Lists, String Manipulation

Data Structures

- So far, we've learned about strings and numbers and we can store these inside variables.
- Guess the number game
- Chatbot

Guess the number

```
from random import randint
x = randint(0, 10)
while True:
    guess = int(raw_input(“Guess a number”))
    if guess > x:
        print “Guess was too high”
    …
```

We use numbers to write programs for games, data calculations… pretty much everything

Chatbot uses strings

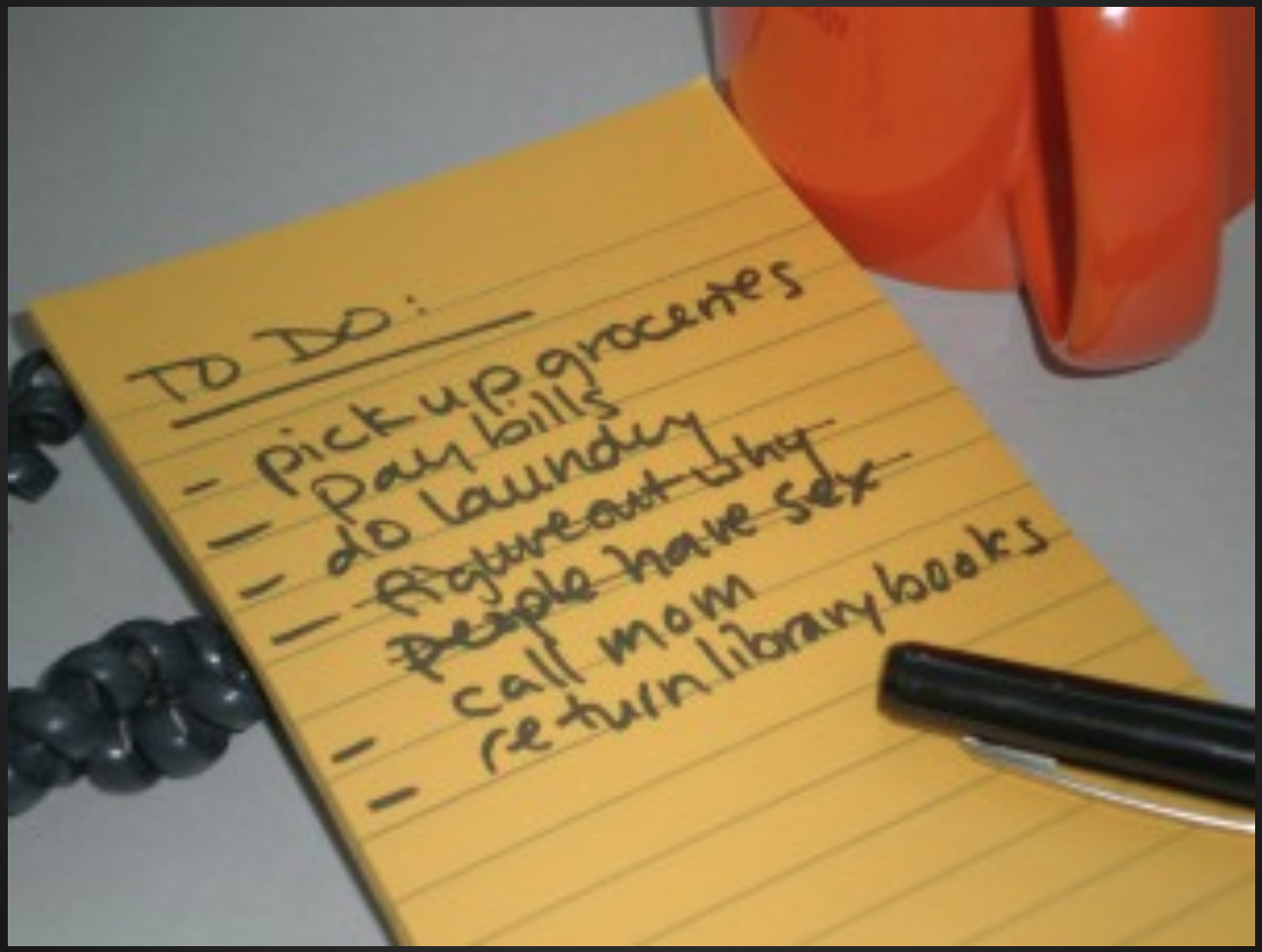
```
x = raw_input(“What shape do you want to draw?”)
if x == ‘square’:
    draw_square()
…
```

Humans communicate in words and it makes sense to have strings to store words

Why Lists?

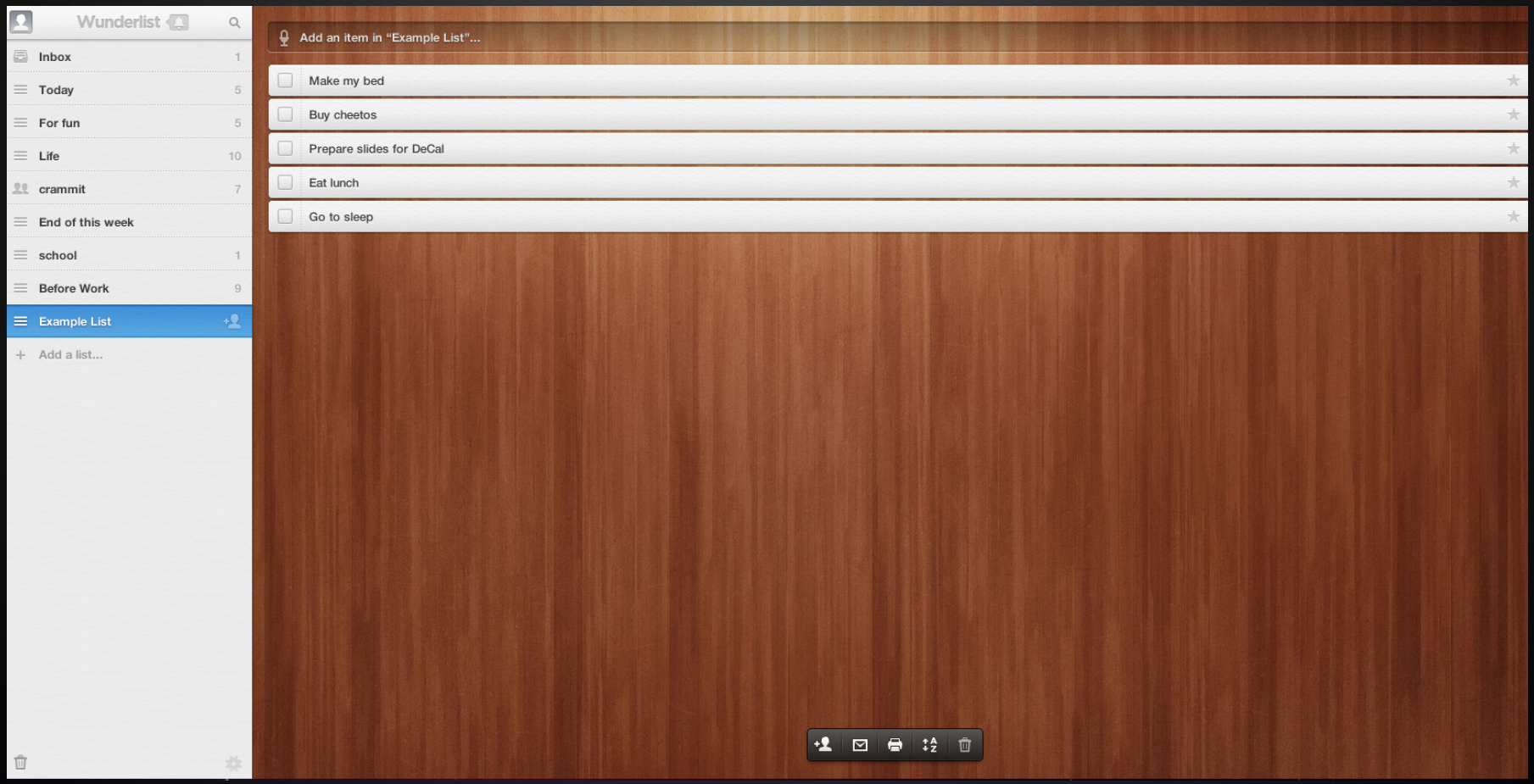
- Lists are essential in storing information.
- Shopping lists
- Ingredients for a recipe
- schedule.berkeley.edu holds a list of all of the classes
- ToDo list
- List of prices at a market
- Google keeps a list of all

Today we're learning about lists!



Does this make sense?

- I use a website called www.wunderlist.com



Does this make sense?

- I use a website called www.wunderlist.com
- Behind every website there is a program.
- There is a program running wunderlist.com.
- Does it make sense for the website to store my lists like this?

todo1 = ‘make my bed’

todo2 = ‘buy cheetos’

todo3 = ‘Prepare slides for DeCal’

todo4 = ‘eat lunch’

todo5 = ‘go to sleep’

We need a way to represent lists

- Let’s use the list data structure!
- wunderlist.com stores each of my to do lists in this form

example_list = [‘make my bed’, ‘buy cheetos’, ‘Prepare slides for DeCal’, ‘eat lunch’, ‘go to sleep’]

- Every time I load my example list page, it will find the example_list it is storing and display my to do items inside.

A side note:

- You'll be learning other data structures in this class.
- Data structures are very important in organizing data.
- One of the most powerful things about computers is that they can sift through data much faster than humans can read.
  - Computers can even do quantum simulations
- Need an organized way to store data

How to use lists?

To create a list assigned to the variable example_list we can do:

example_list = [‘make my bed’, ‘buy cheetos’, ‘Prepare slides for DeCal’, ‘eat lunch’, ‘go to sleep’]

This creates a list of 5 items. The first item in the list is ‘make my bed’, the second item in the list is ‘buy cheetos’...

How to use lists?

To create an empty list we can do:

example_list = [ ]

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What’s the point of an empty list?

How to use lists?

example_list = [ ]

We can add to lists! To add to the end of a list we can do:

example_list.append(‘add this to the end of a list’)

How to use lists?

example_list = [ ]

example_list.append(‘hello’)
example_list.append(‘agent’)
example_list.append(‘smith’)

What will example_list look like now?

How to use lists?

example_list = [ ]

example_list.append(‘hello’)
example_list.append(‘agent’)
example_list.append(‘smith’)

the above is equivalent to:
example_list = [‘hello’, ‘agent’, ‘smith’]

How to use lists?

example_list = [‘make my bed’, ‘buy cheetos’, ‘Prepare slides for DeCal’, ‘eat lunch’, ‘go to sleep’]

To access the first item in the list we can do:
example_list[0]

print example_list[0]
will print ‘make my bed’

How to use lists?

example_list = [‘make my bed’, ‘buy cheetos’, ‘Prepare slides for DeCal’, ‘eat lunch’, ‘go to sleep’]

To access the third item in the list we can do
example_list[2]

print example_list[2]
will print ‘Prepare slides for DeCal’

How to use lists?

example_list = [‘make my bed’, ‘buy cheetos’, ‘Prepare slides for DeCal’, ‘eat lunch’, ‘go to sleep’]

How do we access the 5th item in the list?

How to use lists?

example_list = [‘make my bed’, ‘buy cheetos’, ‘Prepare slides for DeCal’, ‘eat lunch’, ‘go to sleep’]

How do we access the 5th item in the list?

example_list[4]

How to use lists?

example_list = [‘make my bed’, ‘buy cheetos’, ‘Prepare slides for DeCal’, ‘eat lunch’, ‘go to sleep’]

To access the last item in any list we can do:
example_list[-1]

print example_list[-1]
will print ‘go to sleep’

How to use lists?

example_list = [‘make my bed’, ‘buy cheetos’, ‘Prepare slides for DeCal’, ‘eat lunch’, ‘go to sleep’]

How do we print the second to last item in any list?

How to use lists?

example_list = [‘make my bed’, ‘buy cheetos’, ‘Prepare slides for DeCal’, ‘eat lunch’, ‘go to sleep’]

How do we print the second to last item in any list?

example_list[-2]

Lists and For loops

- Remember what this does?

```
for i in range(10):
    print i
```

- Hint: it prints numbers 0 through 9
- What range(10) actually does is create a list that looks like: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
- Essentially what you are doing is

```
for i in [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]:
    print i
```

Lists and For loops

What do you think this does?

```
todos = [‘make my bed’, ‘buy cheetos’, ‘Prepare slides for DeCal’, ‘eat lunch’, ‘go to sleep’]
for x in todos:
    print x
```

Lists and For loops

What do you think this does?

todos = [‘make my bed’, ‘buy cheetos’, ‘Prepare slides for DeCal’, ‘eat lunch’, ‘go to sleep’]

```
for x in todos:
    print x
```

output:

make my bed

buy cheetos

Prepare slides for DeCal ...

Lists and For loops

What do you think this does?

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for x in todos:
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output:

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buy cheetos

Prepare slides for DeCal ...

String manipulation

- Given a string, we should be able to manipulate it.
- Why string manipulation?
  - Remember ELIZA?
    - String manipulation is important in understanding human text
    - An entire branch of CS dedicated to NLP (Natural language processing)
  - Useful for extracting data
    - You'll be doing a project later this semester to systematically scrape data off of thousands of web pages.

String manipulation

Given:

a_string = ‘hello my name is joe’

How do we print the second word in this sentence?

It would be nice to have a_string be in the form of:

[‘hello’, ‘my’, ‘name’, ‘is’, ‘joe’]...

String manipulation

Given:

a_string = ‘hello my name is joe’

How do we print the second word in this sentence?

We can do a_string.split(‘ ‘).

x = a_string.split(‘ ‘) ← this will give us a list of the form [‘hello’, ‘my’, ‘name’, ‘is’, ‘joe’]

print x[1]

String manipulation

a_string = ‘hello my name is joe’

a_string.split(‘ ‘)

- .split(‘ ‘), splits every occurrence of an empty space into a new element
- You can also do things like a_string.split(‘e’)
  - This will give a list of [‘h’, ‘ello my nam’, ‘ is jo’, ‘’]
    - As you can see splitting on some things like spaces are more useful than splitting on random characters.

String manipulation

a_string = ‘hello my name is joe’

You can take slices of a string by using this syntax

If you only want to print the first 5 characters of a string, you can do print a_string[:5]

If you only want the the last 3 characters of a string, you can do print a_string[-3:]

If you only want the 6th character to the 9th characters of a string, you can do

print a_string[5:9]

String manipulation

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