LEC 02

CSE 121

Datatypes and Expressions

Questions during Class?

Raise hand or send here

sli.do #cse121

BEFORE WE START

Talk to your neighbors:

What's your favorite song right now?

Respond on sli.do!

Music: 🎷 CSE 121 25au Lecture Tunes 🎶

Instructors: Brett Wortzman & James Weichert

TAs:

Trey	Ava	Caleb	Elden	Anya
Amogh	Reese	Anum	Suyash	Minh
Samrutha	Hayden	Abdul	Sthiti	TJ
Dalton	Aki	Janvi	Paul	Zach
Ailsa	Spencer	Navya	Shayna	Cayden
Ryan	Savannah	Sam	Jesse	Johnathan
Anant	Tamsyn	Jessica	Nhan	

Agenda

- **Announcements, Reminders** 
- Intro Survey Recap
- Variables Example
- Datatypes and Expressions Review
- Expressions Practice
- Combining Variables and Expressions

Announcements, Reminders

- Creative Project 0 due tonight by 11:59 PM
- Programming Assignment 0 releases later today
  - making a receipt generator!
  - due Tuesday, April 15st at 11:59 PM
  - now on regular "cadence" (Wed release, due following Tue)
- IPL is open! Schedule & instructions on website.
- If you joined late, welcome!
  - Check out the course website and lecture recordings
  - Resubmissions are your friend!

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Intro Survey – things we're excited for!

- "Learning programming" / "Learning how to code"
- "Meeting new people with similar interests"
- "Creative projects!"
- "Learning java"
- "Having peers (a community) and resources for this course!"
- "That [121] is open to people with no experience"

Intro Survey – things we're nervous about

- "Learning how to code" 🤔
- "Everything being new"
  - You're all in the same boat…and in the right place!
- "Coding does not come naturally"
  - *Everyone* struggles ("coming naturally" is a myth)
- "Debugging"/"When my program doesn't work"
  - Debugging is part of programming, and learning requires mistakes
  - Make ugly penguins!
- Workload/"Getting stuck and having to turn to AI for help"
  - Utilize support systems (section, IPL, Ed, resubs, etc.)
  - Reach out early!

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PCM: Datatypes & Expressions

- Programming is about data; we tell Java what **type** of data we have!
- Datatypes (so far): `int`, `double`, `String`, `boolean`
  - note: only `String` is capitalized!
- All values in a (Java) program have a type!
  - some are "obvious", e.g. `42` or `"hello world"`
    - aside: these are called **"literals"**
  - some are more complicated **expressions**!

PCM: Operators

We learned a *ton* of operators!

Numerical:

- + Addition
- - Subtraction
- * Multiplication
- / Division (tricky!)
- % Modulo (or “mod”)
- <, >, <=, >=, ==, != Relational

Strings:

- + Concatenation (not addition!)

Booleans:

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

PCM: Precedence

Operators have precedence (an order of operations).

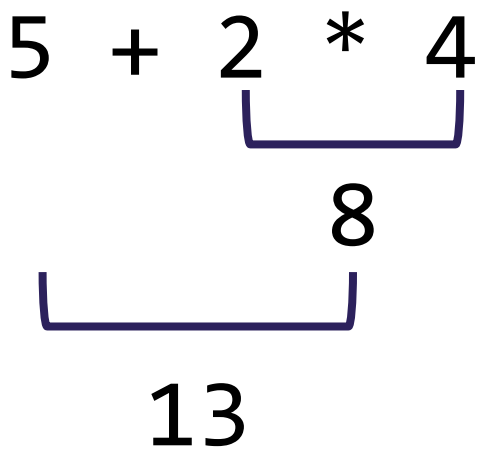
In Math:

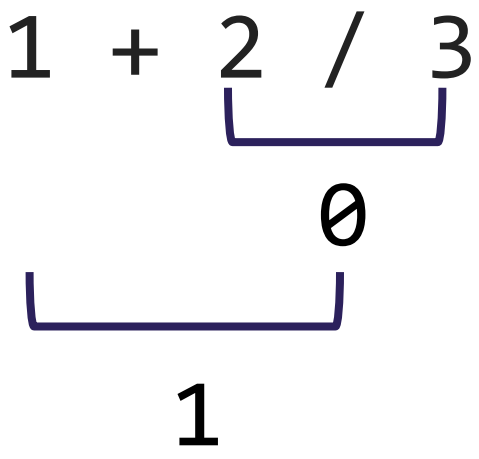
1. **P**arentheses
2. **E**xponent
3. **M**ultiplication
4. **D**ivision
5. **A**ddition
6. **S**ubtraction

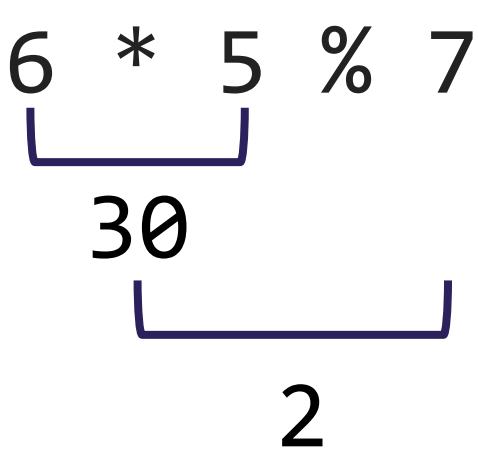
In Java:

1. Parentheses
2. Logical not
3. Multiplication, Modulo, Division
4. Addition (and concatenation), Subtraction
5. Relational operators
6. Equality operators
7. Logical AND
8. Logical OR

Expressions in “little steps”







PCM: Conversions

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

Some conversions are 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!)

New: Conversions (Gone Wrong!!)

Other conversions are “lossy”, because you 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”.
  - called a **type cast**: you’ll see this in Friday’s PCM + in P0

Some conversions don’t make sense.

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

Practice: Think

sli.do #cse121

What does this expression evaluate to?

```
2 + 2 + "hello" + 3 * 5 + 10
```

a. "22hello3510"
b. "22hello1510"
c. "4hello1510"
d. "4hello25"
e. This will cause an error

Practice: Pair

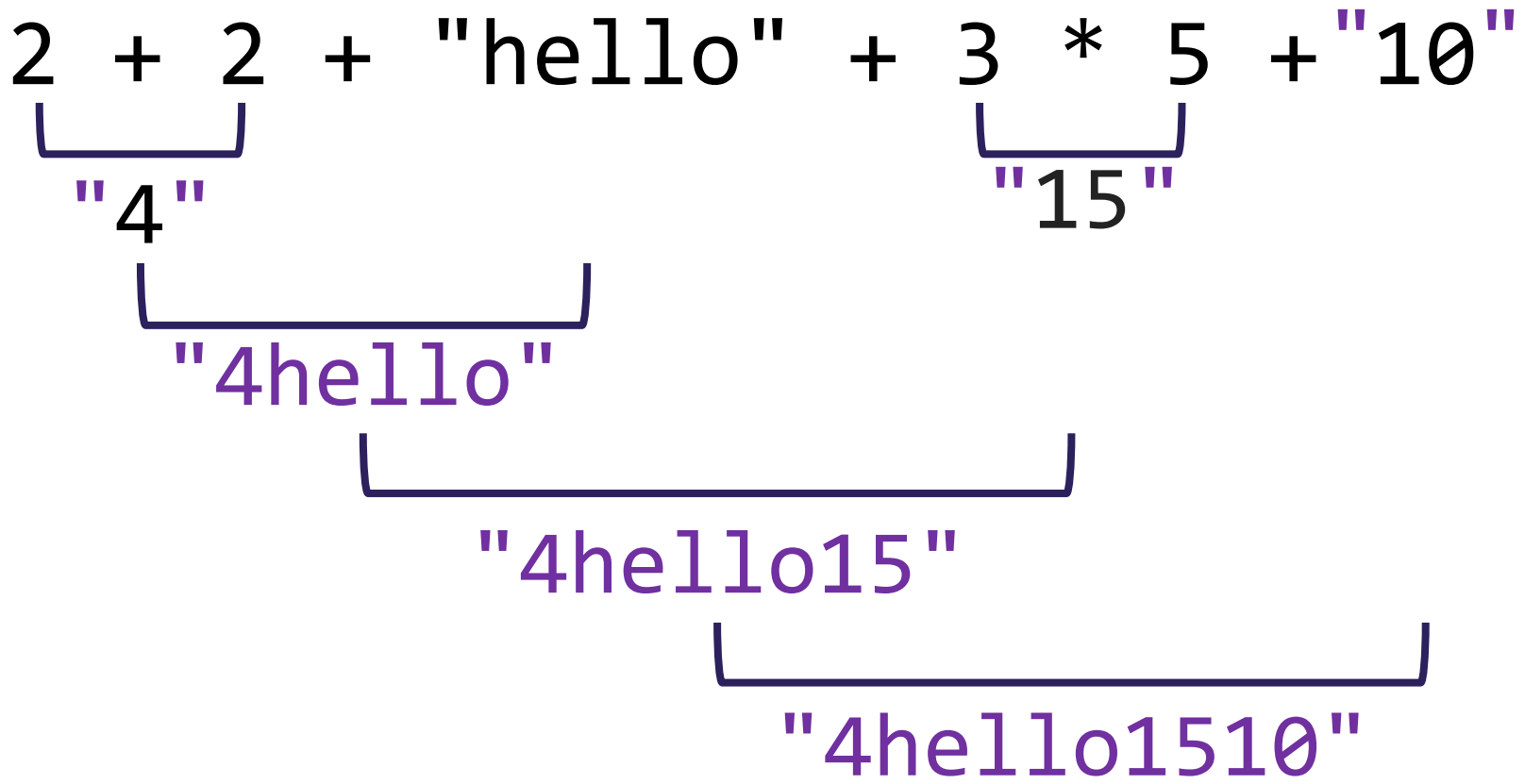
sli.do #cse121

What does this expression evaluate to?

```
2 + 2 + "hello" + 3 * 5 + 10
```

a. `"22hello3510"`
b. `"22hello1510"`
c. `"4hello1510"`
d. `"4hello25"`
e. This will cause an error

Expression example with mixing types



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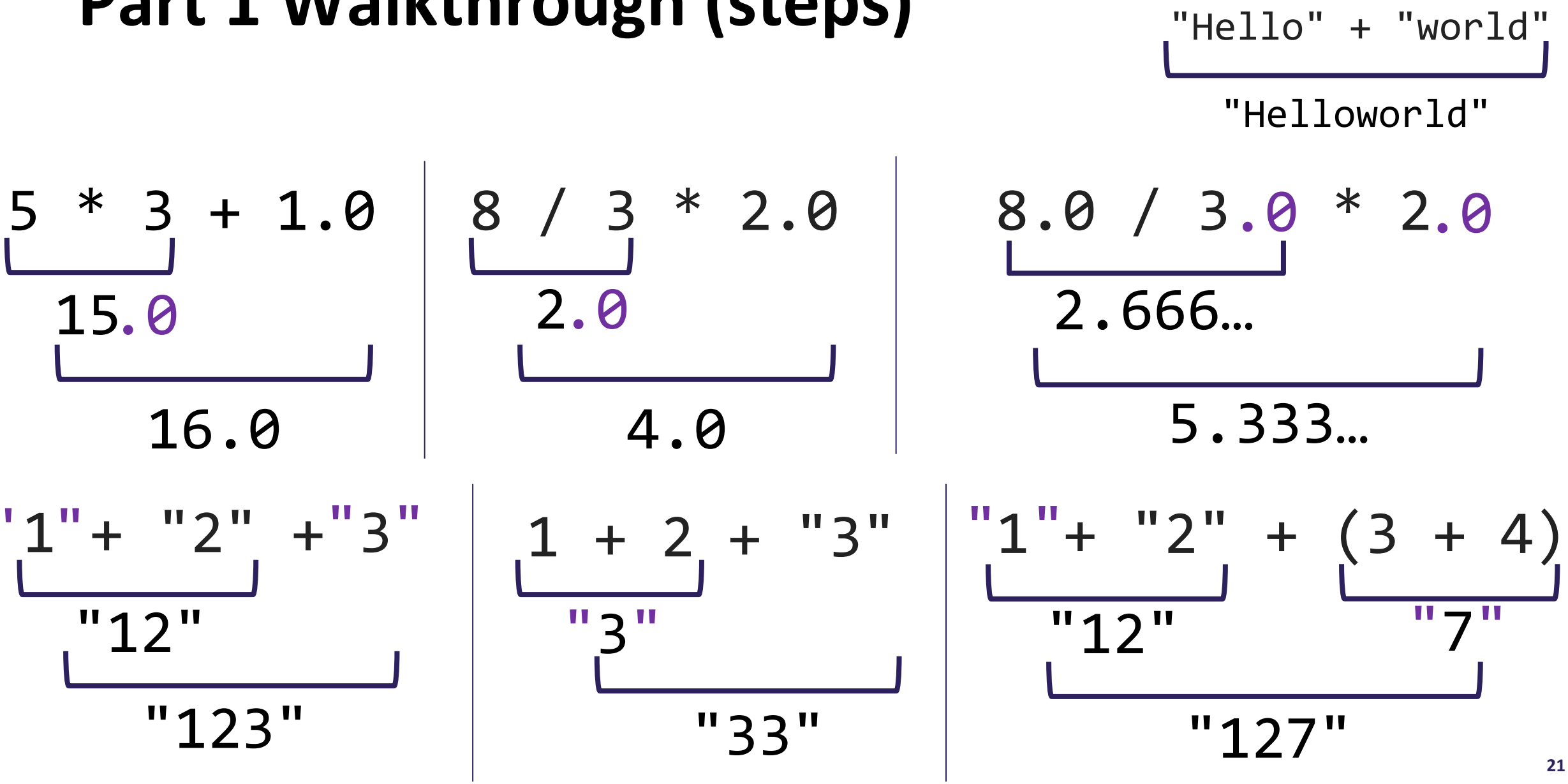
Work on Expressions and Types Practice (1)

- Ed lesson linked from course calendar
- Work with folks around you!
- TAs & I will walk around and 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 1 Walkthrough

Part 1 Walkthrough (steps)



Work on Expressions and Types Practice (2)

- Ed lesson linked from course calendar
- Work with folks around you!
- TAs & I will walk around and help!

```
5 * 3 < 12
10 % 3 == 10 / 3
5 < 9 || (7 != 7)
!(1 + 2 == 3 && 10 % 4 > 2)
```

Part 2 Walkthrough

Part 2 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 2 Walkthrough (2)

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

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Ed time :)

Applying what we learned to variables!

What's in a (variable) name or String?

Switch over to Ed and do some experiments (with a partner), then report back on sli.do.

1. What types of characters are "allowed" in Strings?
2. What types of characters are "allowed" in variable names?

sli.do #cse121

Food for Thought!

This is the beginning of a very interesting rabbit hole!

(but also, a decision made by the Java designers)

Whether or not you program for a career,
you will also make decisions like these!

- for example, what's a "valid name"?
- a theme we'll revisit (and something to continuously reflect on!)