Local variable: variable declared in a method body  
B.10–B.11 slide 45

Inside-out rule, bottom-up/overriding rule C.15 slide 31-32  
and consequences thereof slide 45

Use of this B.10 slide 23-24 and super C.15 slide 28, 33

Constructors in a subclass C.9–C.10 slide 24-29

First statement of a constructor body must be a call on another constructor —if not Java puts in super(); C.10 slide 29
Visit course website, click on Resources and then on Code Style Guidelines. Study

4.2 Keep methods short
4.3 Use statement-comments …
4.4 Use returns to simplify method structure
4.6 Declare local variables close to first use …
**Local variables**

/** Return middle value of a, b, c (no ordering assumed) */

```java
public static int middle(int a, int b, int c) {
    if (b > c) {
        int temp = b;
        b = c;
        c = temp;
    }

    if (a <= b) {
        return b;
    }

    return Math.min(a, c);
}
```

**Parameter:** variable declared in () of method header

**Local variable:** variable declared in method body

**All parameters and local variables are created when a call is executed, before the method body is executed. They are destroyed when method body terminates.**
/** Return middle value of a, b, c (no ordering assumed) */
public static int middle(int a, int b, int c) {
    if (b > c) {
        int temp = b;
        b = c;
        c = temp;
    }
    if (a <= b) {
        return b;
    }
    return Math.min(a, c);
}
/** Return middle value of a, b, c (no ordering assumed) */

public static int middle(int a, int b, int c) {
    int temp;
    if (b > c) {
        temp = b;
        b = c;
        c = temp;
    }

    if (a <= b) {
        return b;
    }

    return Math.min(a, c);
}
Assertions promote understanding

/** Return middle value of a, b, c (no ordering assumed) */
public static int middle(int a, int b, int c) {
    if (b > c) {
        int temp = b;
        b = c;
        c = temp;
    }
    // b <= c
    if (a <= b) {
        return b;
    } // a and c are both greater than b
    return Math.min(a, c);
}
Which method `toString()` is called by `turing.toString()`?

**Overriding rule or bottom-up rule:**
To find out which is used, start at the bottom of the object and search upward until a matching one is found.
public class Time
    private int hr;  //hour of day, 0..23
    private int min; // minute of hour, 0..59

    /** Constructor: instance with h hours and m minutes */
    public Time(int h, int m) { hr = h; min = m; assert …; }

    /** Constructor: instance with m minutes … */
    public Time(int m) {
        hr = m / 60;
        min = m % 60;
    }

    ...  // Want to change body
to call first constructor
public class Time
    private int hr; // hour of day, 0..23
    private int min; // minute of hour, 0..59

    /** Constructor: instance with h hours and m minutes ... */
    public Time(int h, int m) {
        hr = h; min = m; assert ...;
    }

    /** Constructor: instance with m minutes ... */
    public Time(int m) {
        this(m / 60, m % 60);
    }

Use this (not Time) to call another constructor in the class.
Must be first statement in constructor body!
Inside-out rule: Code in a construct can reference names declared in that construct, as well as names that appear in enclosing constructs. (If name is declared twice, the closer one prevails.)

Person@a0

<table>
<thead>
<tr>
<th>name</th>
<th>Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>getNameWithSep() { return name + sep; }</td>
<td></td>
</tr>
</tbody>
</table>

Person@a1

<table>
<thead>
<tr>
<th>name</th>
<th>Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>getNameWithSep() { return name + sep; }</td>
<td></td>
</tr>
</tbody>
</table>

Person (static)

Person's objects and static components
/** Constructor: person “f n” */
public Person(String f, String l) {
    first = n;
    last = l;
}

/** Constructor: PhD “Dr. f m. n”*/
public PhD(String f, char m, String l) {
    super(f, l);
    middle = m;
}

new PhD(“Ross”, ‘E’, “Tate”);
Within a subclass object, **super** refers to the partition above the one that contains **super**.

Because of the keyword **super**, the call **toString** here refers to the **Person** partition.
Bottom-Up and Inside-Out

Person (static)

| sep | " " |

PhD@a0

| first | "Ross" |
| last  | "Tate" |
| sep   | " " |
| getName() | toString() |
| super |
| PhD |

PhD (static)

title | "Dr."
Without OO …

Without OO, you would write a long involved method:

```java
public double getName(Person p) {
    if (p is a PhD) {
        ... }
    else if (p hates formality) {
        ... }
    else if (p prefers anonymity) {
        ... }
    else ...
}
```

OO eliminates need for many of these long, convoluted methods, which are hard to maintain.

Instead, each subclass has its own `getName`.

Results in many overriding method implementations, each of which is usually very short.