled %d and bet \"pass\" - you lose.\
Game Over.", 'red') % (result, )
            elif player_bet == "dp":
                # Player bets don't pass
```

```python
                if result in (2, 3):
                    # If it is 2 or 3 and player bet don't pass, they win
                    print colored("You rolled %d - you win!", 'green') % \
                        (result, )
                else:
                    # Check to see if roll is a push / tie on a 12
                    print colored("You rolled %d - game is a push. Play \
again!", 'cyan') % (result, )

            break
        else:
            # Set the point
            player_point = result

            print u"Your first roll is %s, %s - your point is %d" % \
                (DIE_FACE[die_1], DIE_FACE[die_2], player_point)
    else:
        print u"You rolled %s, %s - result of %d, your point is %d" % \
            (DIE_FACE[die_1], DIE_FACE[die_2], result, player_point)
        # Check the roll to see if it matches
        if result == 7:
            # Check to see if the roll is a 7
            if player_bet == "p":
                # If it is 7 and player bet pass, they lose
                print colored("Ouch, you rolled %d and bet \"pass\" - you \
lose. Game Over.", 'red') % (result, )
            elif player_bet == "dp":
                # If it is 7 and player bet don't pass, they win
                print colored("You rolled %d - you win!", 'green') % \
                    (result, )

            break
        elif result == player_point:
            # The roll matches the point
            if player_bet == "p":
                # The player makes the point and bet pass - a win
                print colored("You rolled %d - you win!", 'green') % (result, )
            elif player_bet == "dp":
                # The player makes the point and bet don't pass - they lose
                print colored("Ouch, you rolled %d and bet \"don't pass\" - you \
lose. Game Over.", 'red') % (result, )

            break
        else:
            # No result matches point or is 7 yet - keep rolling!
            print colored("Keep rolling!", 'green')
```

```python
(blackjack_comments.py)
# Define what a card is; each card has a name, a point value, and a suit


    # Return the card's name and suit for printing


    # Return the card's name


    # Return the card's point value


# Create a deck of cards


    # Use a double ended queue structured list for the deck


    # For each suit, create a card with each of the name and point entries


# Select the top card from the deck


# Calculate the points for a hand


    # Check to see if hand got dealt an Ace and whether 11 points or 1 point


    # For each card, add together all the points


        # Check for Aces, get the name of the card


    # How to determine if Aces are worth 1 or 11
    # A – 1 or 11
    # AA – 2 or 12
    # AAA – 3 or 13
    # AAAA – 4 or 14


    # Add 10 points to the total if it doesn't bust the hand


# First create the deck


# Shuffle the deck


# Print a welcome message


# Deal two cards to the player
```

```
# Deal two cards to the dealer

# It's possible the player can be dealt 21, if so don't give dealer cards

    # Exit the program if 21 is dealt on the first hand

    # Else deal two cards to the dealer

# Play the game until the player or dealer finish

    # Check to see if input is hit or stand

        # If hit, deal a card

            # Check to see if player busts

            # Check to see if player wins

        # If stand, player is done, deal dealer's cards

            # Dealer must hit if points are <= 16 and must stand on > 16

                # Dealer must hit

                    # Check to see if dealer busts

                    # If dealer gets 21, house wins

                # Dealer has to stand, check to see who wins

                    # Player wins with more points

                    # Or there is a tie

                    # Or the dealer wins with more points

    # Or maybe there is bad input
```

(game_library/card.py)

```python
"""This is a library for a standard deck of playing cards."""


from collections import deque
from termcolor import colored


# Define what a card is; each card has a name, a point value, and a suit
class Card(object):
    """The card class is an abstract representation of a playing card.
    It has a point value, a name, and a suit."""
    RED_SUITS = [unichr(0x2665), unichr(0x2666)]
    BLUE_SUITS = [unichr(0x2663), unichr(0x2660)]

    def __init__(self, this_card_name, this_card_points, this_card_suit):
        """Initialization of a card involves setting its three properties."""
        self.card_name = this_card_name
        self.card_points = this_card_points
        self.card_suit = this_card_suit

    # Return the card's name and suit for printing
    def get_card(self):
        """A method to return a card with its name and suit."""
        if self.card_suit in self.RED_SUITS:
            color = 'red'
        else:
            color = 'blue'

        return colored(unicode(self.card_name), 'yellow') + colored(self.card_suit, color)

    # Return the card's name
    def get_name(self):
        """A method to return the name of a card."""
        return unicode(self.card_name)

    # Return the card's point value
    def get_points(self):
        """A method to return the points of a card."""
        return self.card_points


# Create a deck of cards
def create_deck():
    """The method that initializes a full deck of 52 playing cards."""
    suit_list = [unichr(0x2665), unichr(0x2666), unichr(0x2663), unichr(0x2660)]
    name_points_dict = {"A":1, "2":2, "3":3, "4":4, "5":5, "6":6, "7":7, \
                        "8":8, "9":9, "10":10, "J":10, "Q":10, "K":10}
```

```python
        # Use a double ended queue structured list for the deck
    deck_list = deque([])


        # For each suit, create a card with each of the name and point entries
    for each_suit in suit_list:

        for each_entry in name_points_dict.keys():

            new_card = Card(each_entry, name_points_dict[each_entry], each_suit)

            deck_list.append(new_card)


    return deck_list


# Select the top card from the deck
def deal(this_deck):

    """A method to deal a card."""

    dealt_card = this_deck.popleft()


    return dealt_card


# Calculate the points for a hand
def calculate_points(this_hand):

    """Given a hand of cards, this method totals up all cards' point values."""

    # Check to see if hand got dealt an Ace and whether 11 points or 1 point

    total_points = 0

    int_ace_count = 0


    # For each card, add together all the points

    for each_card in this_hand:

        total_points += each_card.get_points()


        # Check for Aces, get the name of the card

        this_card_name = each_card.get_name()


        if this_card_name == "A":

            int_ace_count += 1


    # How to determine if Aces are worth 1 or 11

    # A  - 1 or 11

    # AA  - 2 or 12

    # AAA  - 3 or 13

    # AAAA  - 4 or 14


    if int_ace_count > 0:

        # Add 10 points to the total if it doesn't bust the hand

        if (total_points + 10) <= 21:

            total_points += 10


    return total_points
```

```python
(blackjack_unit_test.py)
#!/usr/bin/env python
"""This is a unit test for the blackjack card library."""


import random


from game_library.card import create_deck


def print_deck(this_deck):
    """This is a function that prints out all the cards in a deck."""
    int_counter = 0

    for each_card in this_deck:
        int_counter += 1

        print str(int_counter) + ":" + each_card.get_card()



# First create the deck
deck = create_deck()


# Show us the deck
print_deck(deck)


print "\n"


# Shuffle the deck
random.shuffle(deck)


# Show us the shuffled deck
print_deck(deck)
```

(blackjack.py)

```python
#!/usr/bin/env python
"""This code plays a blackjack game with the user. It follows all the basic
rules of the blackjack card game. An external game library with an object
oriented card implementation is imported."""


import random
import sys

from termcolor import colored
from game_library.card import create_deck, deal, calculate_points

# First create the deck
deck = create_deck()

# Shuffle the deck
random.shuffle(deck)

dealer_hand = []
player_hand = []

dealer_total = 0
player_total = 0

bool_player_done = False

# Print a welcome message
print colored(u"Welcome to blackjack! Highest to 21 wins. Dealing for you...",
              'green')

# Deal two cards to the player
player_card = deal(deck)
player_hand.append(player_card)
player_total = calculate_points(player_hand)

print colored(u"You have: " + player_card.get_card(), 'cyan')

player_card = deal(deck)
player_hand.append(player_card)
player_total = calculate_points(player_hand)

print colored(u"You have: " + player_card.get_card() + u" , total of " + \
    unicode(player_total), 'cyan')

# It's possible the player can be dealt 21, if so don't give dealer cards
player_total = calculate_points(player_hand)
```

```python
if player_total == 21:
    # Exit the program if 21 is dealt on the first hand
    print colored("Player wins with %s!!" % (str(player_total), ), 'green')
    sys.exit()
else:
    # Else deal two cards to the dealer
    print colored(u"Now dealing for the dealer...", 'cyan')

    dealer_card = deal(deck)
    dealer_hand.append(dealer_card)
    dealer_total = calculate_points(dealer_hand)

    print colored(u"Dealer deals one card up, dealer has: " + \
        dealer_card.get_card() + u" , total of " + unicode(dealer_total), \
        'cyan')

    dealer_card = deal(deck)
    dealer_hand.append(dealer_card)
    dealer_total = calculate_points(dealer_hand)

    print colored(u"Dealer deals another card down.", 'cyan')

# Play the game until the player or dealer finish
while True:
    if not bool_player_done:
        player_action = raw_input("\nDo you want to hit or stand? (h or s): ")
    else:
        player_action = "s"

    # Check to see if input is hit or stand
    if player_action == "h" and not bool_player_done:
        # If hit, deal a card
        player_card = deal(deck)
        player_hand.append(player_card)
        player_total = calculate_points(player_hand)

        print colored(u"Player dealt: " + player_card.get_card() + u" , total \
of " + unicode(player_total), 'cyan')

        if player_total > 21:
            # Check to see if player busts
            print colored("Busted! Game over.", 'red')
            break
        elif player_total == 21:
            # Check to see if player wins
```

```python
            print colored("Player has 21!", 'green')
            bool_player_done = True
    elif player_action == "s":
        # If stand, player is done, deal dealer's cards
        string_dealer = u"Dealer reveals his cards: "

        for each_card in dealer_hand:
            string_dealer += each_card.get_card() + u" , "

        dealer_total = calculate_points(dealer_hand)
        string_dealer += u"total of " + unicode(dealer_total)

        print colored(string_dealer, 'cyan')

        while True:
            # Dealer must hit if points are <= 16 must stand on > 16
            if dealer_total <= 16:
                # Dealer must hit
                print colored("Dealer hits...", 'cyan')

                dealer_card = deal(deck)
                dealer_hand.append(dealer_card)
                dealer_total = calculate_points(dealer_hand)

                print colored(u"Dealer has: " + dealer_card.get_card() + u" , \
total of " + unicode(dealer_total), 'cyan')

                if dealer_total > 21:
                    # Check to see if dealer busts
                    print colored("Dealer busted! Player wins!!", 'green')
                    break
                elif dealer_total == 21:
                    # If dealer gets 21, house wins
                    print colored("Dealer wins! Game over.", 'red')
                    break
            else:
                # Dealer has to stand, check to see who wins
                print colored("Dealer stands.", 'cyan')

                if player_total > dealer_total:
                    # Player wins with more points
                    print colored("Player wins with %s!!" % \
                        (str(player_total), ), 'green')
                elif player_total == dealer_total:
                    # Or there is a tie
                    print colored("Push! Looks like a tie - Game over.", 'cyan')
```

```python
        else:

            # Or the dealer wins with more points

            print colored("Dealer wins with %s! Game over." % \

                (str(dealer_total), ), 'red')


        break


    break
else:

    # Or maybe there is bad input

    print colored("Bad input! Must be h or s to hit or stand respectively.",

                'red')

    continue
```

Further Reading

Learning Python
Lutz, Mark. O'Reilly Media, Inc., October 2009 (may have later editions)

An excellent guide and comprehensive learning reference. O'Reilly is a top notch publisher, you generally cannot go wrong with any O'Reilly book.

The C Programming Language
Kernighan, Brian and Ritchie, Dennis. O'Reilly Media, Inc., 1978 (many later editions)

A.K.A. "K&R" for Kernighan and Ritchie. Nearly every device in the world that isn't a fully general purpose computer is running an embedded firmware / real time operating system that is built with C. All Unix and Unix-derived operating systems are written in C. C++ and Microsoft's C# (putatively) derive from C. Apple's iOS for iPhone & iPad is written in Objective-C, which is derived from C. If you really want to become a true master of all things programming, you need to learn C.

C Problem Solving And Programming
Barclay, Kenneth. Prentice Hall, 1990 (has later editions)

Another terrific text for learning C. My personal favorite.

Structure And Interpretation Of Computer Programs
Abelson, Harold and Sussman, Gerald and Julie. MIT Press, 1985 (has later editions)

The primary text for computer science students at MIT. It teaches programming from a somewhat different perspective than most, as it teaches functional programming languages versus procedural. Nearly all programming languages, Python and C included, are procedural (or imperative), while LISP, Haskell, and Scheme are mostly functional. This is truly for advanced programmers, as it really does represent a wholly different way of "thinking like a programmer".

Godel, Escher, Bach: An Eternal Golden Braid
Hofstadter, Douglas. Basic Books, 1979 (many later editions)

A mind-bending journey into the strangeness of the universe, a lyrical exploration of the conundrums of the fundamental theories of computer science mixed with music and mathematics. You really need to try reading it. This is basically the ultimate zen holy grail of programming and understanding consciousness.

Links

http://www.python.org/
The official Python web site — everything you need to get everything Python.

http://docs.python.org/
The official documentation for the Python language.

http://www.diveintopython.net/
A great GNU licensed tutorial text that can take you further with the Python language.

http://stackoverflow.com/
Stack Overflow is an invaluable resource for getting feedback and advice from other programmers. Search engines will usually return results from this site if you search for specific enough keywords, or by copying and pasting the error you receive from the terminal or console into the search box. Accept no substitutes!

Vocabulary

In this section we define a number of terms related to programming. Please let me know if there are any words I use that you don't understand, so I can add them to future versions of this document!

shell

      The user environment where operating system commands can be executed at a command line prompt. Also called a terminal, or a tty (which stands for teletype).

variable

      A named "storage vessel" in a program which can store a value and changes every time a new value is <u>assigned</u> to it. This is like a bowl with a label on it that can be used to temporarily store ingredients.

assignment

      The act of storing a value into a <u>variable</u>, using the assignment operator **=** . It is critical to note that one usually tests for equality with the equivalency operator **==** . Mixing these up is one of the most common programming errors, right up there with the infamous "off by one" type of error. It is even worse in JavaScript where there is a "really really equals" operator **===** .

operator

      Usually a mathematical symbol, such as: **+, -, /, *** where the forward slash is division and the asterisk is multiplication. Operators can also be used in multiple ways depending on the <u>types</u> being operated upon, for example, two strings can be joined together (concatenated) using the **+** .

type

      The nature of the <u>variable</u> or value in a programming language. Types in Python include integer, string, character, list, and so on. Python is considered a "loosely typed" language because different types of values can be stored in variables without having to declare a type for the variable and values can change their type without causing errors in <u>execution</u>.

execute

      To start a program.

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The latest version of this packet and all other workshop materials can be found online at Github:

https://github.com/mik3cap/Thinking-Like-A-Programmer-workshop-code-examples/tree/master/Coding-For-Beginners