CSE 121 Lesson 2: Expressions and Types

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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 9\textsuperscript{th}
  • 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
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, Modulo, Division

Addition (and Concatenation), Subtraction

If multiple operators at the same level?

Evaluate subexpressions from left to right!
Example

\[1 + 2 \times 3\]
\[= 1 + 6\]
\[= 7\]

\[(1 + 2) \times 3\]
\[= 3 \times 3\]
\[= 9\]
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

\[ 5 + 2 \times 4 \]
\[ 1 + 2 \div 3 \]
\[ 6 \times 5 \mod 7 \]
Part 1 Walkthrough

5 + 2 * 4 = 8
13

1 + 2 / 3 = 0
1

6 * 5 % 7 = 30
2
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:
• 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!)
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

\[ 2 + 2 + "hello" + 3 \times 5 + "10" \]

"4" + "hello" + "15" = "4hello1510"
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

Expressions:

\[ 5 \times 3 + 1.0 \]
\[ 8 \div 3 \times 2.0 \]
\[ 8.0 \div 3 \times 2 \]
\[ "Hello" + "world" \]
\[ 1 + "2" + 3 \]
\[ 1 + 2 + "3" \]
\[ 1 + "2" + (3 + 4) \]
### Part 2 Walkthrough

<table>
<thead>
<tr>
<th>Expression</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>5 * 3 + 1.0</code></td>
<td>15.0</td>
</tr>
<tr>
<td><code>8 / 3 * 2.0</code></td>
<td>2.0</td>
</tr>
<tr>
<td><code>8.0 / 3 * 2.0</code></td>
<td>2.666...</td>
</tr>
<tr>
<td><code>'Hello' + 'world'</code></td>
<td>&quot;Helloworld&quot;</td>
</tr>
<tr>
<td><code>'1' + '2' + '3'</code></td>
<td>&quot;123&quot;</td>
</tr>
<tr>
<td><code>1 + 2 + '3'</code></td>
<td>&quot;33&quot;</td>
</tr>
<tr>
<td><code>'1' + '2' + (3 + 4)</code></td>
<td>&quot;127&quot;</td>
</tr>
</tbody>
</table>
(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

\[ 1 + 2 \times 3 \neq (1 + 2) \times 3 \]

\[ 1 + 6 \neq 3 \times 3 \]

\[ 7 \neq 9 \]

true
Work on Expressions/Types Practice Problems

Part 3

• Ed lesson linked from the course calendar
  \[5 \times 3 < 12\]

• Work with the folks around you!
  \[10 \mod 3 == 10 / 3\]

• TAs and I will be walking around to help
  \[5 < 9 || (7 != 7)\]

  \!(1 + 2 == 3 && 10 \mod 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:  \( \text{int } x; \)
Initialization: \( x = 30; \)

Or all in one line: \( \text{int } x = 30; \)
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: not tested content. Just food for thought :)

Lesson 1 - Spring 2024
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!)