

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 26au Lecture Tunes](#) **Instructor:** Miya Natsuhara and Anjali Pal

TAs:	Samrutha	Tamsyn	Owen	Jennie
	William	Cedric	Jameson	Anisha
	Samvedha	Anum	Paul	TJ
	Syreeta	Navya	Gurbax	Ivory
	Ryan	Gene	Tony	Sarah W
	Anant	Margot	Lucas	Avery
	Henry	Sarah K	Alex	
	Reese	Ethan	Jesse	
	Savannah	Evelyn	Matthew	

Agenda (1/5)

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

Announcements, Reminders

- Programming Project 0 releases later today
 - due Tuesday, October 13th at 11:59 PM
- IPL is open! [Schedule & instructions on website.](#)
- Make sure to read the [syllabus](#) if you haven't already!
 - Added more information about participation grade
 - Complete participation tasks by attempting PCM for a day of lecture (even if not all correct), or by attending and engaging in quiz section
 - Must complete 26/32 participation tasks for an E; 22/32 participation tasks for an S

Agenda (2/5)

- Announcements, Reminders
- **Intro Survey Recap** ←
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Intro Survey – things we're excited for! (1/2)

Learning how to code!

- "Learning the fundamentals of code"
- "Learning too Code and hopefully learned how to mod Minecraft"
- "understanding the fundamentals of code and being able to build things from scratch. If I use AI, I want to be able to understand, review, and cross reference. I'll be able to say 'I can code!' and hold conversations about it"
- "Just to be able to understand basic code, and understand why certain things (like websites and stuff) are the way they are and how I can change them"

Intro Survey – things we're excited for! (2/2)

- "I'm excited to get exposure to CSE and see if it interests me."
- "Getting started to learn coding and also working with others to build connections."
- "I'm excited to learn Java, get more familiar with coding in a college setting, and hopefully meet a lot of new people in the class."
- "I want to learn how to create programs for my engineering projects."
- "learning something new outside of any other course of area I've learned before"

Addressing worries from intro survey (1/3)

A common response: things like "Not having any past computer science experience"

You're in the right place! This class expects zero prior knowledge.

Another common response: difficulty, workload, pace, & falling behind, e.g. "Struggling and finding the course too rigorous for me"

- programming *can* be difficult (if it was easy: why have a class?)
- 121 has many support systems (section, IPL, office hours, Ed, etc.)
- if you feel like you're struggling: reach out early!
 - especially with pace of quarter system

Addressing worries from intro survey (2/3)

Grades, competitiveness, this class being a “weed-out” class

- explicitly not the goal of this class
- course designed against this (grade guarantees, retake/override policy, etc.)

Quizzes & final exams

- timed assessments can be stressful – but we’ll build you up slowly!
- will have many practice resources and opportunities!

Addressing worries from intro survey (3/3)

Memorization & problem-solving

- programming isn't *really* about memorizing syntax (or specific facts)
 - programmers look things up all the time! (but, this takes time...)
 - on assessments, we will give you a reference sheet!
- (in our opinion) the hard part of programming is **problem-solving**
 - "breaking a big problem into smaller pieces"
 - "building a strong mental model of how a system works"
 - **we will explicitly work on this as a class!**

Agenda (3/5)

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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 more straightforward, 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”

$$\begin{array}{ccccccc} 5 & + & 2 & * & 4 & & \\ & & \underbrace{} & & & & \\ & & & 8 & & & \\ \underbrace{} & & & & & & \\ & 13 & & & & & \end{array}$$

$$\begin{array}{ccccccc} 1 & + & 2 & / & 3 & & \\ & & \underbrace{} & & & & \\ & & & 0 & & & \\ \underbrace{} & & & & & & \\ & 1 & & & & & \end{array}$$

$$\begin{array}{ccccccc} 6 & * & 5 & \% & 7 & & \\ & & \underbrace{} & & & & \\ & & 30 & & & & \\ & & & \underbrace{} & & & \\ & & & 2 & & & \end{array}$$

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:

- `ints` can be converted to `doubles` (add `.0`)
- `ints` and `doubles` can be converted to `Strings` (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

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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

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

"4"

"15"

"4hello"

"4hello15"

"4hello1510"

The diagram illustrates the evaluation of the expression `2 + 2 + "hello" + 3 * 5 + "10"` step by step. It uses purple brackets and text to show how intermediate results are concatenated into strings. First, `2 + 2` is evaluated to the string `"4"`. Then, `3 * 5` is evaluated to the string `"15"`. Next, the string `"4"` is concatenated with `"hello"` to form `"4hello"`. This is then concatenated with `"15"` to form `"4hello15"`. Finally, `"4hello15"` is concatenated with `"10"` to produce the final result `"4hello1510"`.

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Work on Expressions and Types Practice (1)

- On the Ed lesson for today, and on your handout
- 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 (blank)

Part 1 Walkthrough (steps)

"Hello" + "world"
"Helloworld"

5 * 3 + 1.0
15.0
16.0

8 / 3 * 2.0
2.0
4.0

8.0 / 3.0 * 2.0
2.666...
5.333...

"1" + "2" + "3"
"12"
"123"

1 + 2 + "3"
"3"
"33"

"1" + "2" + (3 + 4)
"12" "7"
"127"

Work on Expressions and Types Practice (2)

- On the Ed lesson for today, and on your handout
- 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 (blank)

Part 2 Walkthrough (steps 1)

$\underbrace{5 * 3}_{15} < 12$
15 < 12
false

$\underbrace{10 \% 3}_1 == 10 / 3$
1 == $\underbrace{10 / 3}_3$
1 == 3
false

$5 < 9 \ || \ \underbrace{(7 \neq 7)}_{\text{false}}$
 $\underbrace{5 < 9}_{\text{true}} \ || \ \text{false}$
true || false
true

Part 2 Walkthrough (steps 2)

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

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

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

!(3 == 3 && false)

!(true && false)

!(false)
true

Agenda (5/5)

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- **Combining Variables and Expressions** ←

Ed time :)

Applying what we learned to variables!