Week 4

gur zntvp jbeqf ner fdhrnzvfu bffvsentr

Strings, `if/else`, `return`, user input

Special thanks to Scott Shawcroft, Ryan Tucker, and Paul Beck for their work on these slides.

Strings

index	0	1	2	3	4	5	6	7
or	-8	-7	-6	-5	-4	-3	-2	-1
character	P	.		D	i	d	d	y

- Accessing character(s):

  variable [**index**]

  variable [**index1** : **index2**]

  - **index2** is exclusive
  - **index1** or **index2** can be omitted (end of string)

```
>>> name = "P. Diddy"
>>> name[0]
'P'
>>> name[7]
'y'
>>> name[-1]
'y'
>>> name[3:6]
'Did'
>>> name[3:]
'Diddy'
>>> name[:-2]
'P. Did'
```

String Methods

Java	Python
length	len(**str**)
startsWith, endsWith	startswith, endswith
toLowerCase, toUpperCase	upper, lower, isupper, islower, capitalize, swapcase
indexOf	find
trim	strip

```
>>> name = "Jordan Hiroshi Nakamura"
>>> name.upper()
'JORDAN HIROSHI NAKAMURA'
>>> name.lower().startswith("jordan")
True
>>> len(name)
23
```

`for` Loops and Strings

- A `for` loop can examine each character in a string in order.

```
for name in string:
    statements
```

```
>>> for c in "booyah":
...     print(c)
...
b
o
o
y
a
h
```

input

`input` : Reads a string from the user's keyboard.

- reads and returns an entire line of input

```
>>> name = input("Howdy. What's yer name? ")
Howdy. What's yer name? Paris Hilton

>>> name
'Paris Hilton'
```

`input` for numbers

- to read a number, cast the result of `input` to an `int`
  - Only numbers can be cast as `int`s!
  - Example:

```
age = int(input("How old are you? "))
print("Your age is", age)
print("You have", 65 - age, "years until
retirement")
```

Output:

```
How old are you? 53
Your age is 53
You have 12 years until retirement
```

if

```
if condition:
    statements
```

– Example:

```
gpa = int(input("What is your GPA? "))
if gpa > 2.0:
    print("Your application is accepted.“)
```

if/else

```
if condition:
    statements
elif condition:
    statements
else:
    statements
```

- Example:

```
gpa = int(input("What is your GPA? "))
if gpa > 3.5:
    print("You have qualified for the honor roll.")
elif gpa > 2.0:
    print("Welcome to Moon University!")
else:
    print("Apply again in Spring.")
```

if … in

```
if value in sequence:
    statements
```

- The sequence can be a range, string, tuple, or list
- Examples:

```
x = 3
if x in range(0, 10):
    print("x is between 0 and 9")

name = input("What is your name? ")
name = name.lower()
if name[0] in "aeiou":
    print("Your name starts with a vowel!")
```

Logical Operators

Operator	Meaning	Example	Result
==	equals	`1 + 1 == 2`	`True`
!=	does not equal	`3.2 != 2.5`	`True`
<	less than	`10 < 5`	`False`
>	greater than	`10 > 5`	`True`
<=	less than or equal to	`126 <= 100`	`False`
>=	greater than or equal to	`5.0 >= 5.0`	`True`

Operator	Example	Result
`and`	`(2 == 3) and (-1 < 5)`	`False`
`or`	`(2 == 3) or (-1 < 5)`	`True`
`not`	`not (2 == 3)`	`True`

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Cryptography

EASY

- Caesar Cypher
- ROT-13

HARD

- Diffie-Hellman
- RSA encryption
  - Rivest-Shamir-Adelman

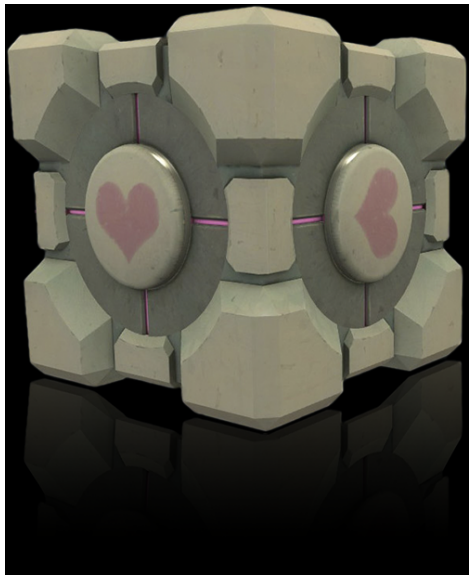
Caesar Cypher

```
abcdefghijklmnopqrstuvwxyz
↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓
defghijklmnopqrstuvwxyzabc
```

“the cake is a lie”

BECOMES

“wkh fdnh lv d olh!”



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Exercise

```
>>> alphabet = 'abcdefghijklmnopqrstuvwxyz'
>>> alphabet2 = 'defghijklmnopqrstuvwxyzabc'
>>> substitute(alphabet, alphabet2, "the cake is a lie")
    'wkh fdnh lv d olh‘
```

Write a method substitute, that takes two alphabets and a message, and returns an encoded message

Solution

```
def substitute(text, alphabet1, alphabet2):
    result = ""
    for ch in text:
        if ch in alphabet1:
            result += alphabet
  2[alphabet1.find(ch)]
        else:
            result += ch
    return result
```

hahuflvh (exercise)

- The Caesar Cypher is easy to crack…

>>> make_phrase(“zebras”)
‘zebrascdfghijklmnopqtuvwxy’

Write a method called make_phrase, that takes a phrase and creates a new alphabet

ROT-13

- It might be nice to have something that doesn't require two separate alphabets as parameters.
  - If we were to actually use one of the two cyphers, we'd need the original alphabet, and the changed alphabet.
- Is there a way to encode a message without needing both alphabets?
  - Maybe just using the normal one? (abcdefghijklmnopqrstuvwxyz)

  abcdefghijklmnopqrstuvwxyz → nopqrstuvwxyzabcdefghijklm
  - Everything is shifted 13 letters.
    - Why is this cool?

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Huh?

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Using the ROT-13 cypher… we get

the magic words are squeamish ossifrage

Wrap up

- Notice how in all the different ways of encoding phrases that we did, both people had to know a "secret".
  - ROT13: you had to know that the alphabet was shifted by 13 letters.
  - Caesar Cypher: You had to know that the alphabet was shifted by 3 letters.
  - Our own "zebras" cypher: You had to know the word "zebras"
- More advanced encryptions like Diffie-Hellman and RSA encryption use the concept of a "secret" number in order to decode the messages.

Formatting Text

"format string" % (parameter, parameter, ...)

- *Placeholders* insert formatted values into a string:
  - `%d` an integer
  - `%f` a real number
  - `%s` a string
  - `%8d` an integer, 8 characters wide, right-aligned
  - `%08d` an integer, 8 characters wide, padding with 0s
  - `%-8d` an integer, 8 characters wide, left-aligned
  - `%12f` a real number, 12 characters wide
  - `%.4f` a real number, 4 characters after decimal
  - `%6.2f` a real number, 6 total characters wide, 2 after decimal

```
>>> x = 3; y = 3.14159; z = "hello"
>>> print("%-8s, %04d is close to %.3f" % (z, x, y))
hello   , 0003 is close to 3.142
```