

The Dictionary ADT

EECS 214, Fall 2017

The Dictionary ADT: values and operations

Looks like: { a: 6, b: 7, c: 8 }

Operations:

- *get*(Dict, Key): Value
- *put*(Dict, Key, Value): Void
- *del*(Dict, Key): Void
- *isEmpty*(Dict): Bool

The Dictionary ADT: laws

$$\text{isEmpty}(\{\}) \Rightarrow \top$$

$$\text{isEmpty}(\{k_1:v_1, \dots\}) \Rightarrow \perp$$

$$\text{get}(\{k_1:v_1, \dots, k_j:v_j, \dots\}, k_j) \Rightarrow v_j$$

$$\{k \neq k_j\} \text{get}(\{k_1:v_1, \dots\}, k) \Rightarrow \text{error!}$$

$$\{d = \{k_1:v_1, \dots, k_i:v_i, \dots\}\} \text{put}(d, k_i, v) \{d = \{k_1:v_1, \dots, k_i:v, \dots\}\}$$

$$\{d = \{k_1:v_1, \dots\} \wedge k \neq k_i\} \text{put}(d, k, v) \{d = \{k_1:v_1, \dots, k:v\}\}$$

$$\{d = \{k_1:v_1, \dots\}\} \text{del}(d, k_i) \{d = \{k_1:v_1, \dots, k_{i-1}:v_{i-1}, k_{i+1}:v_{i+1}, \dots\}\}$$

$$\{d = \{k_1:v_1, \dots\} \wedge k \neq k_i\} \text{del}(d, k) \{d = \{k_1:v_1, \dots, \}\}$$

Law breakdown: *get*

If we try to lookup a key present in the dictionary, we get its associated value:

$$\text{get}(\{k_1:v_1, \dots, k_j:v_j, \dots\}, k_j) \Rightarrow v_j$$

If we try to lookup a key that isn't among the dictionary's keys—that's the precondition $k \neq k_j$ —then it returns a result that indicates that the key wasn't found:

$$\{k \neq k_j\} \quad \text{get}(\{k_1:v_1, \dots\}, k) \Rightarrow \text{error!}$$

Law breakdown: *put*

If we put a key that's already present, its associated value gets replaced:

$$\{d = \{k_1:v_1, \dots, k_j:v_i, \dots\}\} \text{ put}(d, k_i, v) \{d = \{k_1:v_1, \dots, k_i:v, \dots\}\}$$

If we put a key that's absent, the new key and value association is added:

$$\{d = \{k_1:v_1, \dots\} \wedge k \neq k_i\} \text{ put}(d, k, v) \{d = \{k_1:v_1, \dots, k:v\}\}$$

Law breakdown: *del*

If we delete a key that's present, it gets removed:

$$\{d = \{k_1:v_1, \dots\}\} \text{ del}(d, k_i) \{d = \{k_1:v_1, \dots, k_{i-1}:v_{i-1}, k_{i+1}:v_{i+1}, \dots\}\}$$

If we delete a key that's absent, nothing happens:

$$\{d = \{k_1:v_1, \dots\} \wedge k \neq k_i\} \text{ del}(d, k) \{d = \{k_1:v_1, \dots, \}\}$$

Next: a data structure for dictionaries