CS 241 — Introduction to Problem Solving and Programming

Object-Oriented Programming

Intro to Arrays

Feb 18, 2005

Problem 1

Specification:

Write a program to read a list of 100 test scores, find their mean ($m = \sum_{i=1}^{100} x_i$), find their standard deviation ($\sqrt{\frac{1}{n}\sum_{i=1}^{100}(x_i - m)^2}$), and list them in sorted order.

Problem 1

We could have 100 variables.

```
double score1, score2, score3, score4,
           ... score98, score99, score100;

 score1 = DocsIO.readdouble("enter score--> ");
 score2 = DocsIO.readdouble("enter score--> ");
 ...
 score99 = DocsIO.readdouble("enter score--> ");
 score100 = DocsIO.readdouble("enter score--> ");

 /* I'm developing carpal tunnel syndrome... */
```

Problem 1

```
double mean = (score1 + score2 + ...
                    score99 + score100) / 100.0;


double stdDeviation = Math.sqrt(Math.pow((score1 - mean), 2) +
                                Math.pow((score2 - mean), 2) +
                                ...
                                Math.pow((score99 - mean), 2) +
                                Math.pow((score100 - mean), 2));

 /* Sort them? You've got to be kidding.... */
```

Problem 2

Specification:

> Write a program that reads coordinates in the $\mathcal{R} \times \mathcal{R}$ plane and plots them and calculates distances.

But this means I need two variables for every point. A point is a unified concept—why can't Java just have a `point` type?

Problem 3

I'm modelling sequences and series. I need to store a squence, say a, and be able to refer to any element of the sequence, a_k.

With k variables, I can't refer directly to an arbitrary one.

Solution

Use an array, an ordered collection of elements all of the same type.

```
int a[5] = { 3, 5, 6, 4, 7}

int x = a[0] + a[3];    // 3 + 4

a[2] = DocsIO.readint("Enter second score: ");

a[i] = DocsIO.readint("Enter next score: ");
```

Arrays

Arrays can hold a large quantity of data uniformly:

```
double scores[] = ... ;

for (int i = 0; i < numScores; i++)
   scores[i] = DocsIO.readdouble("Enter next score: ");
```

Arrays

Arrays can be used to make new, composite/compound types of data:

```
double[] pair = { 0, 1.5};
```

Arrays

Arrays are equivalent to the mathematical notion of a sequence.

a_k `a[k]`