What does this program print?

Attempt 1

```
public class Rec {
private static int f(int
x){
if(x<2){     return
     1;
}return f(x-
1)+f(x-2
);}
public static void main(
String[] args) {
System.out.println(f(5));}}
```

What does this program print?

Attempt 2: A hint...

```
public class Rec {
    private static int f(int x) {
        if (x < 2) {
            return 1;
        }
        return f(x - 1) + f(x - 2);
    }

    public static void main(String[] args) {
        System.out.println(f(5));
    }
}
```

What does this class do?

Attempt 1

```
public static final class Oc {
    private final Object[] e
                        = new Object[1000000];
    private int pe = -1;
    private int po = 0;

    public void a(Object x) {
        e[po++] = x;
    }

    public Object b() {
        return e[pe++];
    }
}
```

What does this class do?

Attempt 2: A hint...

```
public static final class Queue {
    private final Object[] myValues
                        = new Object[BIG_VALUE];
    private int myHead = -1;
    private int myTail = 0;

    public void enqueue(Object x) {
        myValues[myTail++] = x;
    }

    public Object dequeue() {
        return myValues[myHead++];
    }
}
```

A bug fixed

class Queue

```
private int myHead = -1;
private int myTail = 0;

public void enqueue(Object x) {
    myValues[myTail] = x;
    myTail++;
}

public Object dequeue() {
    myHead++;
    return myValues[myHead];
}
```

What does this function do?

A humble two-line function ☺

```
boolean p(int x) {
    int y = x * (030 >> 4 << 030);
    return y == 0;
}
```

What does this function do?

A humble two-line function ☺

```
boolean p(int x) {
    int y = x * (030 >> 4 << 030);
    return y == 0;
}
```

Hints

- `a << s` = `a * 2^s` — bitwise shift left
- `a >> s` = `a / 2^s` — bitwise shift right
- `0x<DIGITS>` — hexadecimal number
- `0<DIGITS>` — octal number

What we have (hopefully) learned so far

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Example 1: Fibonacci numbers

Format your programs properly!

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Example 2: Queue

Give understandable names to program elements!

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- A good program does not demand comments other than JavaDoc for interfaces.

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Example 3: Divisibility by 256

Do not outsmart yourself!

What we have (hopefully) learned so far

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Format your programs properly!

Example 2: Queue

Give understandable names to program elements!

- A good program does not demand comments other than JavaDoc for interfaces.

Example 3: Divisibility by 256

Do not outsmart yourself!
Use understandable code constructs.

Coding Conventions for Java

Andrey Breslav

ITMO University, St. Petersburg / University of Tartu

Oct. 30, 2009

Exercise 1

- Groups: 4 people each

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- Time: 10 minutes

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- Task: come up with 2 rules (conventions)

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- Task: come up with 2 rules (conventions)
  - Clear formulations
  - Clear explanations

Sun's CCJ

"Code Conventions for Java™ Programming Language"

http://java.sun.com/docs/codeconv/

- A "standard" provided by the Sun Microsystems
- Reflects the opinion of the creators of the language
- Adopted by many projects

Naming Conventions: Types and Methods

Classes and Interfaces

- Class name is most likely a noun phrase
- Written in CamelCase
  - MyFavouriteClass
- [Not in CCJ]: Interface names are prefixed with "I": IModel

Methods

- Method name is most likely a verb phrase
- Starts with a lower case letter, then — CamelCase
  - doTheJob()
- Common prefixes "get", "is", "set"

Naming Conventions: Variables and Constants

Variables: fields, local variables, parameters

- Starts with a lower case letter, then — CamelCase
  - counter, firstOccurrence
- Names should never start with "$" or "_"
- [Not in CCJ]: field names are prefixed with "my"

Constants: **static final**, normally **public**

- Uppercase letters, words separated by underscores "_"
  - THE_CONSTANT

Naming Conventions: Packages

Packages

- Only lowercase ASCII letters
- Starts with a unique domain name (reversed)
  - org.eclipse.emf.ecore

Declaration Order: Elements of a Class

Only one top-level class should be declared in a file

Order of elements in a class

1. Nested classes
2. Static fields
3. Static methods
4. Constructors
5. Instance fields
6. Instance methods

Declaration Order: Inside a Method

Only one variable per line (applies also to fields)

Bad

```
int a = 0, b = 3;
```

Good

```
int a = 0;
int b = 3;
```

Variables are initialized upon declaration (if possible)

Bad

```
int a;
```

Good

```
int a = 0;
```

[Not in CCJ]: Variables are defined as close to their usage as possible

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Variables are initialized upon declaration (if possible)

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```
int a;
```

Good

```
int a = 0;
```

[Not in CCJ]: Variables are defined as close to their usage as possible

Actually CCJ recommends the opposite

Declaration Order: Variable Declaration Example

Bad

```
int a = 0;
int b = 5;
while (b > 0) {
    a = b * b;
    if (a > 10) {
        c++;
    }
}
```

Good

```
int b = 5;
while (b > 0) {
    int a = b * b;
    if (a > 10) {
        c++;
    }
}
```

Declaration Order: Warning

May cause a problem

```
int b = 5;
while (b > 0) {
    A a = new A();
    if (a.getV(b) > 10) {
        c++;
    }
}
```

Safe

```
int b = 5;
while (b > 0) {
    int a = b * b;
    if (a > 10) {
        c++;
    }
}
```

Declaration Order: Declaring Arrays

Brackets are put after the element type

Bad

```
int a[] = 1, 2, 3;
```

Good

```
int[] a = 1, 2, 3;
```

Whitespace: Where to Put Spaces

- Before an opening curly brace ("{"):

```
public void method()  {
```

Whitespace: Where to Put Spaces

- Before an opening curly brace ("{"):
  ```
  public void method() {
  ```
- After a comma (","):
  ```
  public void method(int a, int b)
  ```

Whitespace: Where to Put Spaces

- Before an opening curly brace ("{"):
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  ```
- After a comma (","):
  ```
  public void method(int a, int b)
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- After a control operator keyword (e.g., **if**):
  ```
  if (cond) {
  ```

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- After a semicolon (";") inside **for** loop header:
```
for (int i = 0; i < 10; i++) {
```

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```
- Around binary operations (e.g., "+" and "/"):
```
int a = a + b * (c - 1 / 2.0);
```

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- Around binary operations (e.g., "+" and "/"):
```
int a = a + b * (c - 1 / 2.0);
```
- In a ternary operator (`... ? ... : ...`):
```
(a > b) ? a : b;
```

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```
- After a comma (","):
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- Around binary operations (e.g., "+" and "/"):
```
int a = a + b * (c - 1 / 2.0);
```
- In a ternary operator (`... ? ... : ...`):
```
(a > b) ? a : b;
```
- After a type cast:
```
int a = (int) doubleValue;
```

Whitespace: Where NOT to Put Spaces

- Between a method name and an opening parenthesis ("("):
  `doIt(a)`

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- Between a parenthesis ("(" or ")") and its contents:
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- Between a method name and an opening parenthesis ("("):
```
doIt(a)
```
- Between an unary operation (e.g., ++, −−) and its argument:
```
a++
--b
```
- Between a parenthesis ("(" or ")") and its contents:
```
(a + b)
```
- Before brackets ("[" and "]"):
```
int[] a
int[][] bb
a[1]
bb[1][2]
```

Whitespace: Where to Put Newlines

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- Whenever the current line is too long

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- Between classes
- Whenever the current line is too long
  - indent the remainder of a wrapped line

Whitespace: Where to Put Newlines

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- Between method declarations
- Between logical blocks inside a method
- Between classes
- Whenever the current line is too long
  - indent the remainder of a wrapped line
  - break lines after a comma

```
doIt(a,
     b);
```

Whitespace: Where to Put Newlines

- Before comments
- Between method declarations
- Between logical blocks inside a method
- Between classes
- Whenever the current line is too long
  - indent the remainder of a wrapped line
  - break lines after a comma

```
doIt(a,
     b);
```

  - break lines before a binary operation

```
if ((a > b)
    && (b > c)
    && (c > d)) {
```

Blocks and Indentation

- Indentation width is 4 spaces.

Blocks and Indentation

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  - Or 1 TAB

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- Indentation width is 4 spaces.
  - Or 1 TAB
  - Never mix TABs and spaces
- Bodies of control structures are always enclosed into curly braces ("{" and "}")
  - Even if there is only one line
- Block content must be indented:

```
if (a > b) {
    a = 2 * a;
    b--;
}
```

Blocks and Indentation

- Indentation width is 4 spaces.
  - Or 1 TAB
  - Never mix TABs and spaces
- Bodies of control structures are always enclosed into curly braces ("{" and "}")
  - Even if there is only one line
- Block content must be indented:

```
if (a > b) {
    a = 2 * a;
    b--;
}
```

- Class content must be indented

```
class C {
    private final int myValue = 0;
    ...
}
```

Conditional Operator

Single **if**:

```
if (condition) {

}

if (condition) {

} else {

}
```

"Cascade" **if**:

```
if (condition1) {

} else if (condition2) {

} else {

}
```

When to Use the If Cascade

- It's needed to check several related coditions

When to Use the If Cascade

- It's needed to check several related coditions
- We cannot use **`switch`**:

```
if (a > b) {
...
} else if (a < b) {
...
} else if (a == b) {
...
}
```

Switch

```
switch (condition) {
case ABC:
    statements;
    /* falls through */
case DEF:
    statements;
    break;
case XYZ:
    statements;
    break;
default:
    statements;
    break;
}
```

Loops

Precondition:

```
while (condition) {
    // ...
}
```

Postcondition:

```
do {
    // ...
} while (                );
```

For:

```
for (int i = 0; i < 10; i++) {
    // ...
}
```

Exception Handling

```
try {

} catch (ExceptionClass e) {

} finally {

}
```

Exception Handling

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} catch (ExceptionClass e) {

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- Never throw or catch

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```

- Never throw or catch
  - `java.lang.NullPointerException`
  - `java.lang.ClassCastException`
  - `java.lang.RuntimeException`
  - `java.lang.Exception`
  - `java.lang.Throwable`

Exception Handling

```
try {

} catch (ExceptionClass e) {

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```

- Never throw or catch
  - `java.lang.NullPointerException`
  - `java.lang.ClassCastException`
  - `java.lang.RuntimeException`
  - `java.lang.Exception`
  - `java.lang.Throwable`
- Never catch `java.lang.Error`

Idiots

Idioms

Immediately Returning Ifs

Bad

```
if (cond) {
    return true;
} else {
    return false;
}
```

Immediately Returning Ifs

Bad

```
if (cond) {
    return true;
} else {
    return false;
}
```

Good

```
return cond;
```

Redundant Else

Not Recommended

```
if (cond) {
    ...
    ...
    return;
} else {
   doIt();
}
```

Redundant Else

Not Recommended

```
if (cond) {
    ...
    ...
    return;
} else {
   doIt();
}
```

Recommended

```
if (cond) {
    ...
    ...
    return;
}
doIt();
```

Do NOT Use Expressions with Side-Effects

Bad

```
int a = b = c = 0;
```

Very Bad

```
if (a = b) {
   ...
}
```

Bad

```
int a = b[c++];
```

Why We Need Conventions

- Code is complex

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- Code lives long

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NB: Some additional reasons are mentioned in CCJ

If You Remember Only One Thing . . .

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Always look for explanations!