CSE 121 Lesson 2: Expressions and Types

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Spring 2024

TAs:						
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sli.do #cse121-2

Today's playlist:
CSE 121 lecture beats 24sp

Announcements & Reminders

- Creative Project 0 due tonight by 11:59 PM
- Programming Assignment 0 releases later today
  - due Tuesday, April 9th
  - also features many small activities
- IPL is open! Schedule & instructions on website
- "Extra resources" tab – practice! (with a caveat)

PCM Recap: Data Types & Expressions

- Types: `int, double, String, boolean`
  - note: only `String` is capitalized!
- Operators
  - mathematical operators, like + or –
  - relational operators, like < or !=
  - logical operators, like && or ||
- Two tricky concepts:
  - “precedence” (order of operations)
  - type conversions

(PCM) Data Types in Java

In programming, you're dealing with data…

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

(among other ones – which we'll introduce later)

(PCM) Operators (for numerical & `String` values)

Numerical:

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

Strings:

- + Concatenation

Booleans:

- ! Logical Not
- && Logical And
- || Logical Or
- == and != Relational

(PCM) Precedence

Parentheses

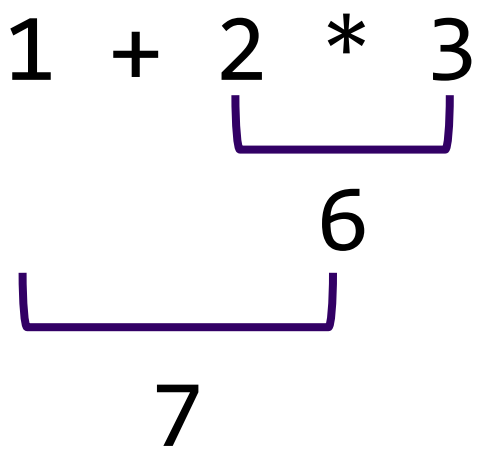
Multiplication, **M**odulo, **D**ivision

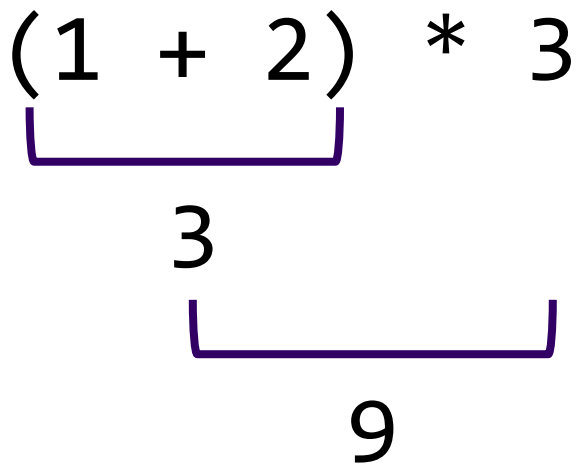
Addition (and Concatenation), **S**ubtraction

If multiple operators at the same level?

Evaluate subexpressions from left to right!

Example





Work on Expressions/Types Practice Problems

Part 1

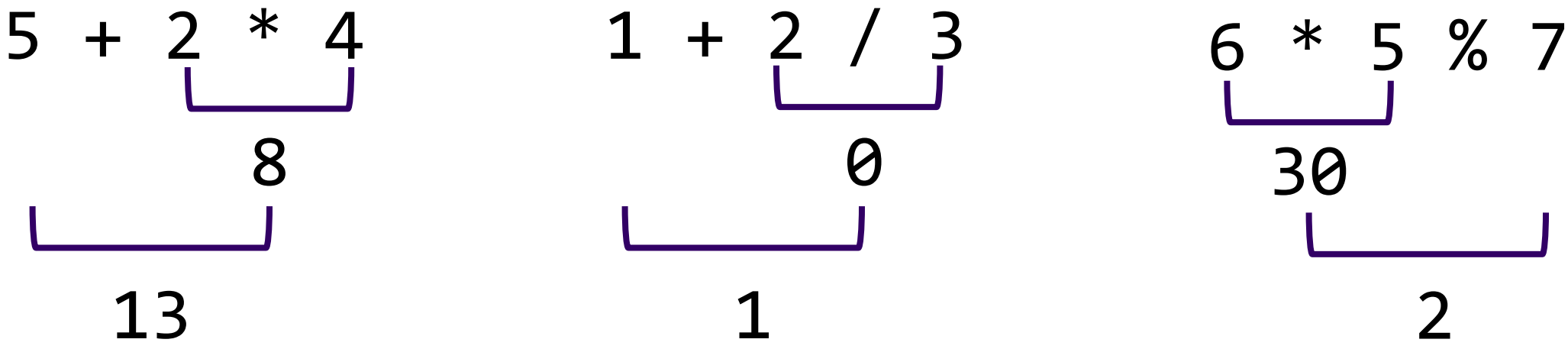
- Ed lesson linked from the course calendar
- Work with the folks around you!
- TAs and I will be walking around to help

```
5 + 2 * 4
```

```
1 + 2 / 3
```

```
6 * 5 % 7
```

Part 1 Walkthrough



(PCM) Mixing Types & Conversions

When mixing types in an expression, Java will convert one type to the other and then perform the operation "normally".

Some conversions seem straightforward:

- `int`s can be converted to `double`s (add `.0`)
- `int`s and `double`s can be converted to `String`s (add `""`)

So, Java does these for you (is this good? controversial!)

(PCM) Conversions Gone Wrong!!

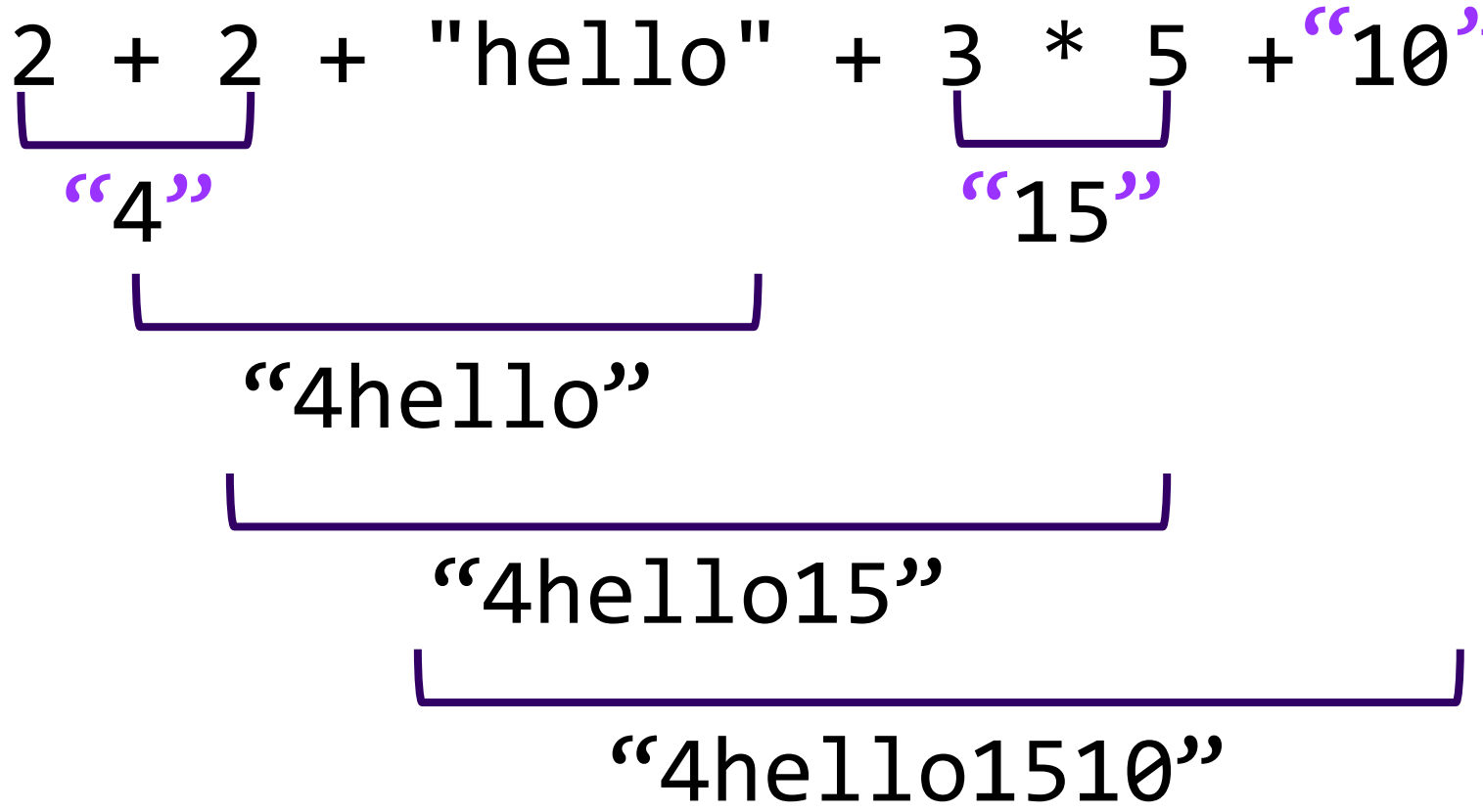
Other conversions are “lossy”, because you'd lose data.

- e.g. to make `3.14` an `int`, you’d probably pick either `3` or `4` – but either one loses data!
- Java won’t do this automatically for you – you need to “ask”.

Some conversions don’t make sense.

- how would you convert "Beyoncé" to an `int`? `double`?
- Java really doesn’t let you do these…

Example 2



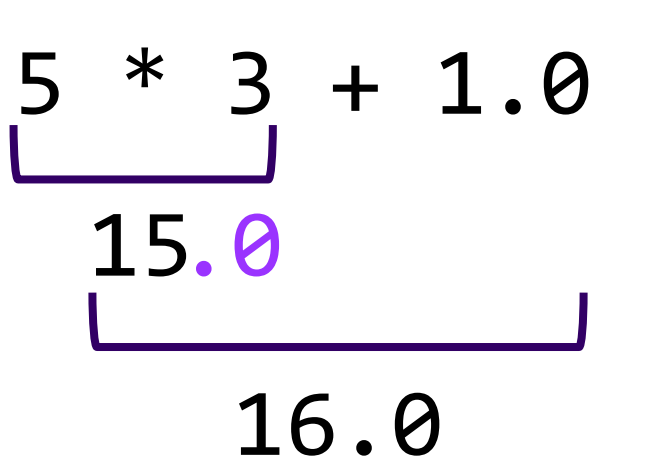
Work on Expressions/Types Practice Problems

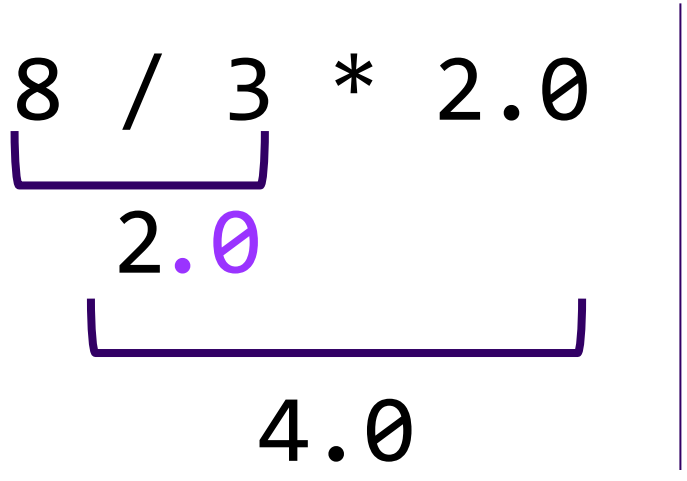
Part 2

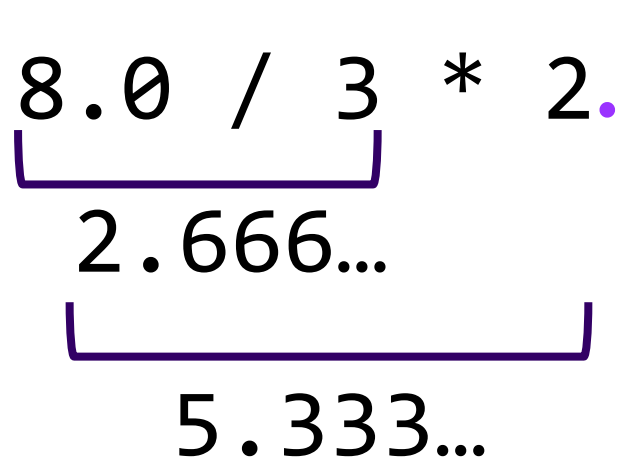
- Ed lesson linked from the course calendar
- Work with the folks around you!
- TAs and I will be walking around to help

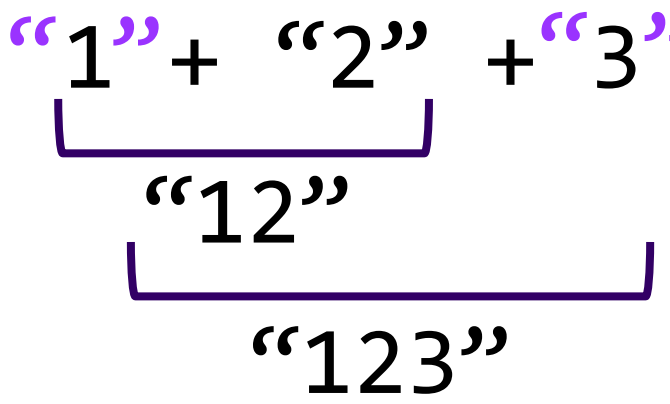
```
5 * 3 + 1.0
8 / 3 * 2.0
8.0 / 3 * 2
"Hello" + "world"
1 + "2" + 3
1 + 2 + "3"
1 + "2" + (3 + 4)
```

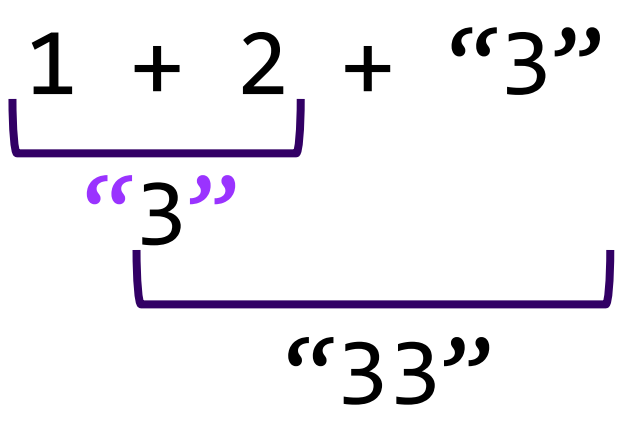
Part 2 Walkthrough

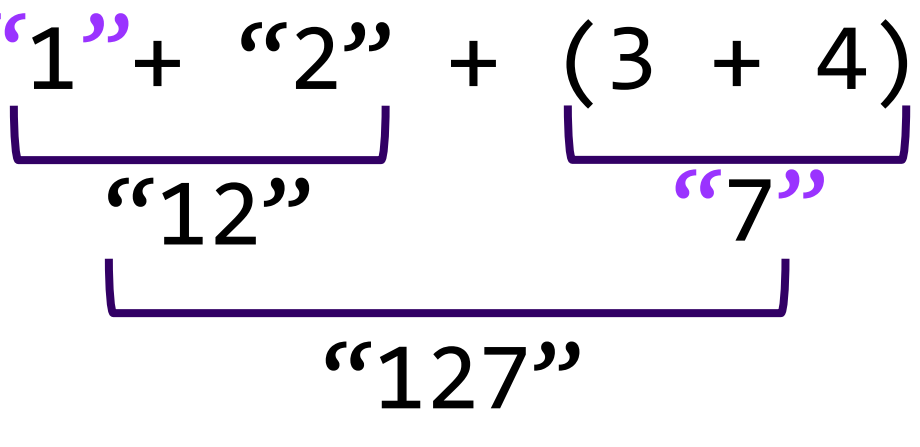












(PCM) Boolean Operators

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

(PCM) Precedence (updated)

Logical not

Parentheses

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

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

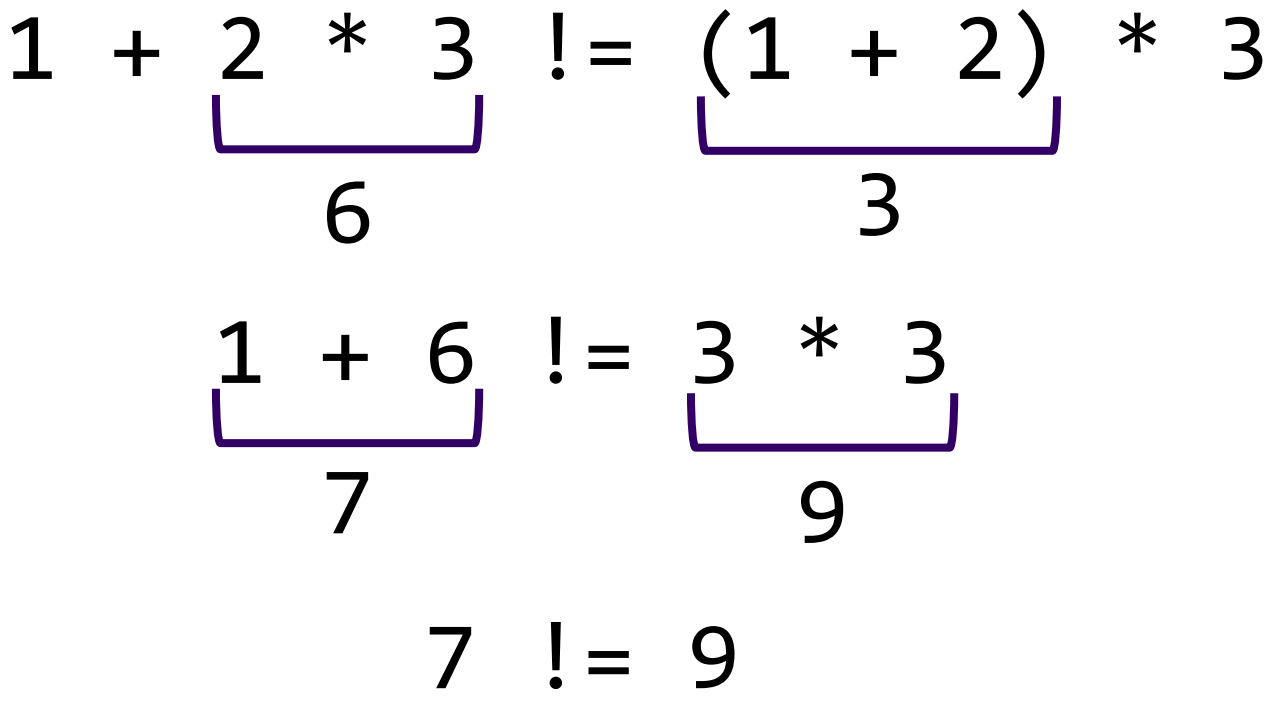
Relational operators

Equality operators

Logical and

Logical or

Example 3



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;
```

Food for Thought

A weekly section where I introduce open problems related to our lecture topic(s) of the week.

Goals:

1. give you “conversational familiarity” with CS terminology
2. see how CS interacts with other fields and people!
3. point you in the direction of more CSE (or adjacent) classes

Note: <u>not tested content.</u> Just food for thought :)

Accessibility: can everyone use Turtle? (1/2)

Hint: have you heard of the term “alt text”?

How is it relevant here?

Accessibility: can everyone use Turtle? (2/2)

Hint: have you heard of the term “alt text”?

How is it relevant here?

Bigger picture question: how do blind (and non-sighted) people use computers?

Accessibility: what's next? (1/3)

In your C0 reflection, you'll experiment with one possible solution to this problem. But, it's far from complete:

- there are many more types of access needs than what we've discussed today
- we don't have enough CS knowledge to dive deep (yet!)

We'll talk about accessibility again in the future
– including in future lectures, assignments, & reflections!

Accessibility: what's next? (2/3)

About 1 in 4 Americans (~40-60 million) have a disability (CDC, Census)

And much of modern life requires computers!

So, this is a problem that matters, whether or not you become a computer science major, write code for a living, etc.

Accessibility: what's next? (3/3)

UW (and UW CSE) has some absolutely stellar folks who work on accessibility, and ways to get involved!

- Jen Mankoff's CSE 493E: Accessibility
- the Quorum language
- UW CREATE, AccessComputing, Disability Studies, ASL Minor

Bottom line: Explore and be curious!
(and reach out if you want to learn more!)