Lec 4

Variables and math
Announcements

• If you did not get an email from your tutor, message Head Tutor, Jason Wong, jwwong@ucsd.edu

• HW2 posted

• Quizzes and midterm moved to Fridays
What is the output of this code?

```java
int x = 3;
int y = x;
System.out.println(y == 3);
x = 4;
System.out.println(y == 3);
```

A) true   B) false   C) true   D) false   E) None of the above
Variables

int x;
Variables

```c
int x;
x = 3;
```
int x;
x = 3;
int y;
int x;
x = 3;
int y;
int z = x;
Variables

```c
int x;
x = 3;
int y;
int z = x;
```
Variables

• What is the output of this code?

```java
int x = 3;
int y = 0;
x = y;
y = x;
System.out.println(y == 3);
x = 3;
System.out.println(y == 3);
```

A) true   B) false   C) true   D) false   E) None of the above
Declaring Variables

Type variableName = value;

• Primitive types:
  – int, long, short – standard integers, e.g. 5, 100, -37
  – double, float – decimal numbers, e.g. 5.32, -100.2
  – char – single character, e.g. ‘C’, ‘!’
  – boolean – true/false
    • boolean flag = true;
Naming variables

• Must start with a letter (upper or lower case)
• Can have digits (0-9)
• _ and $ are considered letters
• Cannot be a reserved word
  – E.g. float, public, short
Which of the following contains all valid variable names?

A) pizza_party, _pepperoni_, chee$y
B) Round.Table., fiveToppings, 1olive
C) Public, pizza_party, int
D) All of the above
E) None of the above
Naming Variables

• Case sensitive
• Start with lower case, if multiple words, make next word capital
  – int numStudents;
• Be descriptive, but not ridiculous
  – thisIsTheValueOfA
Overflow

• 32 bits to represent an int
  – 1 bit for sign
  – 31 bits for value
  – Max value of 2,147,483,647
Integer division

What is the result of the following:

```java
int x = 5 / 2;
x = ?
```

A) 2  
B) 3  
C) 2.5  
D) Compiler error  
E) Runtime error
Integer Division and modulo

int x = 5 / 2;  -> 2 ½
Integer division takes the quotient (2)

int x = 5 % 2;  -> 2 ½
Modulo takes the remainder (1)
Examples

7 % 9 = 7

10 % 2 = 0

0 % 5 = 0
public class DivError {

    public static void division(int x, int y) {
        x = x / y;
    }

    public static void main(String[] args) {
        int i = 10;
        int b = 0;
        division(i, b);
    }
}

You type the following and get:
$ java DivError
Exception in thread "main" java.lang.ArithmeticException: / by zero
    at DivError.division(DivError.java:4)
    at DivError.main(DivError.java:10)

Was this a (1) compile time error or runtime error, (2) on what line of code is the problem and (3) what is the reported error?

A) Compiler error. Can’t tell the line. Bad code
B) Runtime error. Line 4. / by zero
C) Runtime error. Line 10. java.lang.ArithmeticException:
D) Compiler error. Line 4. / by zero
E) Compiler error. Line 10. DivError.java
Order of Operations

• Just like regular math:

```c
int x = 4;
int y = 3 + x / (2 * -1);
// y = 3 + 4 / (2 * -1);
// y = 3 + 4 / -2;
// y = 3 - 2;
// y = 1;
```

To understand how the program works, only do 1 step at a time
Expressions

• Just like regular math:

<table>
<thead>
<tr>
<th>( )</th>
</tr>
</thead>
</table>

pre ++  --  (e.g. ++var, --var)

Type cast

*  /  %
+  -
<  <=  >  >=
==  !=
&&  ||
=

post ++  --  (e.g. var++, var--)
Compound operators

• Different ways to write the same thing

```plaintext
num = 3;
num = num - 1;
num -= 1;
num--; 
--num;
```
**Example**

**What gets printed:**

```java
int j = 10;
System.out.println( j++);
j = 10;
System.out.println( ++j);
```

<table>
<thead>
<tr>
<th>A) 10</th>
<th>B) 11</th>
<th>C) 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

**Options:**

- A) 10
- B) 11
- C) 10
- D) `++j`
- E) None of the `j++` above

**Operators:**

- Pre ++ -- (e.g. `++var`, `--var`)
- Type cast
- `*` `/` `%`
- `+` `-`
- `<` `<=` `>` `>='
- `==` `!=`
- `&&` `||`
- `=`
- Post ++ -- (e.g. `var++`, `var--`)
Programmers’ code

• If it’s not 100% clear, use ()
• Never use ++ inside of expressions