# CS 149

Professor: Kevin Molloy
(adapted from slides originally developed by Alvin Chao)

# Compiling a Java Program

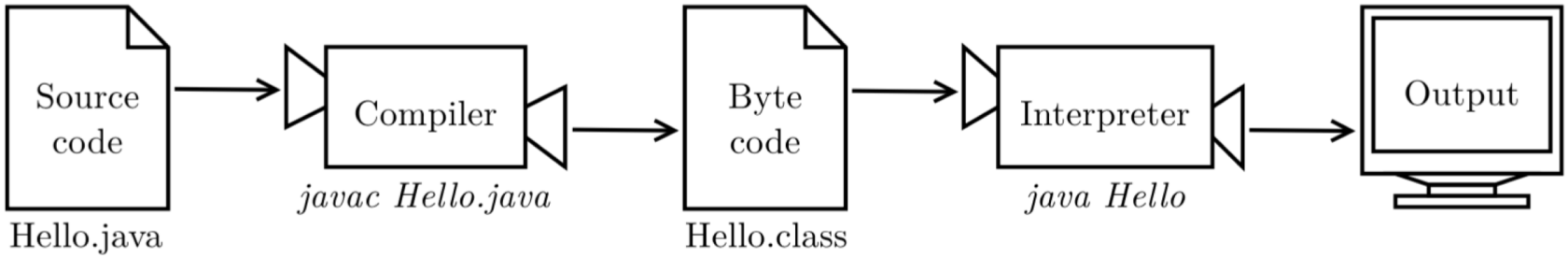


Figure 1.2: The process of compiling and running a Java program.

# Java Primitive Types

| Keyword | Size (bytes) | Min Value | Max Value |
|---|---|---|---|
| Byte | 1 | -128 | 127 |
| Short | 2 | -32,768 | 32,767 |
| int | 4 | $-2^{31}$ | $2^{31} - 1$ |
| long | 8 | $-2^{63}$ | $2^{63} - 1$ |
| float | 4 | $\pm 3.4 \times 10^{-38}$ | $\pm 3.4 \times 10^{38}$ |
| double | 8 | $\pm 1.7 \times 10^{-308}$ | $\pm 1.7 \times 10^{308}$ |
| boolean | (depends) | false | true |
| char | 2 | '\u0000' | '\uffff' |

# Arithmetic Operations Model 1

| **9/4** | **evals to** | **2** |
|---|---|---|
| 10/4 | evals to | 2 |
| 11/4 | evals to | 2 |
| 12/4 | evals to | 3 |
| 13/4 | evals to | 3 |
| 14/4 | evals to | 3 |
| 15/4 | evals to | 3 |
| 16/4 | evals to | 4 |

| **9/4.0** | **evals to** | **2.25** |
|---|---|---|
| 10/4. | evals to | 2.5 |
| 11./4 | evals to | 2.75 |
| 12/4.0 | evals to | 3.0 |
| 13/4. | evals to | 3.25 |
| 14.0/4 | evals to | 3.5 |
| 15/4.0 | evals to | 3.75 |
| 16/4. | evals to | 4.0 |

How do the answers in the first table differ from the second table?

# In Class Work

| 14. / 4. | Evaluates to | |
|---|---|---|
| 14. / 4 | Evaluates to | |
| 14 / 4. | Evaluates to | |
| 14 / 4 | Evaluates to | |

1. Complete the column on the right in the above table.

2. Consider what you know about addition(+).If you add two integers in a Java expression, will the result always be mathematically correct? Justify your answer.

3. What about subtraction(-) and multiplication(*)? If you subtract or multiply two integers, will the answer always be mathematically correct? Justify your answer.

# More in-class Work

```
1 int dollars;
2 int cents;
3 double grams;
4
5 dollars = 1;
6 cents = 90;
7 grams = 3;
```

1. Identify the Java **keyword** used in a variable declaration to indicate

    a) an integer:

    b) a floating-point number:

2. Consider numbers of dollar bills, cents, and grams. Which of these units only makes sense as an **integer**, and why?

# More in-class Work

```
1 int dollars;
2 int cents;
3 double grams;
4
5 dollars = 1;
6 cents = 90;
7 grams = 3;
```

3. What would you expect the following statements to print out?
    a) System.out.println(dollars);
    b) System.out.println(cents);
    c) System.out.println(grams);

4. What do you think the purpose of a variable declaration is?

# More in-class Work

```
1 int dollars;
2 int cents;
3 double grams;
4
5 dollars = 1;
6 cents = 90;
7 grams = 3;
```

5. Consider the statement: cents = dollars;
   a) Compare this code to lines 5–7 in Model 2. What value do you think cents and dollars will have after running this statement?
   b) Which side of the equals sign (left or right) was assigned a new value?

# More in-class Work

```
1 int dollars;
2 int cents;
3 double grams;
4
5 dollars = 1;
6 cents = 90;
7 grams = 3;
```

6. Examples of Java operators include + and - ; they describe an operation to be executed (e.g., addition or subtraction).

a) Do you consider the equals sign in Java an operator (an operation to be executed)? If so, explain the operation. If not, explain why not.

b) Do you consider the equals sign in mathematics an operator (an operation to be executed)? If so, explain the operation. If not, explain why not.

# More in-class Work

```
1 int dollars;
2 int cents;
3 double grams;
4
5 dollars = 1;
6 cents = 90;
7 grams = 3;
```

7. In your own words, explain how you should read the = sign in Java. For example, the Java statement x = a + b; should be read as “x _____ a plus b.”

# Order of Operations

- The Java language defines a specific order of execution for math and other operations. For example, multiplication and division take **precedence** over addition and subtraction. Using parentheses, you can override the order of operations. The following table lists some Java operators from highest precedence to lowest precedence.

| | |
|---|---|
| Parenthesis | ( ) |
| Unary (positive or negative signs) | + - |
| Multiplicative | * / |
| Additive | + - |
| Assignment | = |

# Order of Operations

For the following questions, assume you have these two variables:

**int x;**

**double y;**

**Questions (10 min)**

1. What operator has the lowest precedence? Why do you think Java is designed that way?

2. The + and - operators show up twice in the table of operator precedence. For the Java expression x = 5 * -3; explain how you know whether the - operator is being used as an unary or binary operator in this expression.

# Order of Operations

For the following questions, assume you have these two variables:

**int x;**

**double y;**

**Questions (10 min)**

3. Based on your answer to the previous question, explain why the variable y would be assigned 4.0 (as opposed to 4 or 4.5).

4. Rewrite the assignment for y so that it would be set correctly to 4.5. (Hint: you'll need to recall what you learned about division in Java.)

- **Acknowledgements**
- Parts of this activity are based on materials developed by Helen Hu and Urik Halliday, modified by Chris Mayfield and Nathan Sprague, and licensed under CC BY-NC 4.0 International

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