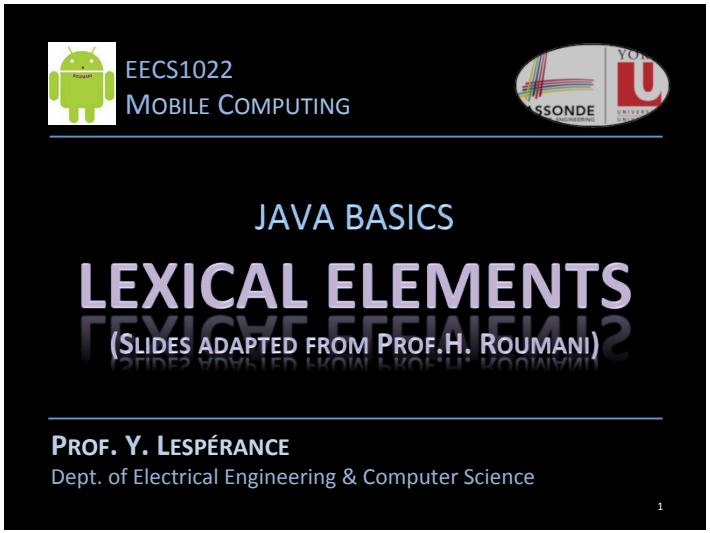
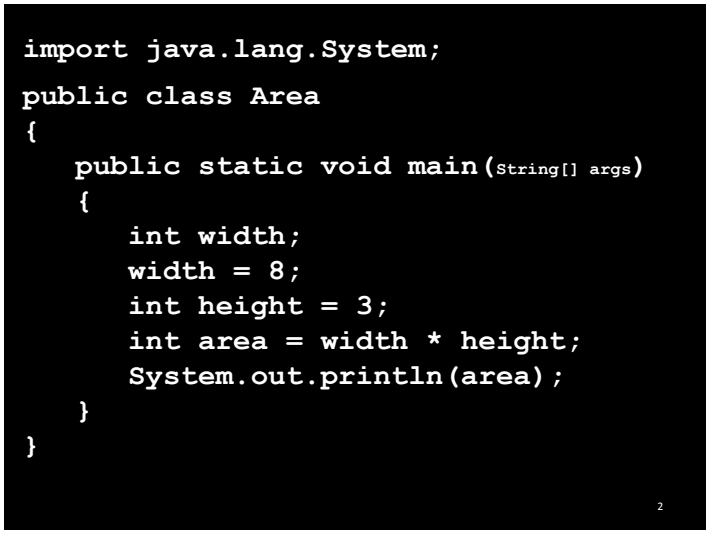
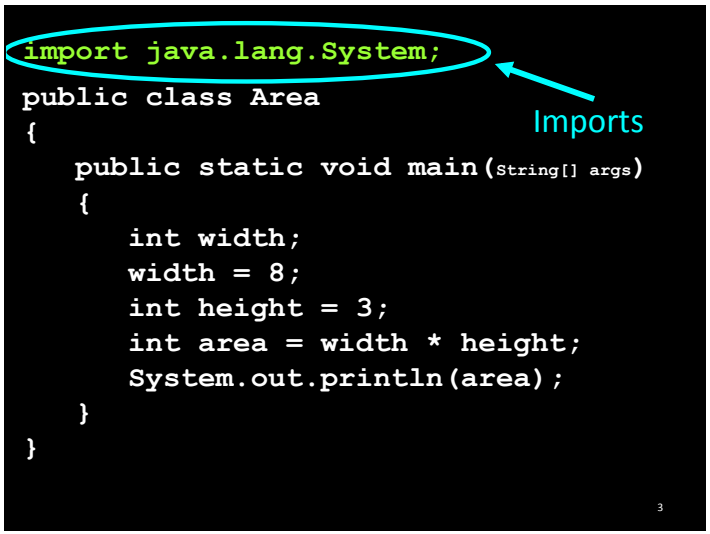

EECS1022
MOBILE COMPUTING
JAVA BASICS
LEXICAL ELEMENTS
(SLIDES ADAPTED FROM PROF.H. ROUMANI)
PROF. Y. LESPÉRANCE
Dept. of Electrical Engineering & Computer Science
1


import java.lang.System;
public class Area
{
public static void main(String[] args)
{
int width;
width = 8;
int height = 3;
int area = width * height;
System.out.println(area);
}
}
2


import java.lang.System;
Imports
public class Area
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public static void main(String[] args)
{
int width;
width = 8;
int height = 3;
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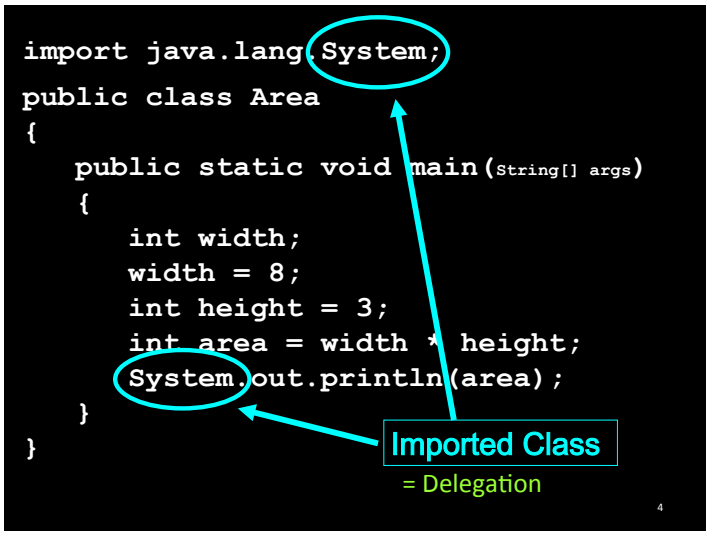
System.out.println(area);
}
}
3


import java.lang.System;
public class Area
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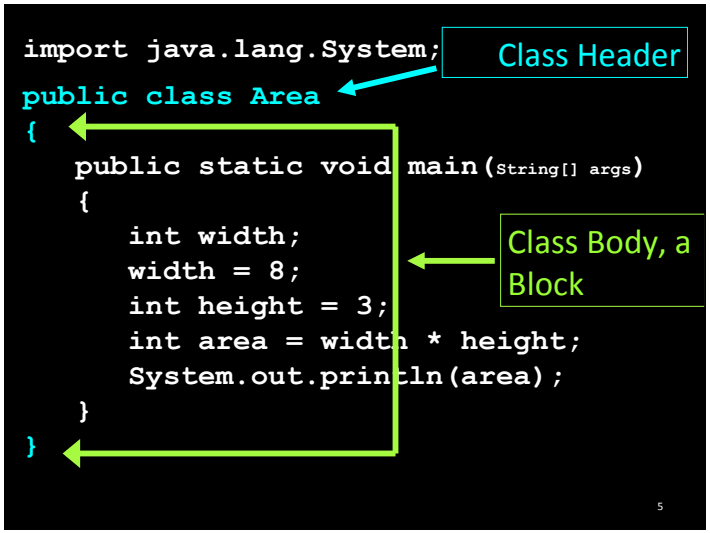
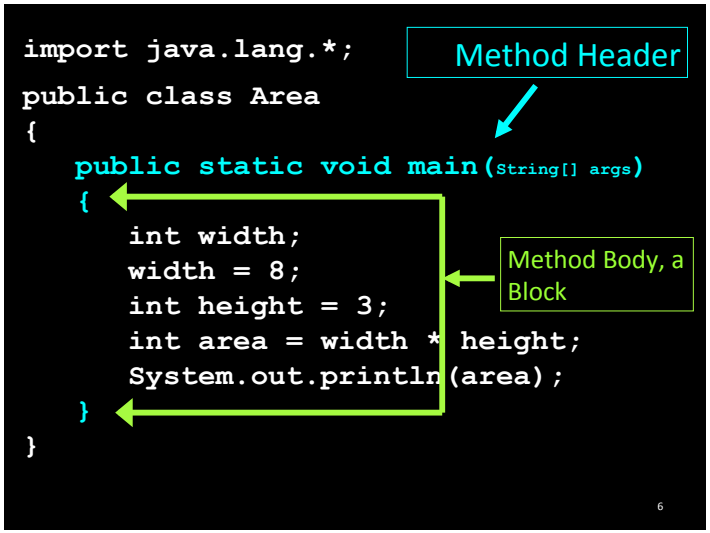
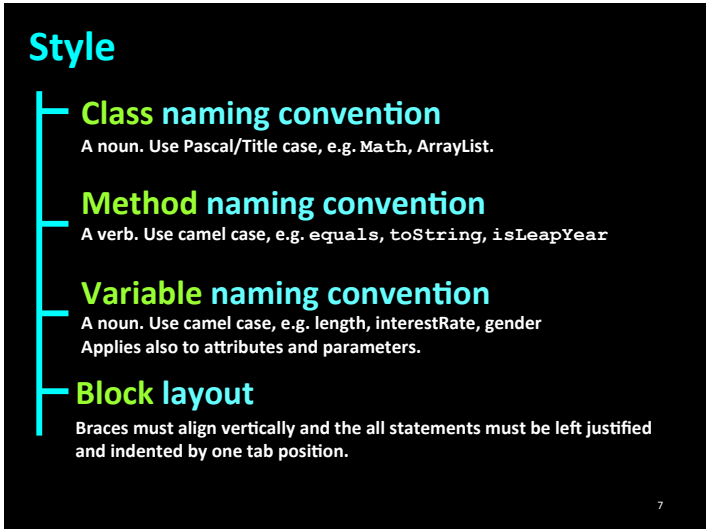
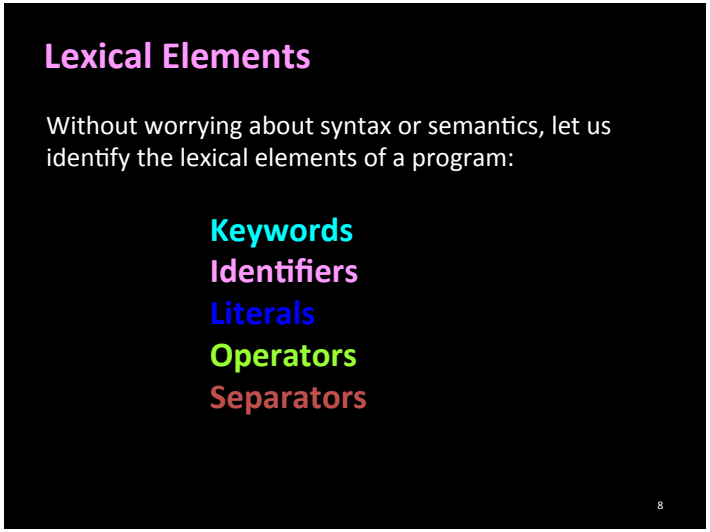
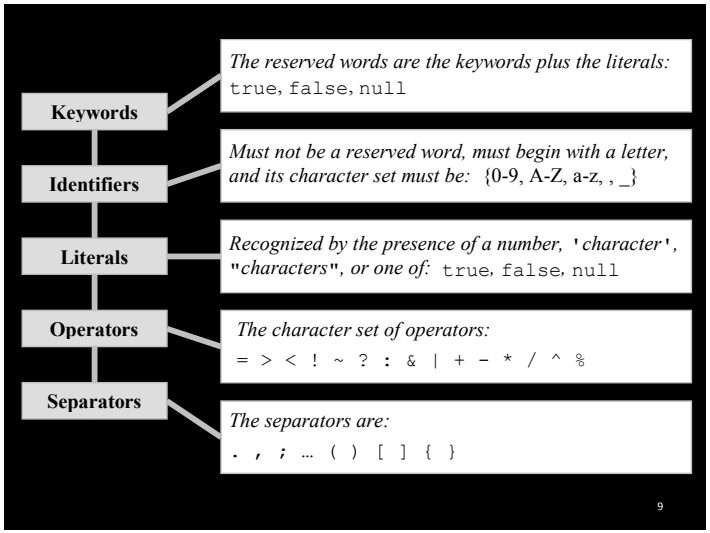
public static void main(String[] args)
{
int width;
width = 8;
int height = 3;
int area = width * height;
System.out.println(area);
}
}
Imported Class
= Delegation
4

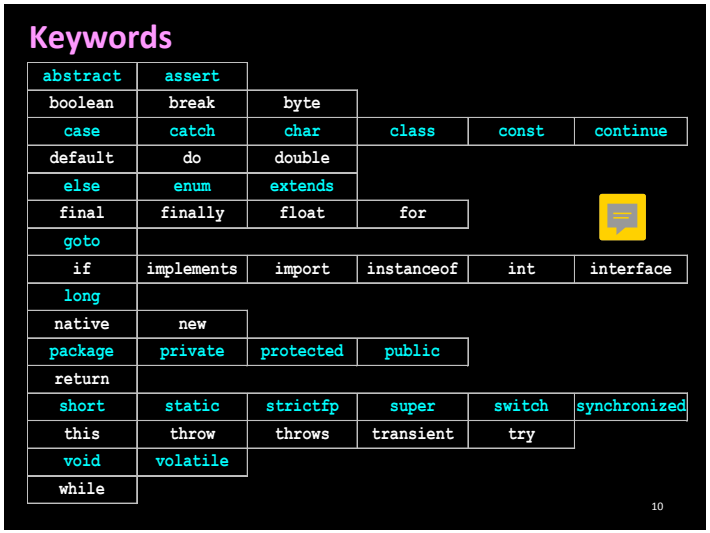

import java.lang.System;
Class Header
public class Area
{
public static void main(String[] args)
{
int width;
width = 8;
int height = 3;
int area = width * height;
System.out.println(area);
}
}
Class Body, a Block
5

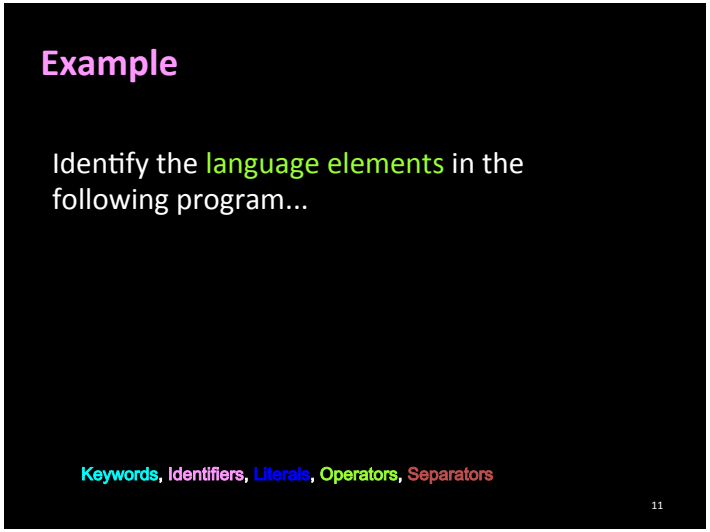

import java.lang.*;
Method Header
public class Area
{
public static void main(String[] args)
{
int width;
width = 8;
int height = 3;
int area = width * height;
System.out.println(area);
}
}
Method Body, a Block
6

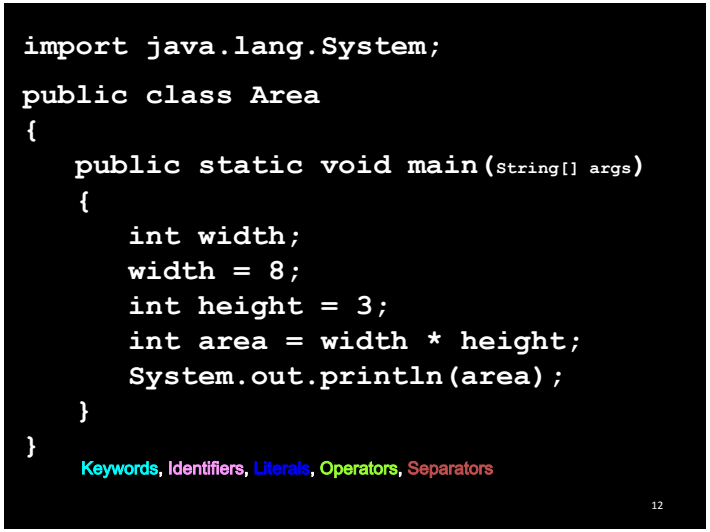

Style
Class naming convention
A noun. Use Pascal/Title case, e.g. Math, ArrayList.
Method naming convention
A verb. Use camel case, e.g. equals, toString, isLeapYear
Variable naming convention
A noun. Use camel case, e.g. length, interestRate, gender
Applies also to attributes and parameters.
Block layout
Braces must align vertically and the all statements must be left justified and indented by one tab position.
7


Lexical Elements
Without worrying about syntax or semantics, let us identify the lexical elements of a program:
Keywords
Identifiers
Literals
Operators
Separators
8


Keywords
The reserved words are the keywords plus the literals:
true, false, null
Identifiers
Must not be a reserved word, must begin with a letter, and its character set must be: {0-9, A-Z, a-z, , _}
Literals
Recognized by the presence of a number, 'character', "characters", or one of: true, false, null
Operators
The character set of operators:
= > < ! ~ ? : & | + - * / ^ %
Separators
The separators are:
. , ; … ( ) [ ] { }
9


Keywords
abstract assert
boolean break byte
case catch char class const continue
default do double
else enum extends
final finally float for
goto
if implements import instanceof int interface
long
native new
package private protected public
return
short static strictfp super switch synchronized
this throw throws transient try
void volatile
while
10


Example
Identify the language elements in the following program...
Keywords, Identifiers, Literals, Operators, Separators
11


import java.lang.System;
public class Area
{
public static void main(String[] args)
{
int width;
width = 8;
int height = 3;
int area = width * height;
System.out.println(area);
}
}
Keywords, Identifiers, Literals, Operators, Separators
12

```
import java.lang.System;
public class Area
{
   public static void main(String[] args)
   {
      int width;
      width = 8;
      int height = 3;
      int area = width * height;
      System.out.println(area);
   }
}
```

Keywords, Identifiers, Literals, Operators, Separators

13

```
import java.lang.System;
public class Area
{
   public static void main(String[] args)
   {
      int width;
      width = 8;
      int height = 3;
      int area = width * height;
      System.out.println(area);
   }
}
```

Keywords, Identifiers, Literals, Operators, Separators

14

## Compile Time vs Run Time Errors

- Before program can run, it must be compiled to (transalted) Java bytecode
- Studio does this as you enter/edit your code; it flags compile-time errors:
  - Syntax errors, e.g. missing ; { (
  - Type errors, e.g. “abc” * 3

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## Compile Time vs Run Time Errors

- When you execute your program, you may get runtime errors:
  - `ArithmeticException`, e.g. 10 / 0
  - `ArrayIndexOutOfBoundException`, etc.
- Logic errors: program appears to run normally but does not behave as required

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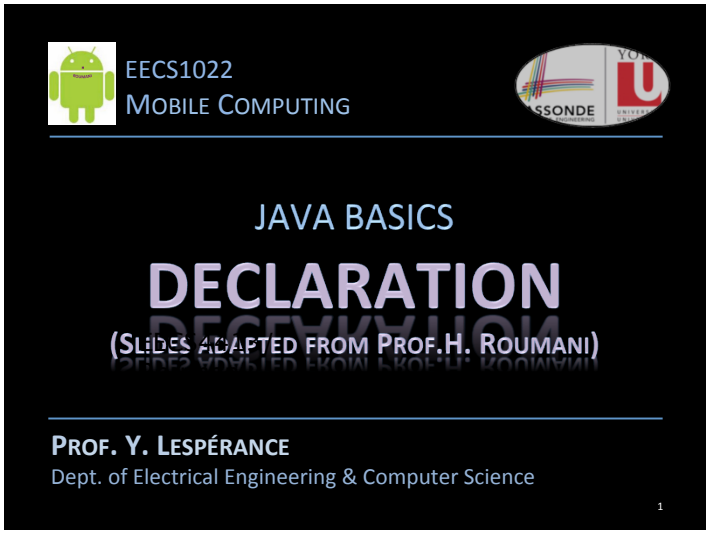
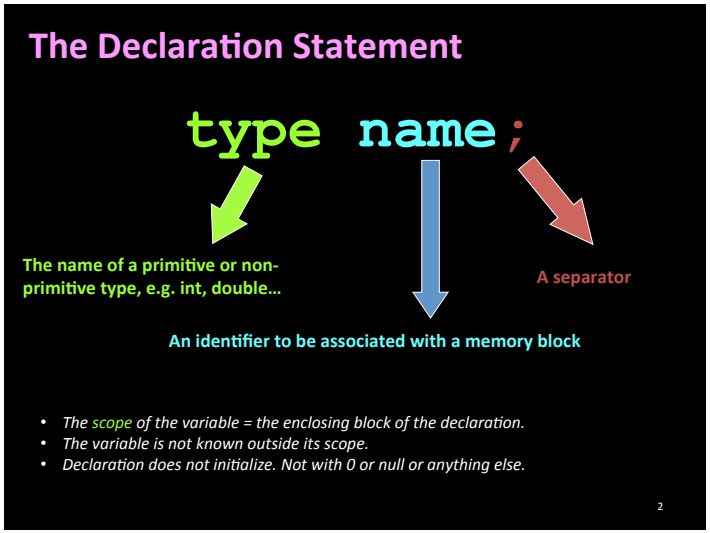
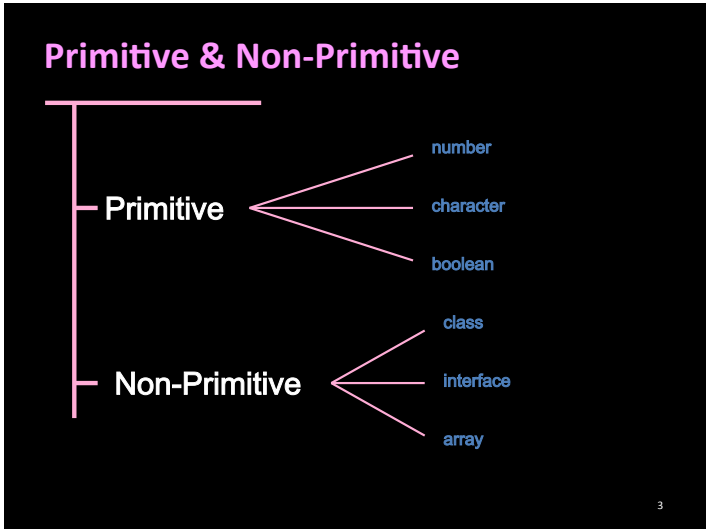
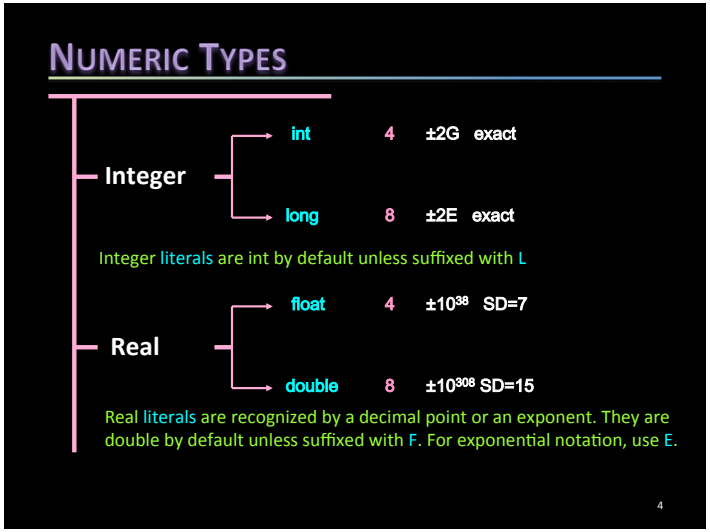
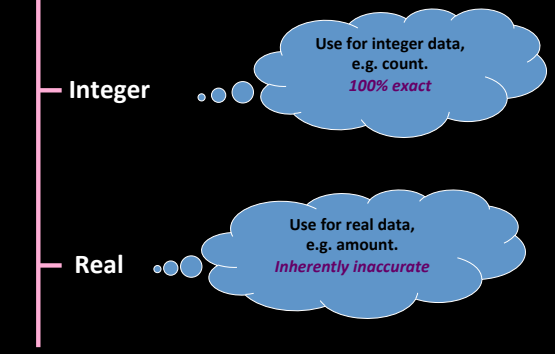

EECS1022
MOBILE COMPUTING
JAVA BASICS
DECLARATION
(SLIDES ADAPTED FROM PROF.H. ROUMANI)
PROF. Y. LESPÉRANCE
Dept. of Electrical Engineering & Computer Science
1


The Declaration Statement
type name;
The name of a primitive or non-primitive type, e.g. int, double…
A separator
An identifier to be associated with a memory block
The scope of the variable = the enclosing block of the declaration.
The variable is not known outside its scope.
Declaration does not initialize. Not with 0 or null or anything else.
2


Primitive & Non-Primitive
Primitive
number
character
boolean
Non-Primitive
class
interface
array
3


NUMERIC TYPES
Integer
int 4 ±2G exact
long 8 ±2E exact
Integer literals are int by default unless suffixed with L
Real
float 4 ±10^38 SD=7
double 8 ±10^308 SD=15
Real literals are recognized by a decimal point or an exponent. They are double by default unless suffixed with F. For exponential notation, use E.
4

## INTEGER OR REAL?




5

## The Type `boolean`

- Stores the result on a condition
- Has only two possible values
- **true** and **false** are reserved words
- Boolean variables are not integers
- The Boolean operators are: **!** (for not), **&&** (for and), **||** (for or), and **^** (for xor)

*Note: Boolean literals are the easiest to recognize!*

6

## The Character Type `char`

- A letter, digit, or symbol
- Digits versus Numbers
- Store the code, not the typeface
- The case of English: ASCII vs UniCode
- **char** is thus an (unsigned) integer type
- No **char** operators! They auto-promote to **int**.

*Character **literals** are recognized by **single** quotes surrounding the character, e.g. 'A'*

7

## More on Characters

| Code | Character |
|---|---|
| 0 | |
| ⋮ | |
| 32 | space |
| ⋮ | |
| 48-57 | '0'-'9' |
| ⋮ | |
| 65-90 | 'A'-'Z' |
| ⋮ | |
| 97-122 | 'a'-'z' |
| ⋮ | |
| 65535 | |

| Escape | Meaning |
|---|---|
| \uxxxx | The character whose code is (hex) xxxx |
| \' | Single quote |
| \" | Double quote |
| \\ | Backslash |
| \n | New line |
| \r | Carriage return |
| \f | Form Feed |
| \t | Tab |
| \b | Backspace |

8

## Java's Primitive Types

| PRIMITIVE TYPES | | | Type | Size (bytes) | Approximate Range min | Approximate Range max | S.D. |
|---|---|---|---|---|---|---|---|
| NUMBER | INTEGER | SIGNED | byte | 1 | -128 | +127 | N/A |
| | | | short | 2 | -32,768 | +32,767 | N/A |
| | | | int | 4 | $-2\times10^{9}$ | $+2\times10^{9}$ | N/A |
| | | | long | 8 | $-9\times10^{18}$ | $+9\times10^{18}$ | N/A |
| | | UNSIGNED | char | 2 | 0 | 65,535 | N/A |
| | REAL | SINGLE | float | 4 | $+3.4\times10^{38}$ | $+3.4\times10^{38}$ | 7 |
| | | DOUBLE | double | 8 | $-1.7\times10^{308}$ | $+1.7\times10^{308}$ | 15 |
| BOOLEAN | | | boolean | 1 | true/false | | N/A |

9

## Class Type `String` *(in java.lang)*

- Stores a sequence of characters
- Optimized for speed → immutable
- Optimized declaration → shortcut
- Optimized concatenation → + operator
- Rich API (e.g. indexOf, charAt, substring)

*Note: String literals are surrounded with double quotes and can use the same escape sequences as chars.*

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## Class Type `Date` *(in java.util)*

- Stores an instance of time
- Captures both date and time
- Accurate to a millisecond
- Simple API (toString and getTime)

*Note: Like all class types (except for String), Date has no literals and no operators.*

11

## Class Type `Rectangle` *(in textbook)*

- Stores an instance of a rectangle
- Captures the height and width as int
- API (getArea and getCircumference)

*Like all class types (except for String), it has no literals and no operators.*

12

## Class Type `Fraction`

*(in i2c library)*

- Stores an instance of a fraction
- Numerator and denominator are long
- API (add, sub, multiply, divide, …)

*Like all class types (except for String), it has no literals and no operators.*

13

## Class Type `TextView`

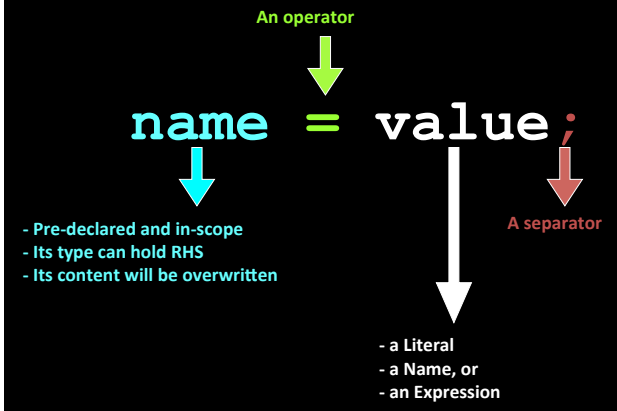
*(in android.widget)*

- Stores a UI label
- Many attributes: text, layout, style, …
- API (getText, setText, setTypeFace, …)

*Like all class types (except for String), it has no literals and no operators.*

14

## The Assignment Statement

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