THE JAVA LANGUAGE CHEAT SHEET

Primitive Types:

INTEGER: byte(8bit),short(16bit),int(32bit),
long(64bit),**DECIM:**float(32bit),double(64bit)
,**OTHER:** boolean(1bit), char (Unicode)
HEX:0x1AF,**BINARY:**0b00101,**LONG:**8888888888888L
CHAR EXAMPLES: 'a','\n','\t','\'','\\','\"'

Primitive Operators

Assignment Operator: = (ex: int a=5,b=3;)
Binary Operators (two arguments): + - * / %
Unary Operators: + - ++ --
Boolean Not Operator (Unary): !
Boolean Binary: == != > >= < <=
Boolean Binary Only: && ||
Bitwise Operators: ~ & ^ | << >> >>>
Ternary Operator: bool?valtrue:valfalse;

Casting, Conversion

```
int x = (int)5.5; //works for numeric types
int x = Integer.parseInt("123");
float y = Float.parseFloat("1.5");
int x = Integer.parseInt("7A",16); //fromHex
String hex = Integer.toString(99,16);//toHex
//Previous lines work w/ binary, other bases
```

java.util.Scanner, input, output

```
Scanner sc = new Scanner(System.in);
int i = sc.nextInt(); //stops at whitespace
String line = sc.nextLine(); //whole line
System.out.println("bla"); //stdout
System.err.print("bla"); //stderr,no newline
```

java.lang.Number types

```
Integer x = 5; double y = x.doubleValue();
double y = (double)x.intValue();
//Many other methods for Long, Double, etc
```

java.lang.String Methods

```
//Operator +, e.g. "fat"+"cat" -> "fatcat"
boolean equals(String other);
int length();
char charAt(int i);
String substring(int i, int j); //j not incl
boolean contains(String sub);
boolean startsWith(String pre);
boolean endsWith(String post);
int indexOf(String p); //-1 if not found
int indexOf(String p, int i); //start at i
int compareTo(String t);
//"a".compareTo("b") -> -1
String replaceAll(String str, String find);
String[] split(String delim);
```

StringBuffer, StringBuilder

StringBuffer is synchronized StringBuilder
(Use StringBuilder unless multithreaded)
Use the .apend(xyz) methods to concat
toString() converts back to String

java.lang.Math

```
Math.abs(NUM),Math.ceil(NUM),Math.floor(NUM)
,Math.log(NUM),Math.max(A,B),Math.min(C,D),
Math.pow(A,B),Math.round(A),Math.random()
```

IF STATEMENTS:

```
if( boolean_value ) { STATEMENTS }
else if( bool )     { STATEMENTS }
else if( ..etc )    { STATEMENTS }
else                { STATEMENTS }
//curly brackets optional if one line
```

LOOPS:

```
while( bool )          { STATEMENTS }
for(INIT;BOOL;UPDATE) { STATEMENTS }
//1INIT 2BOOL 3STATEMENTS 4UPDATE 5->Step2
do{ STATEMENTS }while( bool );
//do loops run at least once before checking
break;    //ends enclosing loop (exit loop)
continue; //jumps to bottom of loop
```

ARRAYS:

```
int[] x = new int[10]; //ten zeros
int[][] x = new int[5][5]; //5 by 5 matrix
int[] x = {1,2,3,4};
x.length; //int expression length of array
int[][] x = {{1,2},{3,4,5}}; //ragged array
String[] y = new String[10]; //10 nulls
//Note that object types are null by default

//loop through array:
for(int i=0;i<arrayname.length;i++) {
  //use arrayname[i];
}

//for-each loop through array
int[] x = {10,20,30,40};
for(int v : x) {
  //v cycles between 10,20,30,40
}

//Loop through ragged arrays:
for(int i=0;i<x.length;i++)
  for(int j=0;j<x[i].length;j++) {
     //CODE HERE
  }

//Note, multi-dim arrays can have nulls
//in many places, especially object arrays:
Integer[][] x = {{1,2},{3,null},null};
```

FUNCTIONS / METHODS:

Static Declarations:

```
public static int functionname( … )
private static double functionname( … )
static void functionname( … )
```

Instance Declarations:

```
public void functionname( … )
private int functionname( … )
```

Arguments, Return Statement:

```
int myfunc(int arg0, String arg1) {
  return 5; //type matches int myfunc
}
//Non-void methods must return before ending
//Recursive functions should have an if
//statement base-case that returns at once
```

CLASS/OBJECT TYPES:

INSTANTIATION:

```
public class Ball {//only 1 public per file
  //STATIC FIELDS/METHODS
  private static int numBalls = 0;
  public static int getNumBalls() {
    return numBalls;
  }
  public static final int BALLRADIUS = 5;

  //INSTANCE FIELDS
  private int x, y, vx, vy;
  public boolean randomPos = false;

  //CONSTRUCTORS
  public Ball(int x, int y, int vx, int vy)
  {
    this.x = x;
    this.y = y;
    this.vx = vx;
    this.vy = vy;
    numBalls++;
  }
  Ball() {
    x = Math.random()*100;
    y = Math.random()*200;
    randomPos = true;
  }

  //INSTANCE METHODS
  public int getX(){ return x; }
  public int getY(){ return y; }
  public int getVX(){ return vx; }
  public int getVY(){ return vy; }
  public void move(){ x+=vx; y+=vy; }
  public boolean touching(Ball other) {
    float dx = x-other.x;
    float dy = y-other.y;
    float rr = BALLRADIUS;
    return Math.sqrt(dx*dx+dy*dy)<rr;
  }

}

//Example Usage:
public static void main(String[] args) {
  Ball x = new Ball(5,10,2,2);
  Ball y = new Ball();
  List<Ball> balls = new ArrayList<Ball>();
  balls.add(x); balls.add(y);
  for(Ball b : balls) {
    for(Ball o : balls) {
      if(b != o) { //compares references
        boolean touch = b.touching(o);
      }
    }
  }
}
```

POLYMORPHISM:

Single Inheritance with "extends"

```
class A{ }
class B extends A{ }
abstract class C { }
class D extends C { }
class E extends D
```

Abstract methods

```
abstract class F {
  abstract int bla();
}
class G extends F {
  int bla() {  //required method
   return 5;
  }
}
```

Multiple Inheritance of interfaces with "implements" (fields not inherited)

```
interface H {
  void methodA();
  boolean methodB(int arg);
}
interface I extends H{
  void methodC();
}
interface K {}
class J extends F implements I, K {
  int bla() { return 5; } //required from F
  void methodA(){} //required from H
  boolean methodB(int a) { //req from A
    return 1;
  }
  void methodC(){} //required from I
}
```

Type inference:

```
A x = new B(); //OK
B y = new A(); //Not OK
C z = new C(); //Cannot instantiate abstract
//Method calls care about right hand type
(the instantiated object)
//Compiler checks depend on left hand type
```

GENERICS:

```
class MyClass<T> {
  T value;
  T getValue() { return value; }
}
class ExampleTwo<A,B> {
  A x;
  B y;
}
class ExampleThree<A extends List<B>,B> {
  A list;
  B head;
}
//Note the extends keyword here applies as
well to interfaces, so A can be an interface
that extends List<B>
```

JAVA COLLECTIONS:

List<T>: Similar to arrays

```
       ArrayList<T>: Slow insert into middle
       //ArrayList has fast random access
       LinkedList<T>: slow random access
       //LinkedList fast as queue/stack
       Stack: Removes and adds from end
```

List Usage:

```
boolean add(T e);
void clear(); //empties
boolean contains(Object o);
T get(int index);
T remove(int index);
boolean remove(Object o);
//remove uses comparator
T set(int index, E val);
Int size();
```

List Traversal:

```
for(int i=0i<x.size();i++) {
       //use x.get(i);
}

//Assuming List<T>:
for(T e : x) {
       //use e
}
```

Queue<T>: Remove end, Insert beginning

```
       LinkedList implements Queue
```

Queue Usage:

```
T element(); // does not remove
boolean offer(T o); //adds
T peek(); //pike element
T poll(); //removes
T remove(); //like poll
```

Traversal: for(T e : x) {}

Set<T>: uses Comparable<T> for uniqueness

```
       TreeSet<T>, items are sorted
       HashSet<T>, not sorted, no order
       LinkedHashSet<T>, ordered by insert
       Usage like list: add, remove, size
```

Traversal: for(T e : x) {}

Map<K,V>: Pairs where keys are unique

```
       HashMap<K,V>, no order
       LinkedHashMap<K,V> ordered by insert
       TreeMap<K,V> sorted by keys

       V get(K key);
       Set<K> keySet(); //set of keys
       V put(K key, V value);
       V remove(K key);
       Int size();
       Collection<V> values(); //all values
```

Traversal: for-each w/ keyset/values

java.util.PriorityQueue<T>

A queue that is always automatically sorted using the comparable function of an object

```
public static void main(String[] args) {
  Comparator<String> cmp= new LenCmp();
  PriorityQueue<String> queue =
     new PriorityQueue<String>(10, cmp);
  queue.add("short");
  queue.add("very long indeed");
  queue.add("medium");
  while (queue.size() != 0)
    System.out.println(queue.remove());
}
class LenCmp implements Comparator<String> {
  public int compare(String x, String y){
    return x.length() – y.length();
  }
}
```

java.util.Collections algorithms

Sort Example:

```
//Assuming List<T> x
Collections.sort(x); //sorts with comparator
```

Sort Using Comparator:

```
Collections.sort(x, new Comparator<T>{
  public int compareTo(T a, T b) {
    //calculate which is first
    //return -1, 0, or 1 for order:
    return someint;
  }
}
```

Example of two dimensional array sort:

```
public static void main(final String[] a){
   final String[][] data = new String[][] {
     new String[] { "20090725", "A" },
     new String[] { "20090726", "B" },
     new String[] { "20090727", "C" },
     new String[] { "20090728", "D" } };
     Arrays.sort(data,
       new Comparator<String[]>() {
         public int compare(final String[]
entry1, final String[] entry2) {
            final String time1 = entry1[0];
            final String time2 = entry2[0];
            return time1.compareTo(time2);
          }
     });

     for (final String[] s : data) {
       System.out.println(s[0]+" "+s[1]);
     }
   }
}
```

More collections static methods:

```
Collections.max( … ); //returns maximum
Collections.min( … ); //returns maximum
Collections.copy( A, B); //A list into B
Collections.reverse( A ); //if A is list
```