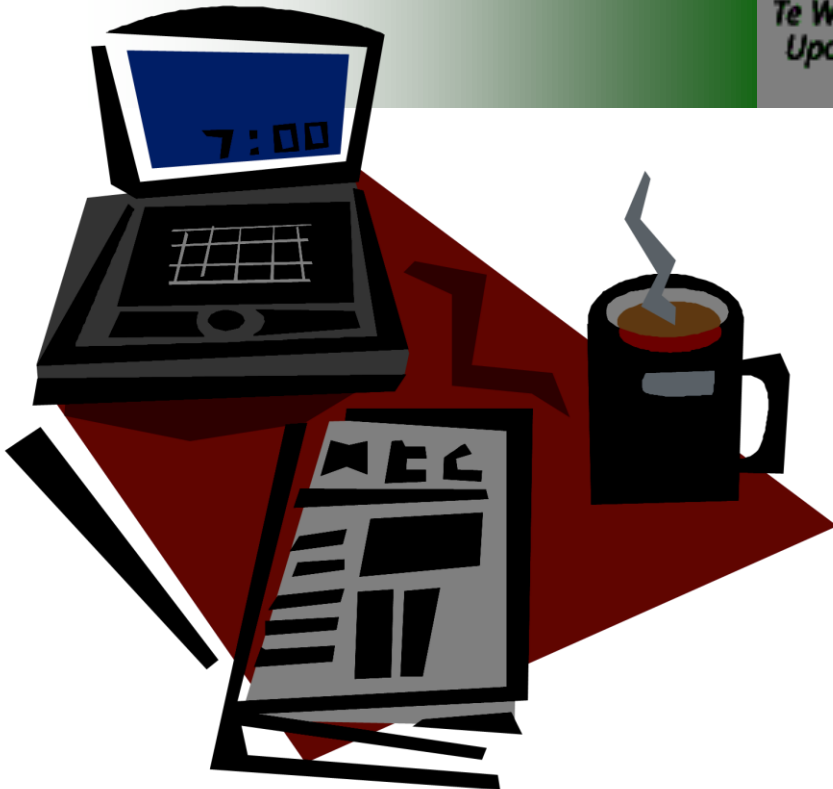




Victoria University
of Wellington, New Zealand
*Te Whare Wananga o te
Upoko o te Ika a Maui
Aotearoa*



SWEN221 Software Development *Assertions*

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(slides modified from slides by
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Contracts

Every method has,
implicitly or explicitly,
a contract

```
double sqrt(double n) {  
    ...  
    return result;  
}
```

If method is called with
acceptable parameters,
then a
certain result
is produced



Explicit Contracts

Informal

Documentation

→ comments

→ Javadoc

Formal

Assertions

→ executable

→ enforced

→ support testing

→ could be the
basis for proofs

Assertions

Assertions are not limited to checking pre- and post-conditions

- class invariants
- mid-code assertions
- loop invariants
- loop variants

Assert

Example

```
void add(Element e) {  
    assert e != null;  
    ...  
    assert this.contains(e);  
}
```

Assert keyword

Added in Java 1.4

Basic usage

```
assert <condition>;
```

Or

```
assert <condition> : <message>;
```

Assertion checking is disabled by default

```
java -ea MyProgram
```

Examples

assert e != null : “cannot add null”;

assert x >= 0 : “x can not be negative”;

But also

assert isConsistent();

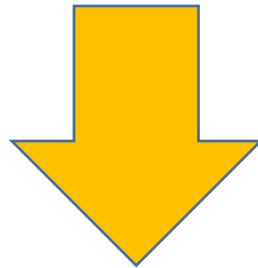
Should be a function
(no side-effects)

Or

assert x != null : ErrorMessage.notNull;

Semantics

assert *e* **!= null** : “non-null required”;



if ((*e* **!= null**) == false) **then**
 throw new AssertionError(“non-null required”);

Enabling Assertions

Command line

```
java -ea MyMainClass
```

```
java -ea -jar MyExecutablejarFile
```

Eclipse

Run | Run Configurations | Arguments |
VM arguments | “-ea”

Enabling Assertions

Enable assertions only in a package
(and its subpackages)

-ea:packagename...

Enable assertions only in a class

-ea:classname

Quiz 1

```
class A {  
    public static boolean b;  
    public static void main(String[] args) {  
        assert b;  
        System.out.println("b is "+b);  
    }  
}
```

>> javac A.class

>> java A

1) AssertionError

2) "b is false"

3) "b is true"

4) "b is null"

5) NullPointerException

Quiz 2

```
class A {  
    public static boolean b;  
    public static void main(String[] args) {  
        assert b;  
        System.out.println("b is "+b);  
    }  
}
```

>> javac A.class

>> java -ea A

- 1) AssertionError
- 2) "b is false"
- 3) "b is true"
- 4) "b is null"
- 5) NullPointerException

Quiz 3

```
class A {  
    public static Boolean b;  
    public static void main(String[] args) {  
        assert b;  
        System.out.println("b is "+b);  
    }  
}
```

>> javac A.class

>> java A

1) AssertionError

2) "b is false"

3) "b is true"

4) "b is null"

5) NullPointerException

Quiz 4

```
class A {  
    public static Boolean b;  
    public static void main(String[] args) {  
        assert b;  
        System.out.println("b is "+b);  
    }  
}
```

>> javac A.class

>> java -ea A

- 1) AssertionError
- 2) "b is false"
- 3) "b is true"
- 4) "b is null"
- 5) NullPointerException

Quiz 5

```
class A {  
    public static Boolean b = true;  
    public static void main(String[] args) {  
        assert b;  
        System.out.println("b is "+b);  
    }  
}
```

>> javac A.class

>> java -ea A

1) AssertionError

2) "b is false"

3) "b is true"

4) "b is null"

5) NullPointerException

Assertions and Exceptions

```
void methodName(...) {  
    assert precondition();  
  
    ...  
  
    assert postcondition();  
}
```

What if an exception occurs before the postcondition is checked?

Assertions and Exceptions

```
void methodName(...) {  
    assert precondition();  
  
    try {  
        ...  
    }  
  
    finally {  
        assert postcondition();  
    }  
}
```