COMPILERS 10/11/22
**Register Allocation**

\[ x = 1 \]
\[ y = x + 2 \]
\[ \cdots \]
\[ \text{mpx} \]

\[ x = 10 \quad \text{x is live} \]
\[ \vdots \]
\[ \sim x + 3 \]

**Liveness of a Variable:**

- \( x \) is live immediately after an instruction `if` it's value might be read later (before that value is changed).

\[ x = 10 \quad \text{x is live} \]
\[ x = 7 \quad \text{x is live} \]
\[ \sim x + 3 \]

Simultaneously live vars must occupy different locations.
\[ a = 30 \]
\[ b = a \]
\[ c = -a \]
\[ d = b - c \]
\[ b = a + d \]
\[ c = b + c \]

\[
\begin{align*}
\text{movq} & \; 30, \; a \\
\text{movq} & \; a, \; b \\
\text{movq} & \; a, \; c \\
\text{negq} & \; c \\
\text{movq} & \; b, \; d \\
\text{subq} & \; c, \; d \\
\text{movq} & \; a, \; b \\
\text{addq} & \; d, \; b \\
\text{addq} & \; b, \; c \\
\end{align*}
\]

\[ \text{LIVE}_{\text{AFTER}}(i) = \text{LIVE}_{\text{BEFORE}}(i) \cap i \in C \]
\[ \text{LIVE}_{\text{AFTER}}(C(0)) = \emptyset \]
\[ \text{LIVE}_{\text{BEFORE}}(C) = (\text{LIVE}_{\text{AFTER}}(i) \setminus w(i)) \cup R(i) \]

INTERFERENCE

VARIABLE INTERFERENCE

IF THEY MUST LIVE 
(IN DIFFERENT LOCATIONS)