CP213 Review Session 3

STATIC METHODS AND VARIABLES, MATH CLASS, WRAPPER CLASSES, ARRAYS AND ARRAYLISTS

Please take this moment to sign in...

UPCOMING EVENTS...

Code & Chill #1:

October 25, 2023 7:00 PM (location TBD)

Next Review Session:

Wednesday, November 1 (second midterm review)

Useful Links and Follow Along Resources

MATH AND STATS LEARNING SUPPORT

This office hosts drop in and directed homework sessions to give you any extra help you need with course content in most lower level CS courses. You can also get their course widget in MyLS.

CODING SANDBOXES

A really good Java code sandbox is Replit.com.
Follow along or write code on your own time without setting up files by using one of these.

A really good Python, Java, HTML, sandbox (and almost every other language) is Replit.com
https://replit.com/

Another good HTML/CSS/JS sandbox:
https://codepen.io/

Mental Health Resources

We know university is very challenging and difficult. Please don't hesitate to reach out to people if you need help. Listed below are a few useful resources you can access, for additional resources please view the LCS linktree.

SAFEHAWK APP

Connects you with telephone helplines and other mental health resources.

STUDENT WELLNESS CENTRE

Provides comprehensive physical, emotional and mental health services for Waterloo and Brantford Campus students.

DELTON GLEBE COUNSELLING CENTRE:

A holistic counselling facility.

Static methods

- A STATIC METHOD IS ONE THAT CAN BE USED WITHOUT A CALLING OBJECT
  - IT STILL BELONGS TO A CLASS, AND ITS DEFINITION IS GIVEN INSIDE THE CLASS DEFINITION

Display 5.3 Another Class with a `main` Added

```
33      /**
34       Returns number of Celsius degrees equal to
35       degreesF Fahrenheit degrees.
36      */
37      public static double toCelsius(double degreesF)
38      {
39
40           return 5*(degreesF - 32)/9;
41      }

42      public static void main(String[] args)
43      {
44          double degreesF, degreesC;
45
46          Scanner keyboard = new Scanner(System.in);
47          System.out.println("Enter degrees Fahrenheit:");
48          degreesF = keyboard.nextDouble();
49
50          degreesC = toCelsius(degreesF);
51
```

Because this is in the definition of the class `Temperature`*, this is equivalent to* `Temperature.toCelsius(degreesF)`.

(continued)

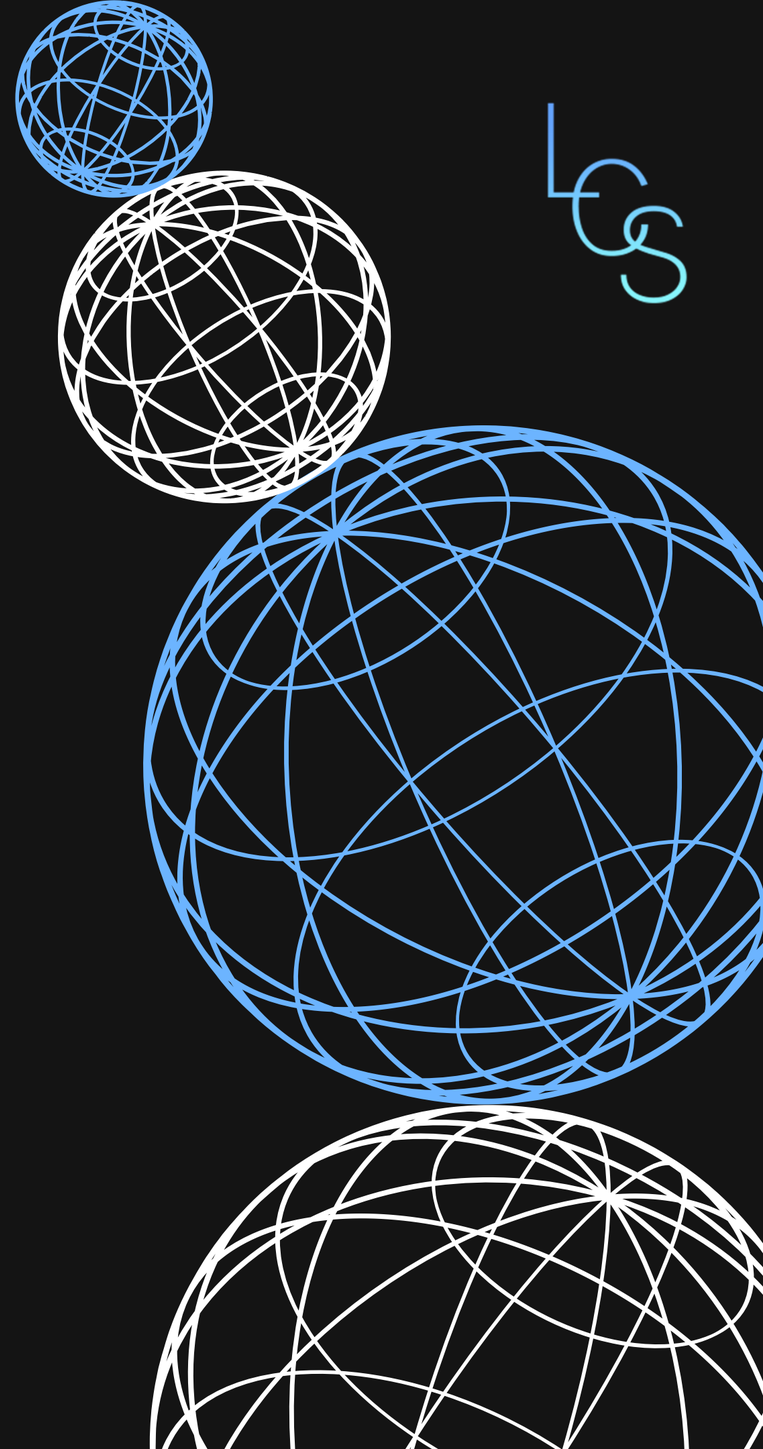
Static variables

- WHEN A VARIABLE IS DECLARED AS STATIC, THEN A SINGLE COPY OF THE VARIABLE IS CREATED AND SHARED AMONG ALL OBJECTS AT THE CLASS LEVEL. STATIC VARIABLES ARE, ESSENTIALLY, GLOBAL VARIABLES. ALL INSTANCES OF THE CLASS SHARE THE SAME STATIC VARIABLE.
  - WE CAN CREATE STATIC VARIABLES AT CLASS-LEVEL ONLY.

```
class Test {

    // static variable
    public static int a = 35;

    public static double timesTwo(int a){
     return a*2.0;
    }
    public static void main(String[] args)
    {
        System.out.println("Value of a : " + a);
      System.out.println("Value of a times 2.0 : " + timesTwo(a));

    }
}
```

```
Value of a : 35
Value of a times 2.0 : 70.0
```

Do you have any questions?



The `Math` Class

- The **`Math`** class provides a number of standard mathematical methods
  - It is found in the **`java.lang`** package, so it does not require an **`import`** statement
  - All of its methods and data are static, therefore they are invoked with the class name **`Math`** instead of a calling object
  - Examples:
    - Math.pow(a, b) returns a^b.
    - Math.toRadians(x) takes a parameter of degrees and returns a radians value.
    - Math.sin(b) returns the sin of radians parameter b.

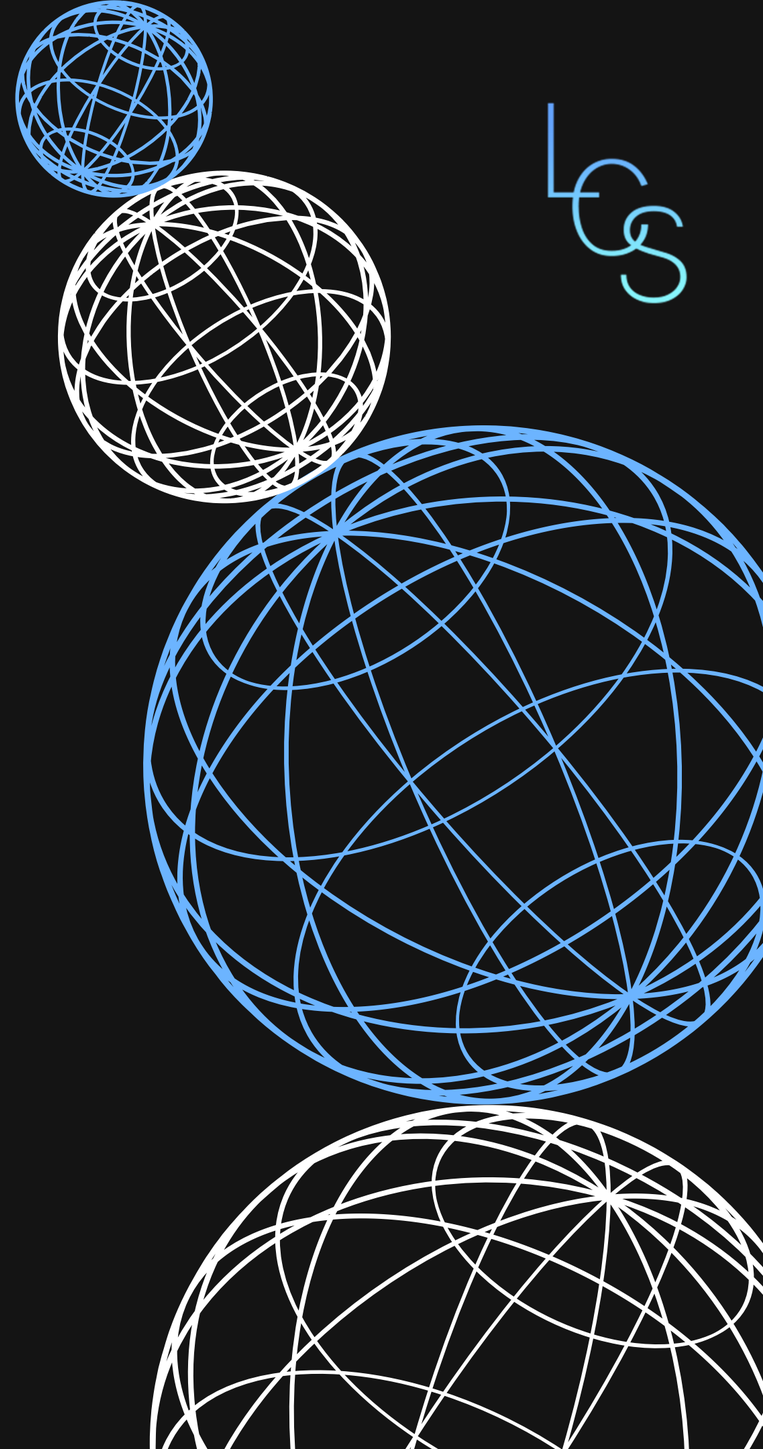
Wrapper Classes

- *Boxing*: the process of going from a value of a primitive type to an object of its wrapper class
  - To convert a primitive value to an "equivalent" class type value, create an object of the corresponding wrapper class using the primitive value as an argument
  - The new object will contain an instance variable that stores a copy of the primitive value
  - Unlike most other classes, a wrapper class does not have a no-argument constructor

```
Integer integerObject = new Integer(42);
```

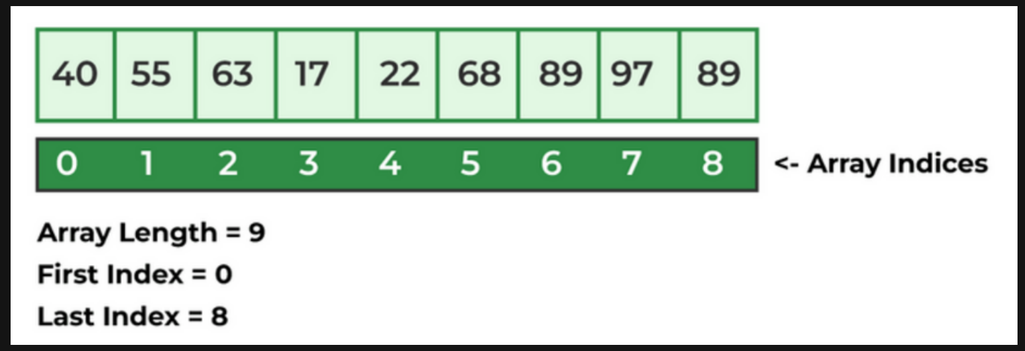
LETS US STORE PRIMITIVE TYPES INTO AN ARRAYLIST

Do you have any questions?



Arrays: Introduction

- AN ARRAY IS A DATA STRUCTURE USED TO PROCESS A COLLECTION OF DATA THAT IS ALL OF THE SAME TYPE



- AN ARRAY THAT BEHAVES LIKE THIS COLLECTION OF VARIABLES, ALL OF TYPE **DOUBLE**, CAN BE CREATED USING ONE STATEMENT AS FOLLOWS:
- **DOUBLE[] SCORE = NEW DOUBLE[5];**
- **OR USING TWO STATEMENTS:**
  - **DOUBLE[] SCORE;**
  - **SCORE = NEW DOUBLE[5];**

Arrays Cont’d

- THE INDIVIDUAL VARIABLES THAT TOGETHER MAKE UP THE ARRAY ARE CALLED INDEXED VARIABLES
- IN JAVA, INDICES MUST BE NUMBERED STARTING WITH **0**, AND NOTHING ELSE
    - EX: **SCORE[0], SCORE[1], SCORE[2], SCORE[3], SCORE[4]**

- JAVA ARRAYS ARE OBJECTS!!!
    - NOT ALL LANGUAGES HAVE ARRAYS AS OBJECTS
- AN ARRAY HAS ITS LENGTH FIXED WHEN INITIALISED
- LIKE PYTHON, JAVA ARRAYS CAN BE MULTIDIMENSIONAL

Arrays: Example

long form

```
double[] a;
a = new double[N];
for (int i = 0; i < N; i++)
   a[i] = 0.0;
```

declaration

creation

initialization

short form

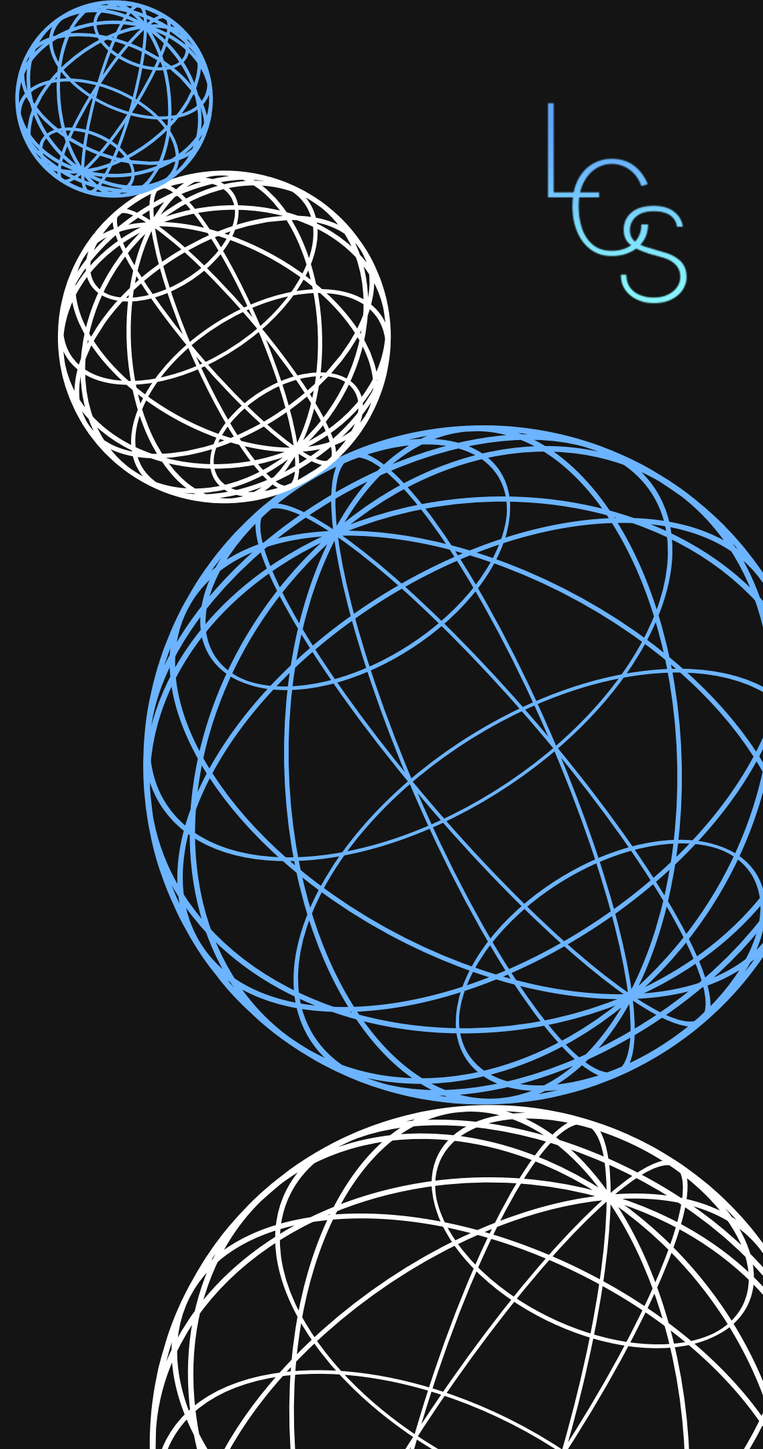
```
double[] a = new double[N];
```

initializing declaration

```
int[] a = { 1, 1, 2, 3, 5, 8 };
```

- WHEN YOU CREATE AN ARRAY IN JAVA, YOU'RE ESSENTIALLY CREATING AN OBJECT OF THE CORRESPONDING ARRAY CLASS, AND YOU CAN USE METHODS AND PROPERTIES PROVIDED BY THAT CLASS TO WORK WITH THE ARRAY

Do you have any questions?



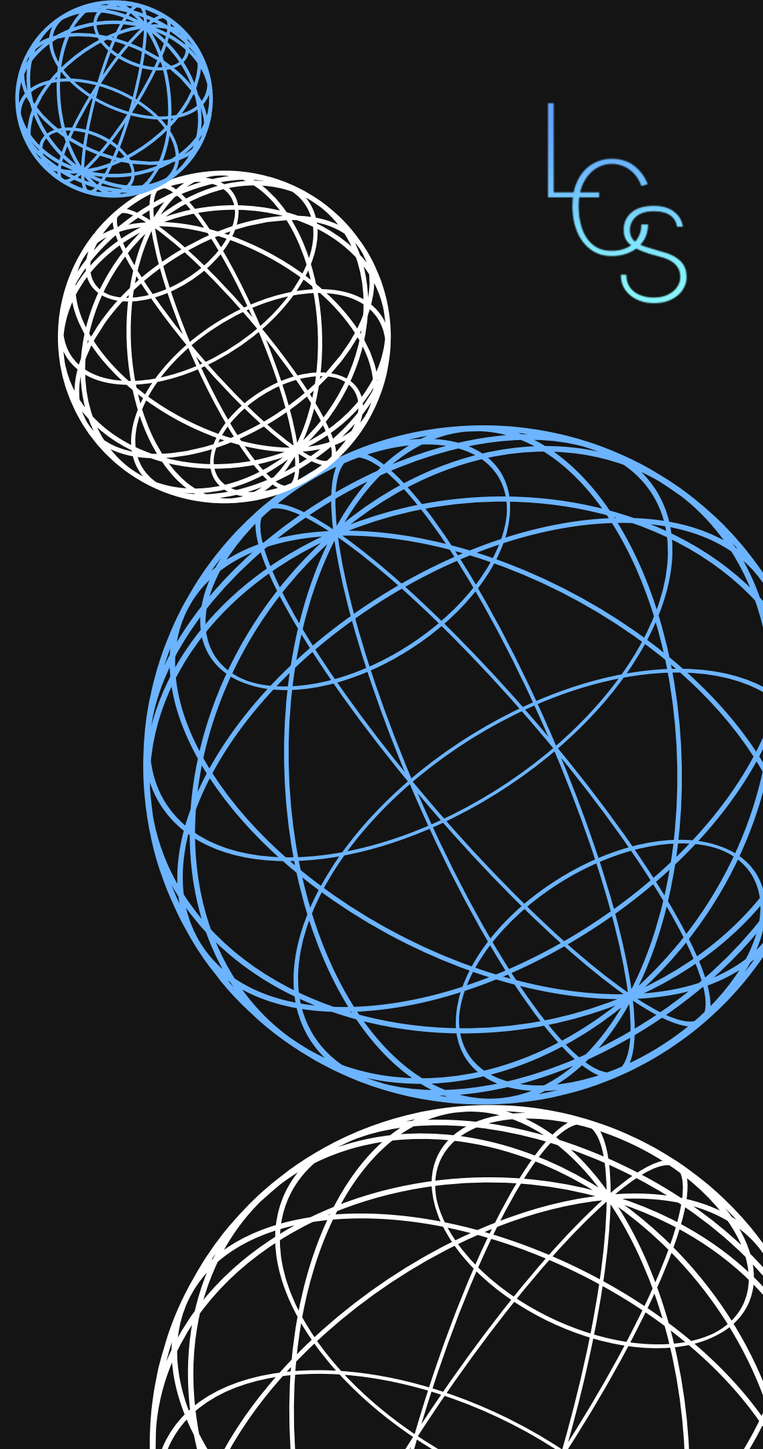
ArrayList

- ARRAYLIST: A JAVA DATA STRUCTURE AND OBJECT WHICH ACTS LIKE AN ARRAY WITH A DYNAMIC (CAN BE CHANGED) LENGTH
- ARRAYLIST<STRING> REPRESENTS ARRAYLIST OF STRINGS.
- ARRAYLIST<TYPE> LIST = NEW ARRAYLIST<TYPE>();
  - INITIALISE
- METHODS DEMONSTRATED ON THE NEXT SLIDE

ArrayList Methods

- LIST.ADD(ELEMENT);
  - THIS LETS YOU ADD THE ELEMENT TO THE ARRAYLIST
- TYPE ELEMENT = LIST.GET(INDEX);
  - YOU CAN ACCESS ELEMENTS IN THE ARRAYLIST BY THEIR INDEX USING THE **GET** METHOD
- INT SIZE = LIST.SIZE();
  - RETURNS SIZE OF ARRAYLIST
- REMOVE METHOD
  - LIST.REMOVE(INDEX); TO REMOVE BY INDEX
  - LIST.REMOVE(ELEMENT); TO REMOVE AN ELEMENT

Do you have any questions?



Please fill out this event survey!

Thank you for coming!

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