CS100J 13 October 2005

Arrays. Reading: Secs 8.1, 8.2, 8.3.

Please listen to the following lectures on loops on your Plive CD. They are only 2-3 minutes long, and each has an insightful message for you.

1. The three lectures on Lesson page 7-6 --in fact, read the whole page.
2. The four lectures in Lesson page 7-5.

It also will help to read Secs. 8,1, 8.2, and 8.3 on arrays.

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8th Grade Final Exam: Salina, KS -1895

This is an 8-hour test
(continued on next page)

8th grade test from 1895

Grammar (Time, one hour)

1. Give nine rules for the use of capital letters.
2. Name the parts of speech and define those that have no modifications.
3. Define verse, stanza, and paragraph.
4. What are the principal parts of a verb? Give principal parts of "lie", "play", and "run".
5. Define case; Illustrate each case.
6. What is punctuation? Give rules for principal marks of punctuation.

7 - 10. Write a composition of about 150 words and show therein that you understand the practical use of the rules of grammar.

Arithmetic (Time, 1.25 hours)

1. Name the Fundamental Rules of Arithmetic.
2. A wagon box is 2 ft. deep, 10 feet long, and 3 ft. wide How many bushels of wheat will it hold?
3. If a load of wheat weighs 3942 lbs., what is it worth at 50cts/bushel, deducting 1050 lbs. for tare?
4. District No. 33 has a valuation of $35,000. What is the necessary levy to carry on a school seven months at $50 per month, and have $104 for incidentals?
5. Find the cost of 6720 lbs. coal at $6.00 per ton.
6. Find the interest of $512.60 for 8 months and 18 days at 7 percent.
7. What is the cost of 40 boards 12 inches wide and 16 ft. long at $20 per metre?
8. Find bank discount on $300 for 90 days (no grace) at 10 percent.
9. What is the cost of a square farm at $15 per acre, the distance of which is 640 rods?
10. Write a Bank Check, a Promissory Note, and a Receipt.

8th grade test from 1895

U.S. History (Time, 45 minutes)

1. Give the epochs into which U.S. History is divided.
2. Give an account of the discovery of America by Columbus.
3. Relate the causes and results of the Revolutionary War.
4. Show the territorial growth of the United States.
5. Tell what you can of the history of Kansas.
6. Describe three of the most prominent battles of the Rebellion.
7. Who were the following: Morse, Whitney, Fulton, Bell, Lincoln, Penn, and Howe?
8. Name events connected with the following dates: 1607, 1620, 1800, 1849, 1865 .

Orthography (Time, one hour)

1. What is meant by the following: Alphabet, phonetic, orthography, etymology, syllabication?
2. What are elementary sounds? How classified?
3. What are the following, and give examples of each: Trigraph, subvocals, diphthong, cognate letters, linguals 4.

Give four substitutes for caret 'u.' (HUH?) 5. Give two rules for spelling words with final 'e.' Name two exceptions under each rule.

6. Give two uses of silent letters in spelling. Illustrate each.
7. Define the following prefixes and use in connection with a word:

bi, dis, mis, pre, semi, post, non, inter, mono, sup.

8th grade test from 1895

Orthography (continued)

8. Mark diacritically and divide into syllables the following, and name the sign that indicates the sound: card, ball, mercy, sir, odd, cell, rise, blood, fare, last.
9. Use the following correctly in sentences: cite, site, sight, fane, fain, feign, vane, vain, vein, raze, raise, rays.
10. Write 10 words frequently mispronounced and indicate pronunciation by use of diacritical marks and by syllabication.

Geography (Time, one hour)

1. What is climate? Upon what does climate depend?
2. How do you account for the extremes of climate in Kansas?
3. Of what use are rivers? Of what use is the ocean?
4. Describe the mountains of North America.
5. Name and describe the following: Monrovia, Odessa, Denver, Manitoba, Hecla, Yukon, St. Helena, Juan Fernandez, Aspinwall and Orinoco.
6. Name and locate the principal trade centers of the U.S.
7. Name all the republics of Europe and give the capital of each.
8. Why is the Atlantic Coast colder than the Pacific in the same latitude?
9. Describe the process by which the water of the ocean returns to the sources of rivers.
10. Describe the movements of the earth. Give the inclination of the earth.

Computational simplicity

If you are writing too much code --it gets longer and longer, with no end in sight: **stop and look for a better way**.

If your code is getting convoluted, and you have trouble understanding it: **stop and look for a better way**.

Learning to keep things simple, to solve problems in a simpler way, sometimes requires a different way of thinking.

We are trying to teach not just Java but how to think about problem solving.

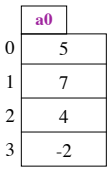
A key point is to break a problem up into several pieces and do each piece in isolation, without thinking about the rest of them. Our methdology for developing a loop does just that.

Make everything as simple as possible, but no simpler. Einstein

Computer science has its field called computational complexity; ~~mine is called computational simplicity.~~ Gries

Arrays

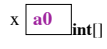
An array is an object that can hold a fixed number of values of the same type. The array to the right contains 4 **int** values.



The **type** of the array to the right is

int[]

Here is a variable that contains the name of the array.



Remember that a basic declaration has the form

<type> <variable-name> ;

Therefore, a declaration of x looks as to the right. The declaration does not create the array, it only declares x. x's initial value is **null**. We'll show you later how to create the array.

int[] x ;

The elements of the array are numbered 0, 1, 2, …, x.length–1. Note that length is a variable, not a function, so don't put () after it.

int[] x ; x [null] **int**[]

x= **new int**[4]; Create an array object of length 4 and store its name in x

x [a0] **int**[]

x[2]= 5;
x[0]= -4;

Assign 5 to array element 2 and -4 to array element 0

x[2] is a reference to element number 2 of array x

int k= 3;
x[k]= 2* x[0];
x[k-1]= 6;

Assign 2*x[0], i.e. -8, to x[3]
Assign 6 to x[2]

Arrays

	a0
0	0
1	0
2	0
3	0

	a0
0	-4
1	0
2	5
3	0

	a0
0	-4
1	0
2	6
3	-8

Difference between Vector and array --both used to contain a bunch of things

Declaration:	**int[]** a;	Vector v;
	Elements of a: **int** values	Elements of v: any Objects
Creation:	a= **new int**[n];	v= **new** Vector();
	Array always has n elements	Number of elements can change
Reference:	a[e]	v.get(e)
Change element:	a[e]= e1;	v.set(e, e1);

Array locations a[0], a[1], a[2] are in successive location in memory. Access is guaranteed to be the same, no matter which one you reference.

Elements are all the same type (a primitive type or some Object type)

You can't tell how Vectors are stored in memory. Referencing and changing elements done through method calls

Elements can be of any Object type (but not a primitive type), and casting may be necessary when an element is retrieved.

Array initializers

Instead of

int[] c= **new** int[5];
c[0]= 5; c[1]= 4; c[2]= 7; c[3]= 6; c[4]= 5;

Use an array initializer:

int[] c= **new int**[ ] {5, 4, 7, 6, 5};

No expression between the brackets [ ].

array initializer: gives the values to be in the array initially. The values must all have the same type, in this case, **int**. The length of the array is the number of values in the list

a0
5
4
7
6
5

A use of an array initializer

```
public class D {
  private static String[] months= new String[]{"January", "February",
                "March", "April", "May", "June", "July", "August",
                "September", "October", "November", "December"};

  /** = the month, given its number m
      Precondition: 1 <= m <= 12 */
  public static String theMonth(int m) {
    return months[m–1];
  }
}
```

Variable months is made static, so that the object assigned to it will be created only once. It is private, so that it cannot be seen outside class D.

Note that months[m–1] is returned, since

months[0] = "January", months[1] is "February", …

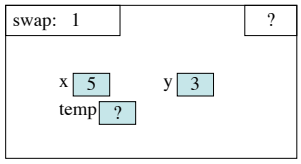
Procedure swap

```
public class D {
  /** = Swap x and y */
  public static void swap (int x; int y) {
    int temp= x;
    x= y;
    y= temp;
  }
}
```

The call will NOT swap a and b. Parameters x and y are initialized to the values of a and b, and thereafter, there is no way to change a and b.

```
….
  swap(a, b);
```

a [5] b [3]



frame for call just after frame is created.

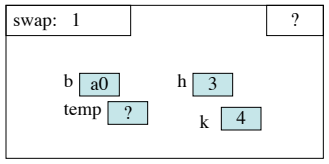
Procedure swap

```
public class D {
  /** = Swap b[h] and b[k] */
  public static void swap (int[] b, int h; int k) {
    int temp= b[h];
    b[h]= b[k];
    b[k]= temp;
  }
}
```

This method does swap b[h] and b[k], because parameter b contains the name of the array.

```
….
  swap(c, 3, 4);
```

c [a0]



frame for call just after frame is created.

a0
5
4
7
6
5