

CSE 121 – Lesson 2

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[sli.do #cse121-2](https://sli.do/#cse121-2)

Announcements, Reminders

- [Creative Project 0](#) due TONIGHT by 11:59 PM
- Programming Assignment 0 releasing later today—due January 16th
- IPL is open! - [Schedule and instructions](#) can be found on course website.
- **Just joined CSE 121?** Resubmission policy is your friend! See more in [syllabus](#).
- Reminder: Pre-Class Work and Section work are not graded! (but you should do them anyway 🙄🙄)

PCM Recap: Data Types & Expressions

- Types: `int`, `double`, `String`, `Boolean`
- Expressions: Operators
- Beware of precedence! (order of operations)

(PCM) Data Types in Java

In programming, you're dealing with data...

- `ints` (whole numbers)
- `doubles` (real numbers)
- `Strings`
- `booleans` (true or false)

(PCM) Operators (for numerical & String values)

Numerical:

- + Addition
- - Subtraction
- * Multiplication
- / Division
- % Modulo or “Mod”
- <, >, <=, >=, ==, !=

Strings:

- + Concatenation

Booleans:

- ! Logical Not
- && Logical And
- || Logical Or

(PCM) Precedence

Parentheses

Multiplication, **M**odulo, **D**ivision

Addition (and Concatenation), **S**ubtraction

If multiple operators at the same level?

Evaluate subexpressions from left to right!

Example

$$1 + 2 * 3$$

Diagram illustrating the order of operations for the expression $1 + 2 * 3$. The multiplication $2 * 3$ is performed first, resulting in 6. Then, the addition $1 + 6$ is performed, resulting in 7.

$$(1 + 2) * 3$$

Diagram illustrating the order of operations for the expression $(1 + 2) * 3$. The addition $1 + 2$ is performed first, resulting in 3. Then, the multiplication $3 * 3$ is performed, resulting in 9.

Work on Expressions/Types Practice Problems

Part 1

- Ed lesson linked from the course calendar
- Work with the folks around you!
- TAs and I will be walking around to help

$$5 + 2 * 4$$

$$1 + 2 / 3$$

$$6 * 5 \% 7$$

Part 1 Walkthrough

$$5 + 2 * 4$$

13

$$1 + 2 / 3$$

1

$$6 * 5 \% 7$$

2

(PCM) Mixing Types 1

- When mixing types in an expression, Java will convert one type to the other and then perform the operation “normally”
- ints can be converted to doubles
- Both ints and doubles can be converted to Strings
- How about the other way?...



(PCM) Mixing Types 2

- When mixing types in an expression, Java will convert one type to the other and then perform the operation “normally”
- Can we convert doubles to ints? Strings to doubles? Strings to ints?

🚨 Danger: Data loss or incompatibility! 🚨



1995: Robert Overcracker going over Niagara Falls.

Work on Expressions/Types Practice Problems

Part 2

- Ed lesson linked from the course calendar
- Work with the folks around you!
- TAs and I will be walking around to help

5 * 3 + 1.0

8 / 3 * 2.0

8.0 / 3 * 2

"Hello" + "world"

1 + "2" + 3

1 + 2 + "3"

1 + "2" + (3 + 4)

Part 2 Walkthrough

“Hello” + “world”
“Helloworld”

$$\begin{array}{l} 5 * 3 + 1.0 \\ \underbrace{} \\ 15.0 \\ \underbrace{} \\ 16.0 \end{array}$$

$$\begin{array}{l} 8 / 3 * 2.0 \\ \underbrace{} \\ 2.0 \\ \underbrace{} \\ 4.0 \end{array}$$

$$\begin{array}{l} 8.0 / 3 * 2.0 \\ \underbrace{} \\ 2.666... \\ \underbrace{} \\ 5.333... \end{array}$$

$$\begin{array}{l} \text{“1”} + \text{“2”} + \text{“3”} \\ \underbrace{\phantom{\text{“1”} + \text{“2”} + \text{“3”}}} \\ \text{“12”} \\ \underbrace{\phantom{\text{“12”} + \text{“3”}}} \\ \text{“123”} \end{array}$$

$$\begin{array}{l} 1 + 2 + \text{“3”} \\ \underbrace{\phantom{1 + 2 + \text{“3”}}} \\ \text{“3”} \\ \underbrace{\phantom{\text{“3”} + \text{“3”}}} \\ \text{“33”} \end{array}$$

$$\begin{array}{l} \text{“1”} + \text{“2”} + (3 + 4) \\ \underbrace{\phantom{\text{“1”} + \text{“2”} + (3 + 4)}} \\ \text{“12”} \\ \underbrace{\phantom{\text{“12”} + (3 + 4)}} \\ \text{“7”} \\ \underbrace{\phantom{\text{“12”} + \text{“7”}}} \\ \text{“127”} \end{array}$$

(PCM) Boolean Operators

- **!** Logical Not
- **< > <= >=** Relational Operators
- **== !=** Relational Operators (equality)
- **&&** Logical And
- **||** Logical Or

(PCM) Precedence (updated)

Logical not

Parentheses

Multiplication, Modulo, Division

Addition (and Concatenation), Subtraction

Relational operators

Equality operators

Logical and

Logical or

Example 3

$$1 + \underbrace{2 * 3}_6 \neq \underbrace{(1 + 2)}_3 * 3$$

$$\underbrace{1 + 6}_7 \neq \underbrace{3 * 3}_9$$

$$7 \neq 9$$

true

Work on Expressions/Types Practice Problems

Part 3

- Ed lesson linked from the course calendar
- Work with the folks around you!
- TAs and I will be walking around to help

`5 * 3 < 12`

`10 % 3 == 10 / 3`

`5 < 9 || (7 != 7)`

`!(1 + 2 == 3 && 10 % 4 > 2)`

Part 3 Walkthrough 1

$5 * 3 < 12$
15
15 < 12
false

$10 \% 3 == 10 / 3$
1
1 == $10 / 3$
3
1 == 3
false

$5 < 9 || (7 != 7)$
false
 $5 < 9 ||$ false
true
true || false
true

Part 3 Walkthrough 2

!(1 + 2 == 3 && 10 % 4 > 2)

!(1 + 2 == 3 && 2 > 2)

!(3 == 3 && 2 > 2)

!(true && 2 > 2)

!(true && false)

!(false)

true

Variables

- Now that we know about different types and data, we can learn about how to store it!
- Java allows you to create variables within a program. A variable has:
 - a type,
 - a name, and
 - (potentially) a value it is storing

Declaration: `int x;`
Initialization: `x = 30;`

Or all in one line:

```
int x = 30;
```