CS100J 18 October 2005 Arrays

Reading: You are responsible for: Secs 8.1, 8.2, 8.3, 8.4

A decimal point	I'm a dot in place	Slot machines	Cash lost in 'em
Animosity	Is no amity	Parishioners	I hire parsons
Debit card	Bad credit	Schoolmaster	The classroom
Desperation	A rope ends it	Statue of liberty	Built to stay free
Dormitory	Dirty room	The Morse code	Here come dots
Eleven plus two	Twelve plus one	Vacation times	I'm not as active
Evangelist	Evil's agent	Funeral	Real fun
The earthquakes	That queen shake	Intoxicate	Excitation
Mother-in-law	Woman hitler	Western Union	No wire unsent

Ronald Wilson Reagan	Insane Anglo Saxon warlord
Snooze alarms	Alas! No more Z's
Victoria, England's queen	Governs a nice quiet land
William Shakespeare	I am a weakish speller
William Shakespeare	We all make his praise

Some Anagrams (permutations of sequences of letters)

Today

- Look at horizontal notation for writing assertions about arrays.
- **Develop** several functions that process arrays. The idea is to help you learn how to develop algorithms.
  - Write a function to tell whether two arrays are equal.
  - Write a function to copy an array.
  - Write a function to tell whether two DNA sequences are complements of each other.
- Look at storing a table of values in a Java array.

  including adding a value to the table,

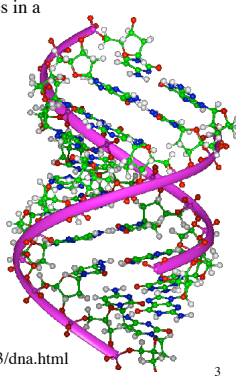
  deleting the last value of the table,

  deleting some other value from the table.

The material on tables is in Sec. 8.4 of course text.

Deoxyribonucleic acid (DNA) is the building block of all life. Each DNA strand consists of two strings of bases twisted together to form a double helix. The 4 possible bases are represented by G, A, T and C. In a helix, A and T bond together, as do C and G. The two sequences in a helix are complements. For example, these two sequences are complements of each other:

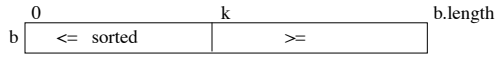
sequence 1: ACGTTAC
sequence 2: TGCAATG



Paired bases meet at an angle. DNA is a very large molecule; the image shows only a tiny fraction of the typical molecule. For the bacterium *Escherichia coli*, the image would be 80 kilometers long. For a typical piece of DNA from an eukaryote cell, the image would stretch from Dallas to Washington, D. C.! DNA is not fully stretched out inside a cell but is wound around proteins, which protect the DNA.

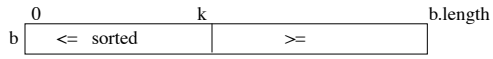
Taken from www.ucmp.berkeley.edu/glossary/gloss3/dna.html

Horizontal notation for arrays, strings, Vectors

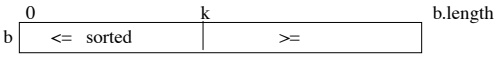


Example of an assertion about an array b. It asserts that:

1. b[0..k–1] is sorted (i.e. its values are in ascending order)
2. Everything in b[0..k-1] is ≤ everything in b[k..b.length–1]



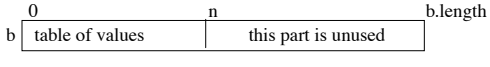
1. b[0..k] is sorted (i.e. its values are in ascending order)
2. Everything in b[0..k] is ≤ everything in b[k+1..b.length–1]



Maintain a table of values in an array

As a program executes, it may have to maintain a table of values, say temperatures, within an array. The table will start out empty; then values will be added to it. We must say *where* in the array the values are stored.

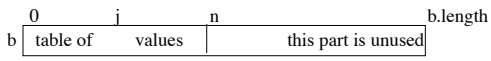
```
int[] b= new int[5000];  // The n values in the table are in b[0..n–1]
int n= 0;                // 0 ≤ n <= 5000
```




```
// Add t to the table:
b[n]= t;
n= n+1;
```

```
// Delete last element of table
// (assuming it exists).
n= n –1;
```


Maintain a table of values in an array



// Delete value b[j] from the table.

If the order of values in the table doesn't matter:

```
n= n–1;
b[j]= b[n];
```

If the order of values in table does matter:

```
n= n–1;
// Move b[j+1..n] to b[j..n–1]
// inv: b[j+1..k–1] have been moved
for (int k= j+1;  k–1 != n;  k= k+1 ) {
    b[k–1]= b[k];
}
```