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Exam 2 Review Sheet

SELECTION

- Boolean expression: an expression that compares two values (true or false) – boolean values
- Boolean operators:
  - == equal to
  - < less than
  - > greater than
  - =! not equal to
  - >= greater than or equal to
  - <= less than or equal to
- Conditional execution:
  - If & else statements
- Chained conditions:
  - If & elif & else statements
- Nested conditions:
  - Conditions that are nested within another
    - Ex. def is _ positive(value):
      - Return value > 0 (** returns true or false **)

UNIT TESTING

- Unit testing: the process of writing small animated tests to check code
- Pytests: tests are organized into functions which pytest automatically finds and runs & failure reports show exactly where tests failed
- Assert: the assert statement is used to check assumptions inside code. If the condition is false, the program raises an error.
- ** in order to write a good unit test, they should be specification based **

STRINGS

- Immutable: existing strings cannot be changed
- Common string methods: upper, lower, capitalize, strip, lstrip, rstrip, count, replace, center, lijust, rjust, find, rfind, index, rindex, format
- Slice operator: [n:m] returns the part of the string from the n+n character to the m+n
- Indexing: selects a single character from a string, the characters are accessed by their position and/or index value
- +(concatenation): joins two strings together
- *(repetition): repeats a string given # of times
- in/not operators: tests if one string is a substring of another

LISTS

- List: data structure used to store an ordered collection of items (numbers, strings, etc.)
    - Ex. animals = [“cat”, “lion”]
- Mutable: lists are mutable, meaning they can be changed without creating a new list
- List methods:
    - append(*): adds one item
    - extend(r): adds all items from another list
    - sort(): arranges elements in order
    - remove(x): deletes first matching item
    - pop(): removes & returns last item
    - copy(): make a copy of your list
- Tuples: a tuple is like a list but it is immutable, often used to return multiple values from function

DICTIONARIES

- Dictionary: a collection of key value pairs, each key is unique and maps to a value
- Dictionary methods:
    - keys() – returns all keys
    - values() – returns all values
    - items() – returns key value pairs
    - clear() – removes all items
- You can add items, change values, and delete items in dictionaries
- Items are unordered, they don’t use positions like lists
    - Ex. student_info = {“name” : “Alice”, “age” = 20, “gpa” = 3.8, “major” = “CS”}
- Aliasing: occurs when two variables refer to the same dictionary, to avoid this you can make a copy of the dictionary
- Sparse matrices: a large grid or table where most of the cells are empty (or zero), this approach saves a lot of space and is a common way to handle data like images networks or mathematical grids

FILES

- Loading in files: [/users/yourname/hello.txt]
- Line: the line of a file defined to be a sequence of characters up to and including a special character called the newline character
- With statements: for line in my file
    - Statement 1
    - Statement 2
- Method names & uses:
    - Open → open(filename, ‘r’)

- Open → open(filename, ‘w’)
- Close → filevariable.close()
- Write → filevar.write(astring)
- read(n) → filevar.read()
- readline(n) → filevar.readline()
- readlines(n) → filevar.readlines()

CLASSES AND OBJECTS

An object has a state and a collection of methods that it can perform

- Object and arguments as parameters: you can pass an object as an argument in the useful way
- You can convert objects to strings
- Functions and methods can return objects
- Class point: “point class for representing and manipulating x,y coordinate
    - def__int__(self):
        - self.x=0
        - self.y=0
- Deep equality: equality of values, or two references that point to objects with same value
- Shallow equality: equality of references or two references that point to same object
- Deep copy: to copy the contents of an object as well as any embedded objects embedded in them and so on
- Shallow copy: to copy the contents of an object, including any references to embedded objects
- Helper function: used to assist in a larger more complex function

TKINTER MODULE

- Tkinter code file:
    1) Import statements for loading modules
    2) A class def that will define a type of object to control the GUI aspects of the program including setup, running, manipulating
    3) A main function or script that makes the GUI object
- Label widget: used to display text or images to the user
- Button widget: button that displays test or image that user can click on
- Frame widget: an organizing widget that forms a self contained box
- Canvas widget: allows user to display & animate shapes of various kinds
- Object ids: every object placed on a canvas is assigned to an object id
- Toplevel widget: creates a new, separate window
- Rebuild dialog windows: shall box that asks a question and looks for an answer

RECURSION

- 3 laws of recursion:
    1) A recursive algorithm must have a base case
    2) A recursive algorithm must change its state and move toward the base case
    3) Must call itself, recursively
- Recursion: a method of solving problems that involves breaking a problem down into smaller subproblems until you get a small enough problem that it can be solved trivially, usually involves a function calling itself
- Converting an integer to a string
    1) Reduce the original number to a series of single digit numbers
    2) A recursive algorithm must change its state and move toward the base case
    3) Contacts the single digit strings together to form the result

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