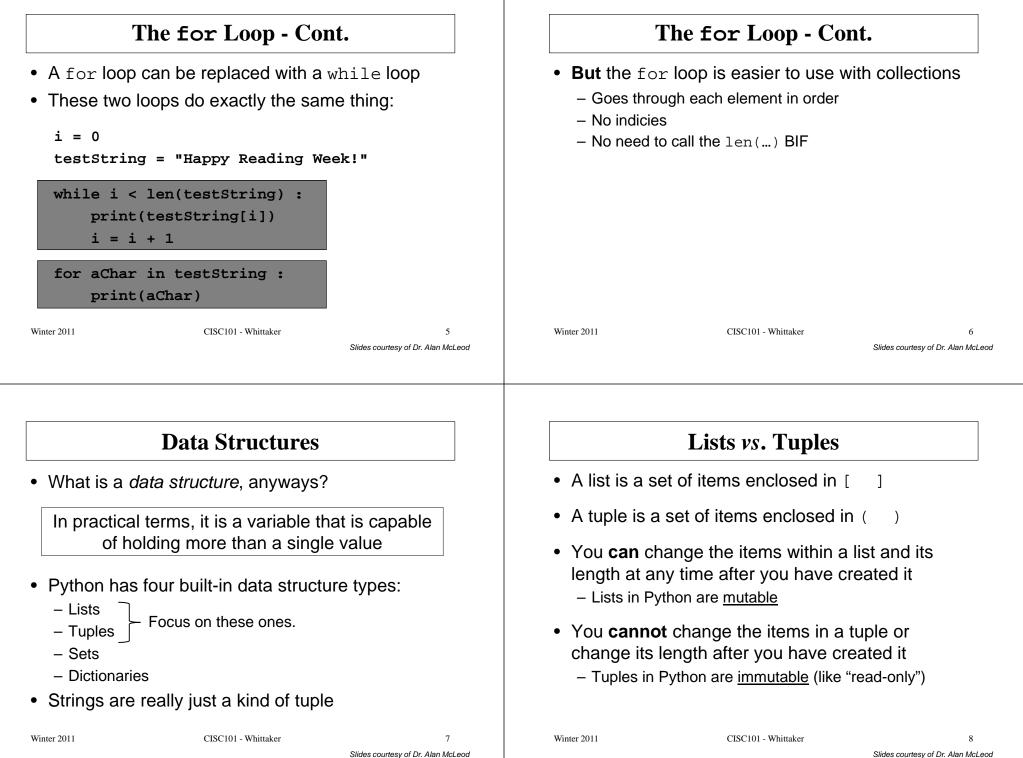
CISC101 Reminders & Notes Today Assignment 2 is due on Sunday at 11:59PM Looping through strings • The for loop • Built-in collections or data structures There are no CISC 101 lectures, tutorials or labs during Reading Week - Tuples - Lists • The slice operator Test 2 will occur the week after Reading Week More on programming style - Some review Some new material Winter 2011 CISC101 - Whittaker Winter 2011 CISC101 - Whittaker 2 1 Slides courtesy of Dr. Alan McLeod Slides courtesy of Dr. Alan McLeod The for Loop **Looping Through Strings** • Strings are actually a kind of *collection* in Python - A collection of characters - makes sense! for variable name in iterable : line1 • The len(aStr) BIF returns the length of a string - Or any other collection line2 • Use the *slice* operator [] to access any character ... aString[index] • You make up variable_name - index ranges from 0 (first character on the left) to len(aString) - 1 (last character on the right) • *iterable* is a collection, such as a string Demo: IterateString.py Winter 2011 CISC101 - Whittaker 3 Winter 2011 CISC101 - Whittaker Δ



Lists vs. Tuples – Cont. **Dictionaries** Dictionaries or "dicts" are enclosed in { } Numbers and strings are also immutable - You can't mess with the individual digits of a number or • They consist of key : value associations the individual characters of a string after you have • For example, created them - You can only re-assign variables that are numeric or cisc101Dict = { 'instructor' : 'SJW', \ string types `room' : `BI01203', \ - Don't believe me? Let's try using the slice operator to try to change a character in a string ... `exclusion' : `CISC110' } We will look at these more closely later ... Winter 2011 CISC101 - Whittaker Winter 2011 CISC101 - Whittaker 9 10 Slides courtesy of Dr. Alan McLeod Slides courtesy of Dr. Alan McLeod Lists Sets Are new to Python 3 Lists can contain items of all the same type Items enclosed in { } (like dictionaries) [3, 2, -1, 10]• Each item **must** be unique - If you try to create a set with duplicate items, the Lists can also contain a mixture of types duplicates will be discarded [4.2, '7abc', 3, aVar] We will look at these more closely later too ... Lists can store variables as well as literals! All elements are comma-separated Winter 2011 CISC101 - Whittaker 11 Winter 2011 CISC101 - Whittaker 12 Slides courtesy of Dr. Alan McLeod

Tuples Empty Lists Can store a mixture of types, just like lists You can create an empty list like so: aTuple = (4, 3.2, 'abc', 7, -3, 'ding') mtList = [] Since a tuple is immutable, you cannot change its You can add and alter the values in a list later. values - Lists are mutable, unlike tuples - You can't do anything like aTuple[1] = 7 • Useful things: • Use (*element*,) to create a single-element tuple - The slice operator - Python needs the comma - The + operator - The append (anElement) function • Use () to create an empty tuple Winter 2011 CISC101 - Whittaker 13 Winter 2011 CISC101 - Whittaker 14 Slides courtesy of Dr. Alan McLeod Slides courtesy of Dr. Alan McLeod **Slice Operator Slice Operator - Cont.** • When using [start index : end index], You can extract single elements or a set of elements from a collection using the slice you can supply one or two numbers operator: • Omit start index ? [index] **Or** [start index : end index] The slice starts at the start of the collection - All indicies are int numbers • Omit end index ? Locations are *indexed* from 0 (first element) - The slice ends at the end of the collection. - Maximum index is len(collection) - 1 (last • Use both start index and end index? element) - Slice starts at start index • The slice operator with the : returns a *range* of - Slice ends at end index - 1 elements - No : returns a single element Winter 2011 CISC101 - Whittaker 15 Winter 2011 CISC101 - Whittaker 16

Slice Operator - Cont.

- If end_index is too large, then the slice defaults to the end of the list
- The slice operator can be used on either side of an assignment operator!
- You can also number the elements backwards, where -1 is the last number in the list ...
- Let's try a few out at the prompt!

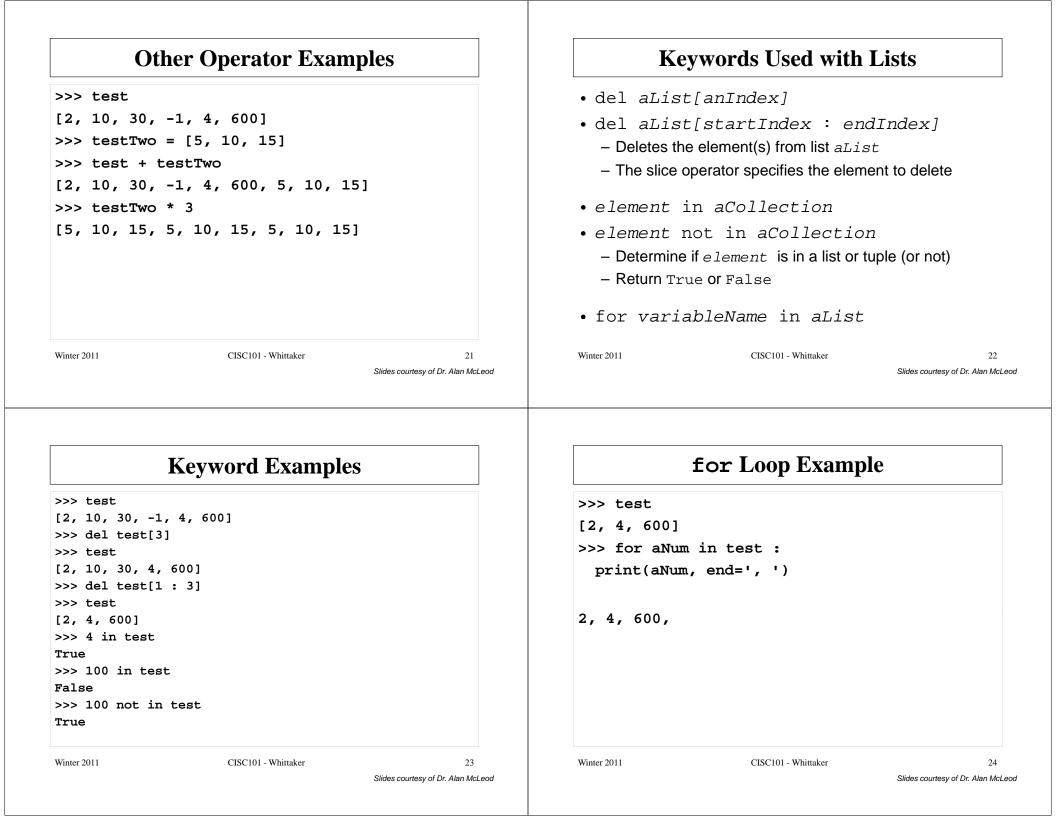
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Slice Ope	erator Example	s – Cont.	
>>> test[1 : 3]	= [10, 30]		• W
>>> test [2, 10, 30, -1, >>> test[-1] =			• +
>>> test			-
[2, 10, 30, -1,	4, 600]		• *
			-
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Slice Operator Examples

011	CISC101 - Whittaker	18 Slides courtesy of Dr. Alan McLee
3]		
test[1 : 3]		
1, 3]		
test[: 3]		
6]		
test[4 :]		
test[-1]		
test[3]		
test = [2, 1,	5, 1, 1, 0]	
	<pre>test[3] test[-1] test[4 :] 6] test[: 3] 1, 3] test[1 : 3] 3]</pre>	<pre>test[3] test[-1] test[4 :] 6] test[: 3] 1, 3] test[1 : 3] 3]</pre>

Other Operators For Lists and Sets

- Vhat is there in addition to the slice operator?
- can be used to concatenate lists
 - Requires a list on both sides or a tuple on both sides
 - You cannot mix types!
- is used to generate multiples of lists
 - Must have an int after the *
 - Works with tuples or lists
 - Remember "abc" * 3 = "abcabcabc"?



Some Built-In Functions for Lists The range() BIF • len(aCollection) This function returns an *iterable*, not a list Returns the number of elements in the collection Where did we see iterable before? • list(*iterable*) - An iterable is a collection, such as a string tuple(iterable) - Returns a new list/tuple with the same elements Let's create one and display its contents • range(start, stop, step) Can convert to a list or tuple - Returns an *iterable* with integers Starts with integer start (optional parameter) - Use list(*iterable*) or tuple(*iterable*) • Stops at stop - 1 Increases integers by step (optional parameter) - Often used with a for loop ... Winter 2011 CISC101 - Whittaker Winter 2011 CISC101 - Whittaker 25 26 Slides courtesy of Dr. Alan McLeod Slides courtesy of Dr. Alan McLeod The range () BIF - Cont. sorted(...) and reversed(...) BIFs • Say, that's handy! sorted(iterable) - Returns a sorted version of *iterable* • For example, these two loops are the same: - Does not change *iterable*! i = 0• *aList*.sort() while i < 20: - Sorts aList "in situ", changing it print(i) i = i + 1 reversed(iterable) - Often used with a for loop ... for i in range(20) : Reverses the direction of iteration print(i) Starts at the last element and ends with the the first CISC101 - Whittaker Winter 2011 CISC101 - Whittaker 27 Winter 2011 28 Slides courtesy of Dr. Alan McLeod

enumerate(...) and zip(...) BIFs

- for *i*, *element* in enumerate(*iterable*):
 - Provides an index number and an element for collections
- for e1, e2, ... in zip(iter1, iter2, ...):
 - Provides a way to loop through any number of collections at the same time
- Demo: ListBIF.py

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	List Methods - Cont.			Methods vs. BIFs		
	 None of these methods work for tuples They only work on lists 		 A method belongs to an <i>object</i> Objects are data structures like strings or lists More complicated than numbers or Booleans 			
 Consult the Python Tutorial, Chapter 5 for more information on data structures 		o for more	 Need an <i>instance</i> of an object to call the method on e.g., aString.format(), aList.pop(), etc. Invoke methods using an_object.method_name() 			
Demo: ListMethods.py			 A BIF does not belong to any object Can just call the function e.g., print(), input(), etc. Invoke functions using function_name() 			
Winter 2011	CISC101 - Whittaker	31	Winter 2011	CISC101 - Whittaker	32	

List Methods

appends obj to list

counts occurrences of obj

first occurrence of *obj*

search between *i* and *j*

removes the last element

reverses in place

sorts in place

search for and remove obj

These methods belong to a list object

list.append(obj) list.count(obj)

list.index(obj)

list.pop()

list.sort()

list.index(obj, i, j)

list.remove(obj) list.reverse()

• *list* is the name of a list; *obj* is a value

list.insert(index, obj) # insert obj at index

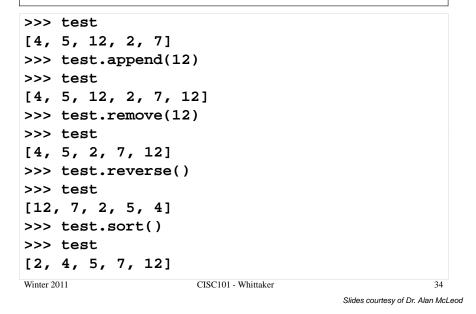
List Method Examples

>>> test = [4, 5, 2, 7	, 9]
>>> test	
[4, 5, 2, 7, 9]	
>>> test.append(12)	
>>> test	
[4, 5, 2, 7, 9, 12]	
>>> test.pop()	
12	
>>> test	
[4, 5, 2, 7, 9]	
>>> test.pop()	
9	
>>> test	
[4, 5, 2, 7]	
>>> test.insert(2, 12)	
>>> test	
[4, 5, 12, 2, 7]	
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33

List Method Examples - Cont.



Programming Style & Documentation

• Purpose is to make your code readable and "debuggable" by you or another programmer

> "Code is read more often than it is written." (Guido van Rossum)

- Internal style elements
 - Documentation (comments)
 - Spacing
 - Descriptive variable names
- Select your conventions and <u>be consistent</u>

Comments

- Add a comment at the top of your program and at the beginning of each function describing ...
 - the overall purpose of the program or function
 - the main algorithm used
 - author and date created
 - any assumptions made and/or bugs found
- Function comments should state ...
 - what parameters are expected by the function
 - what the function returns, if anything
 - any assumptions made about the arguments

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Comments – Cont.

- When the name of a variable is not selfexplanatory, add an inline comment when it is first initialized
- Add comments at the start of logical blocks
 Indent comment same as start of block
- · You don't need to explain code that is obvious
 - Focus on code that is tricky to understand
 - Maybe it needs to be re-written?
- # TODO comments can be used to mark where more work is needed

Documentation Strings

- We've seen these already
- If you describe your function in a doc string you don't need as much in its comment
- What would you <u>not</u> include in a doc string?
 - Author(s), date/revision number, code history, problem areas, incomplete section(s), license/copyright, *etc.*
- Write doc strings for each function in a program unless they are short and obvious
- Don't forget that doc strings are available through the use of the help() BIF at the prompt

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 Don't mix ta Not a prob When yo Long lines: Keep lines Use the Py Indent a 	Spacing es for indentation abs and spaces blem if you are only using IDL ou hit the <tab> key you automatica a < 80 characters in length ython continuation character continued line so that it lines up nic he after a binary operator, not</tab>	lly get 4 spaces \ ely	•	longAssign returnedVa Don't put n if bingo <	Spacing - Cont. ion examples: ment = aLongName + another anotherVariable * 2 al = functionCall(param1, a param2, multiple lines of code on a 3 : bork = try + again = are + all + winners	2.0 anotherParam, \ param3)

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Do **Round Brackets and Tuples** # This program is used to demonstrate better style. # Version 1, by Alan McLeod, 27 Oct. 2009 • On the last slide the (x, y) is a tuple made from variables \mathbf{x} and \mathbf{y} def product(num1, num2) : '''This is a useless little function that does not do much''' · Any list of variables separated by commas is print('Hello') automatically a tuple return num1 * num2 - You don't need the brackets to make one def main() : '''main invokes product and then waves goodbye!''' However, if you wish to keep the brackets as a print product(3, 4) personal preference then do so print('Goodbye!') main() Winter 2011 CISC101 - Whittaker Winter 2011 CISC101 - Whittaker 45 46 Slides courtesy of Dr. Alan McLeod Slides courtesy of Dr. Alan McLeod Don't! Above All Else, def m(ll1,l1):print('Hello');return(ll1*l1); def main():print(m(3,4));print("Goodbye!") main () This works, but is incomprehensible How many things are wrong with this code?