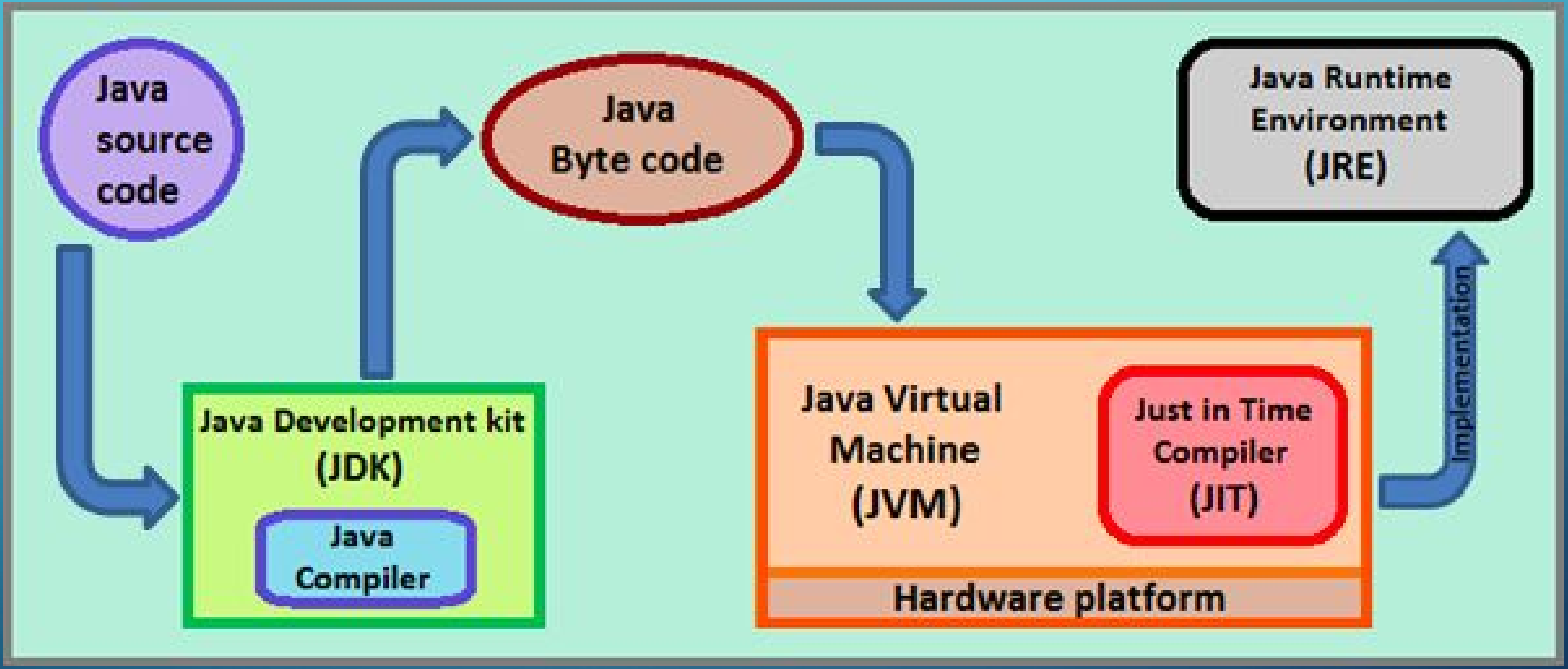
CH 2: FIRST JAVA PROGRAM CH 3: SYNTAX, ERRORS, AND DEBUGGING

CSAP – CHAPTER 2 & CHAPTER 3

2.1 WHY JAVA

1. It's a modern object-oriented programming language
2. It's secure, robust and portable
3. It supports the use of threads. A thread is a process that can run concurrently with other processes. For example, Garbage Collection can run while you are executing your java program
4. It bears a superficial resemblance to C++

2.2 THE JAVA VIRTUAL MACHINE AND BYTE CODE


Java source code
Java Byte code
Java Runtime Environment (JRE)
Java Development kit (JDK)
Java Compiler
Java Virtual Machine (JVM)
Just in Time Compiler (JIT)
Hardware platform
Implementation

http://www.letustweak.com/wp-content/uploads/2015/12/all.png

2.3 CHOOSING A USER INTERFACE STYLE

- Two choices:
  1. GUI – Graphical User Interface – buttons and other widgets
  2. Terminal I/O User Interface – text based

2.4 AND 2.5 DID YOU KNOW ?

- `System.out` is the name of an object, and `println` is the name of a method
- Source code is saved in a file with a `.java` extension. Once it is compiled it translates the source code into Java byte code and saved with a `.class` extension.
- Java programs can be written in Windows NotePad, then compiled and executed through Command-line terminal.

2.6 SCANNER

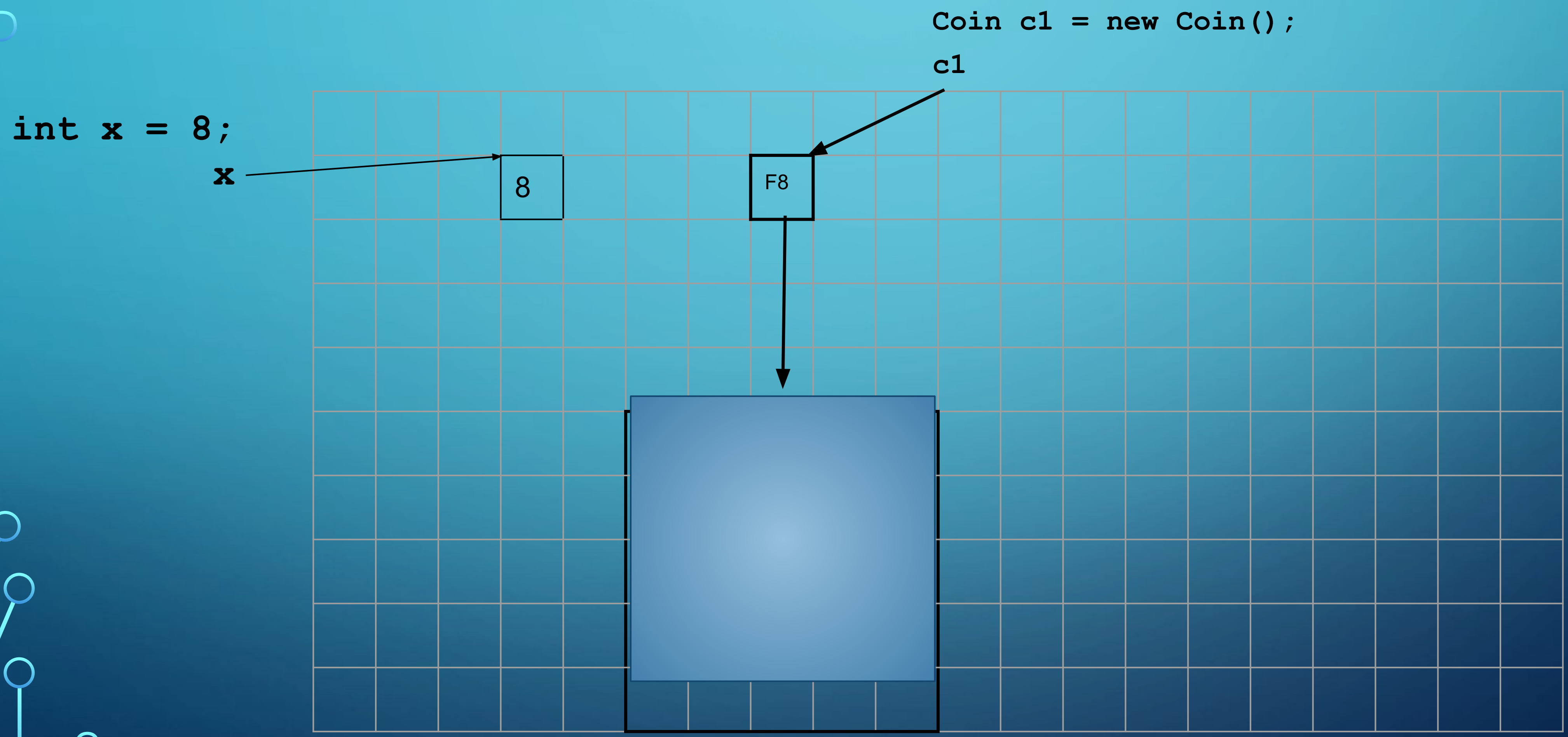
```
import java.util.Scanner;

Scanner input =
   new Scanner (System.in);

int myData = input.readInt();
```

- `import` tells Java where to find code for the Scanner class.
- `System.in` is the name of an variable in the `System` class that refers to the keyboard
- Use eclipse's code-completion feature to discover all the methods that Scanner supports

Variables and Objects in memory



```
Coin c1 = new Coin();
```

Your Turn

1. Give 2 examples of compile-time errors
2. The Java compiler translates Java into a pseudomachine language called ____________
3. What are the 3 types of comments?

SYNTAX, ERRORS AND DEBUGGING

CHAPTER 3

3.1 LANGUAGE ELEMENTS

- Vocabulary is the set of all of the words and symbols in the language
- Syntax is the set of rules for combining words into statements
- Semantics – define the rules for interpreting the meaning of statements.

3.1
PROGRAMMING LANGUAGE VS. NATURAL LANGUAGE

- Small vocabulary, simple syntax
- Rigid – statements must be exact
- Literal – must tell the computer exactly what to do

- Much larger vocabulary, many exceptions
- The meaning of sentences can still be conveyed even if there are errors
- Can be vague

3.2 BASIC JAVA SYNTAX AND SEMANTICS

- Primitive data types – can you name them?
- Literals – anything in a program whose values do not change. 1.45 is a numeric literal and “Pumpkin Pie” is a String literal
- Variables (for a primitive data type) - a piece of memory that has a name and can store a value. What is stored in that piece of memory can change during the execution of a program; the data type that is stored cannot change
- Constants – use the keyword `final`, to stop a memory cell from changing

3.2
ARITHMETIC EXPRESSIONS AND ORDER OF OPERATION

( )	Grouping parentheses
.	Dot operator
+ or -	Unary operator (positive negative
new	Instantiating
( )	Typecasting parentheses
* / %	Multiplication, division, modulus
+ -	Addition, Subtraction
=	Assignment

3.2 MIXED-MODE ARITHMETIC

- When working with **`int`** and **`double`** in the same expression , Java will temporarily convert the “less specific” data type into the “more specific” data type in order to execute the arithmetic operation

```
int a;
double z;
a = 45;          //storing an int in an int
z = a + .5;      //valid z contains 45.5

a = z;          //will generate a compile error because a double
                //is more specific than an int
```

3.2 TYPE CASTING

- (int)3.6 results in 3
- (double)3 results in 3.0
- (double)2/3 results in .667
  - Type cast an integer 2 to a double. The 3 is promoted to a double automatically in order to perform the division. Finally, divide.
- (int)2.0/3 results in 0
  - Type casting has precedence over arithmetic operations

WHAT DOES THIS CODE DO?

```
int m;
double x;
x = reader.readDouble();   //assign some positive
                           //value to x
m = (int)(x + 0.5);
```

Typecasting a double to an int will truncate the decimal portion of the double

3.2 CONCATENATION OR ADDITION

- Concatenation has the same precedence as addition which can lead to unexpected results

```
“number ” + 3 + 4  → “number 3” + 4 → “number 34”

“number” + (3 + 4) → “number ” + 7 → “number 7”

“number ” + 3 * 4 → “number ” + 12 → “number 12”

3 + 4 + “ number” → 7 + “number” → “7 number”
```

3.2 METHODS, MESSAGES AND SIGNATURES

- Methods are used as a mechanism of sending messages to an object
- To use a method you must know
  - Its name
  - Its parameters (number of, type and order of)
  - Its return type
- This information is known as its signature

3.2 RULES FOR IDENTIFIERS

- Must begin with a letter
- After first letter, any combination of letters, digits, underscore (_) or dollar sign ($)
- Cannot be a reserved word
- Case sensitive

3.2 PACKAGES AND THE IMPORT STATEMENT

- Packages are prewritten classes that are grouped together.
- When using a package, you need to use an import statement
- `import x.y.z;`
- where x is the name of the package, y is the subsection within the package and z is a specific class in the subsection.

3.3 JAVADOC

- Allows you to create documentation in the same style as a Java API by adding special comments to your program.
- https://docs.oracle.com/javase/7/docs/api/index.html?java/lang/String.html

3.5 PROGRAMMING ERRORS

1. Syntax Errors
2. Run-time Errors – division by zero, null pointer exception,
3. Logic Errors - do you see one here?

```
double celsius = (fahr – 32) * (5/9);
```

OR

```
public static void main (String [] args) {
    Scanner reader;
    int age = reader.nextInt();
```

3.6 DEBUGGING

- Try this first
  - Adding statements that display the contents of a variable at various places in your program
  - `System.out.println (“<some message>” + <variable name>);`
- Then learn to use the debugger feature of eclipse

Your Turn

1. Determine which of the following are valid Java identifiers
   a. `length`
   b. `Import`
   c. `hello-and-goodbye`
   d. `Public`
2. What is the correct data type for variable `answer`?

```
______ answer = 5* 5 * 3.14159;
```

3. _______ is joining the end of one string to the beginning of another.

Homework

Read Chapter 2 and 3.

Skip graphics and GUI

by next Friday 9/29