

Dictionaries

Dictionaries are *associative* structures -- they associate *keys* with *values*. You look up something in a dictionary by giving it the key; the dictionary gives you the value stored for that key. The values can be any data you can represent in Python - numbers, strings, lists, and so forth. The keys must be members of an *immutable* type -- such as numbers, strings, or tuples. You can't use lists for keys because lists are mutable. Dictionaries themselves are another mutable type, so we can write functions that change the data stored in a dictionary.

There aren't a lot of operations for dictionaries:

`D = {}` creates an empty dictionary.

`D[key]` looks up the value associated with the key.

`D[key] = value` creates an association between the key and the value.

`D.keys()` is the list of keys currently set for the dictionary.

Note that your program will crash if you try to look up something that isn't a key, so we usually do lookups in 2 steps. For example, to print the value associated with key x:

```
if x in D.keys():
    print(x, D[x])
else:
    print( "no value found." )
```

You can't use a for-loop to run directly through the values in a dictionary; instead, work through the keys, as in

```
for x in D.keys():
    print( x, D[x] )
```

Suppose we wanted to make a "database" with all student organizations and their contact persons. Let's assume each organization has exactly one contact person. We could use a dictionary to hold this data. What would be the keys and what would be the values?

- A) Key: Organization name; Value: Contact name
- B) Key: Contact name; Value: Organization name
- C) Key: List of organizations; Value: List of contacts
- D) I don't know

Suppose we want to make a "database" with people and their phone numbers, where a person (like me) might have multiple phones. What are the keys and values?

A) Key: Name string Value: Phone string

B) Key: Phone string Value: Name string

C) Key: Name string Value: List of Phone strings

D) Key: Phone string Value: List of Name strings

E) Something else

What will this print?

```
def change(D):
```

```
    D["bob"] = 65
```

```
def main():
```

```
    Ages = {}
```

```
    change(Ages)
```

```
    for person in Ages.keys():
```

```
        print( "%s: %d" ) %(person, Ages[person])
```

```
main()
```

- A: nothing: D and Ages are different variables
- B: It will generate an error and not run
- C: It will run and crash because D isn't defined
- D: It will print
bob 65

What will this print?

```
def change(D):  
    D = {}  
    D["bob"] = 65  
  
def main():  
    Ages = {}  
    change(Ages)  
    for person in Ages.keys():  
        print( "%s: %d" ) %(person, Ages[person])  
  
main()
```

A: nothing: D and Ages are different variables

B: It will generate an error and not run

C: It will run and crash because D isn't defined

D: It will print

bob 65