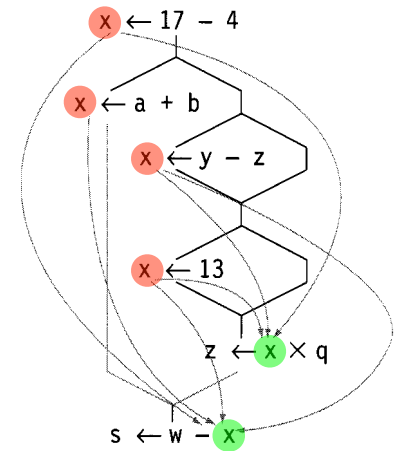


## Def-Use Chains

How many definitions and uses are here?

What are the possible values of  $x$  in its two uses?

How can we improve a program if we have this info?



## Reaching Definition

- Reach( $n$ ) definition (how large can a set be?)
- Local information
- Data flow equation
- Initialization
- Convergence

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## Dead Code Elimination

all stmts are unmarked  
 worklist  $w = \{i/o, \text{branches, calls, volatile ops}\}$   
 mark those  
 while  $w \neq \text{empty}$   
   extract stmt  $x$  from  $w$   
   for all  $y$ , s.t.  $(y, x)$  in def-use  
     if  $y$  is unmarked  
       mark  $y$   
       add  $y$  to  $w$   
 remove all unmarked stmts

$w: a \leftarrow a + 1$   
 $x: c \leftarrow a * b$   
 $y: c \leftarrow b + d$   
 $z: \text{print}(c)$

Which statements are useless (dead)?

What are the def-use chain?

Can we infer the dead code automatically?

What is the cost of the algorithm?