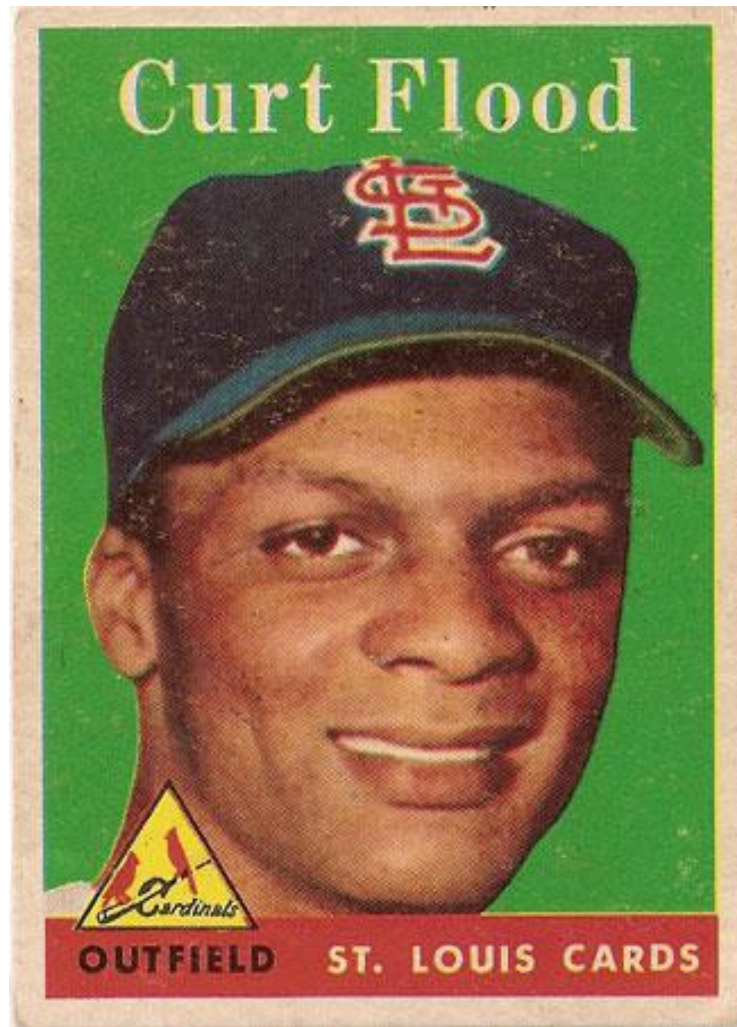


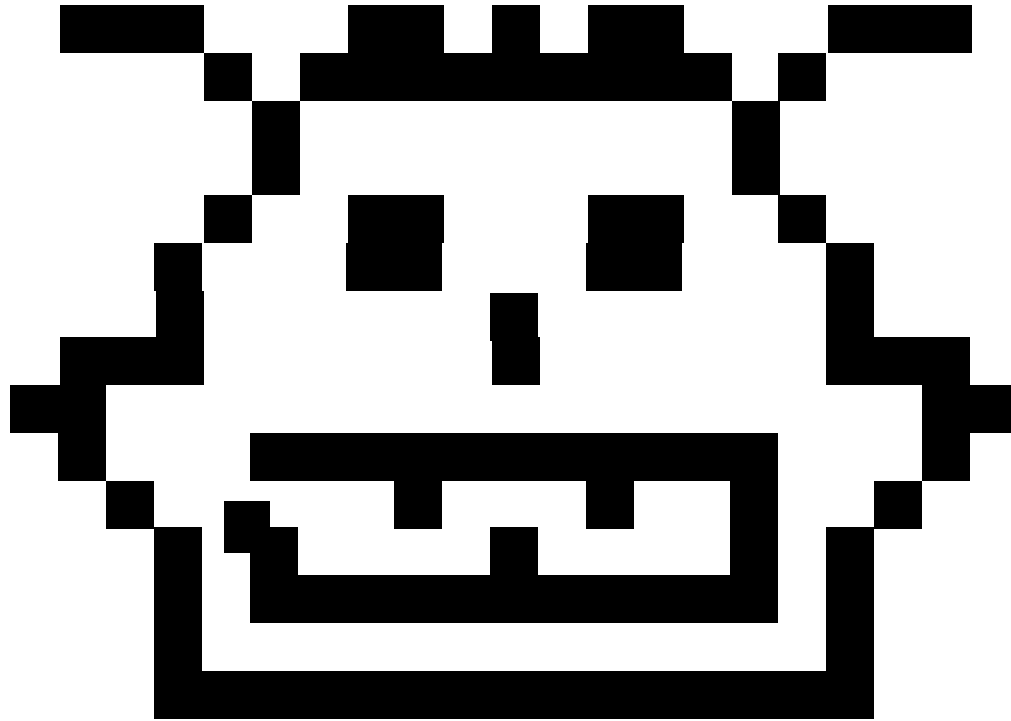
# Flooding



# Flooding

- If the spot on the drawing is not empty
  - return
- Color the spot using  $c$
- Create a to-do list with spot as its element
- While the to-do list is not empty
  - Pop an element from the to-do list and assign it to  $v$
  - If  $v$ 's left is empty, paint it and add to to-do list
  - If  $v$ 's right is empty, paint it and add to to-do list
  - If  $v$ 's above is empty, paint it and add to to-do list
  - If  $v$ 's below is empty, paint it and add to to-do list

Example

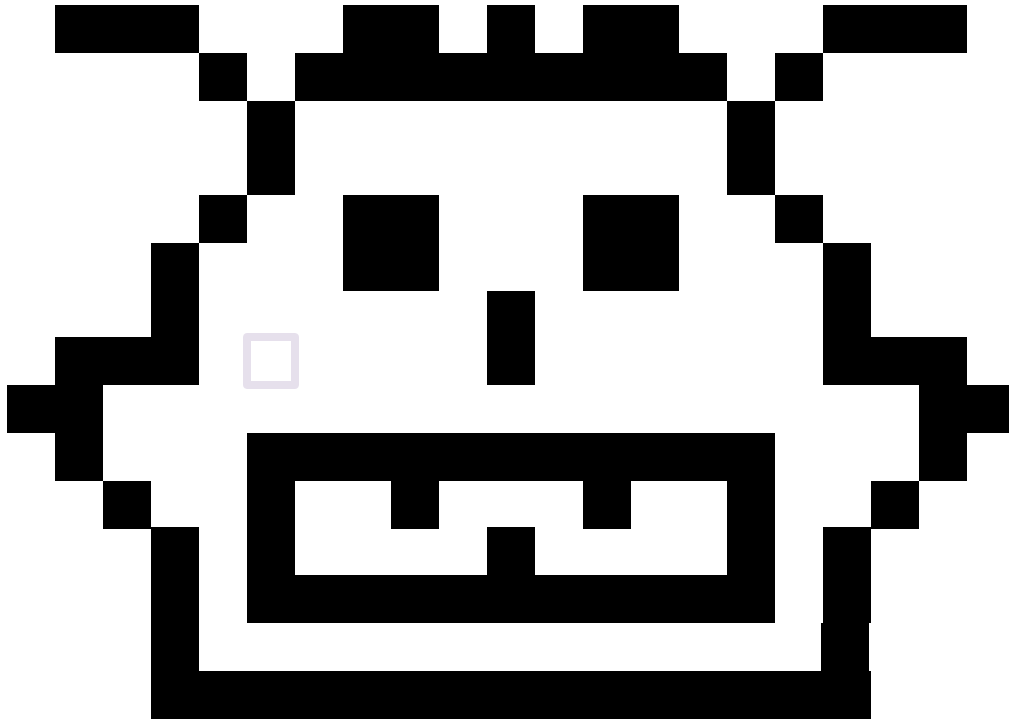


Suppose spot is ( 6, 12 )



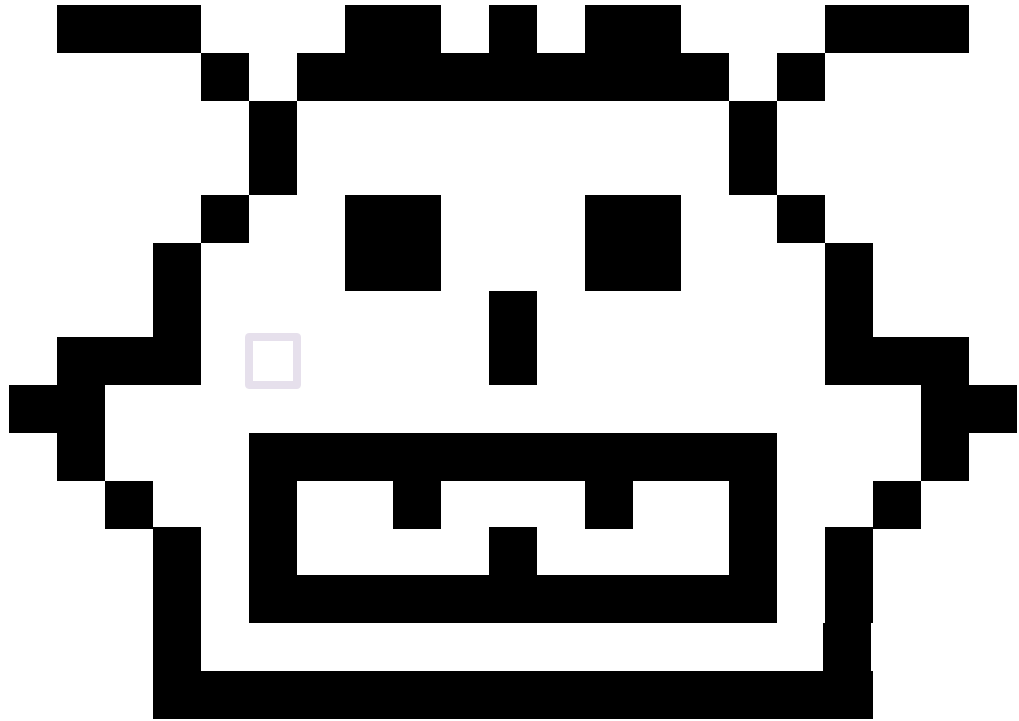
spot on drawing is not empty, so no flooding to perform

Suppose spot is ( 7, 7 )

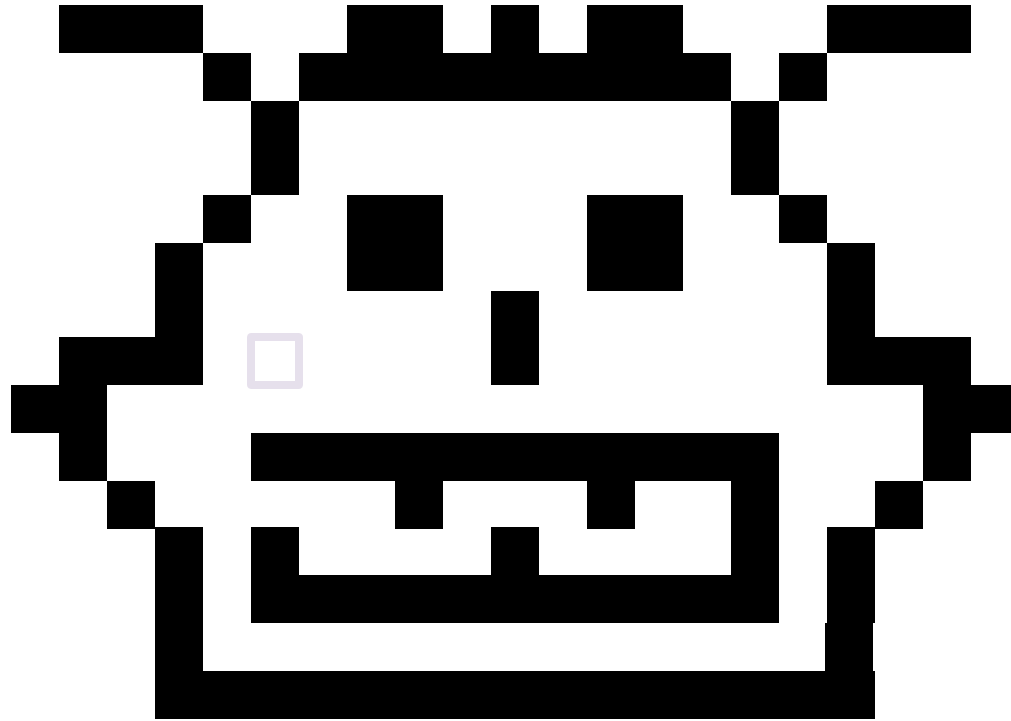


spot on drawing is empty, so there is flooding to perform

Flood drawing starting at spot ( 7, 7 ) using **c**



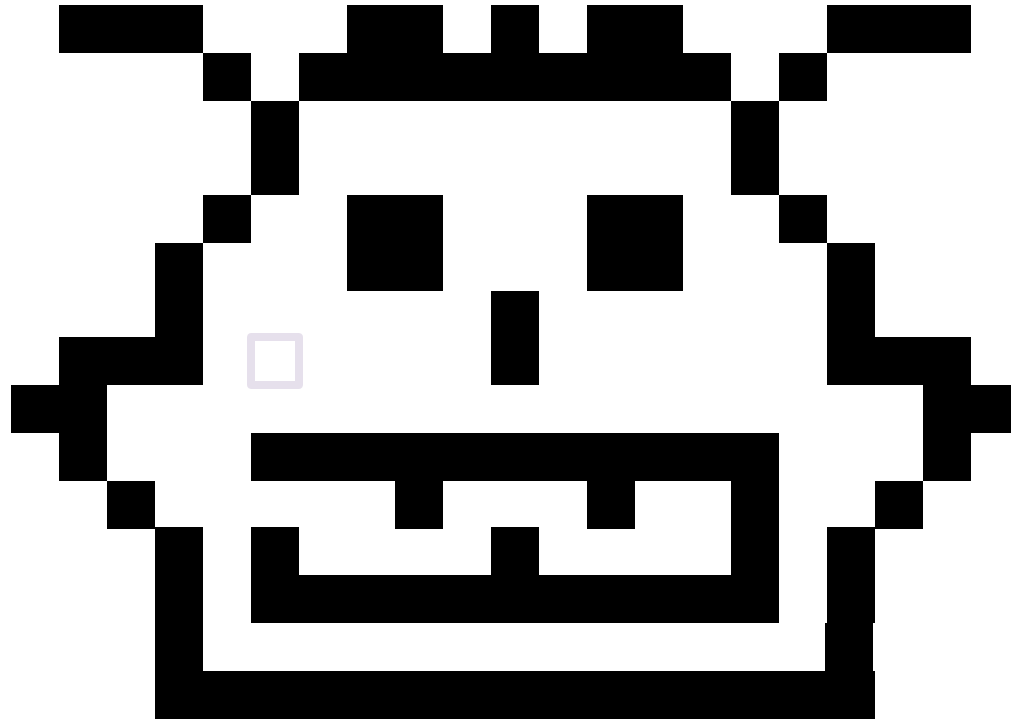
Flood drawing starting at spot ( 7, 7 ) using **c**



spot (7,7)



Flood drawing starting at spot ( 7, 7 ) using **c**

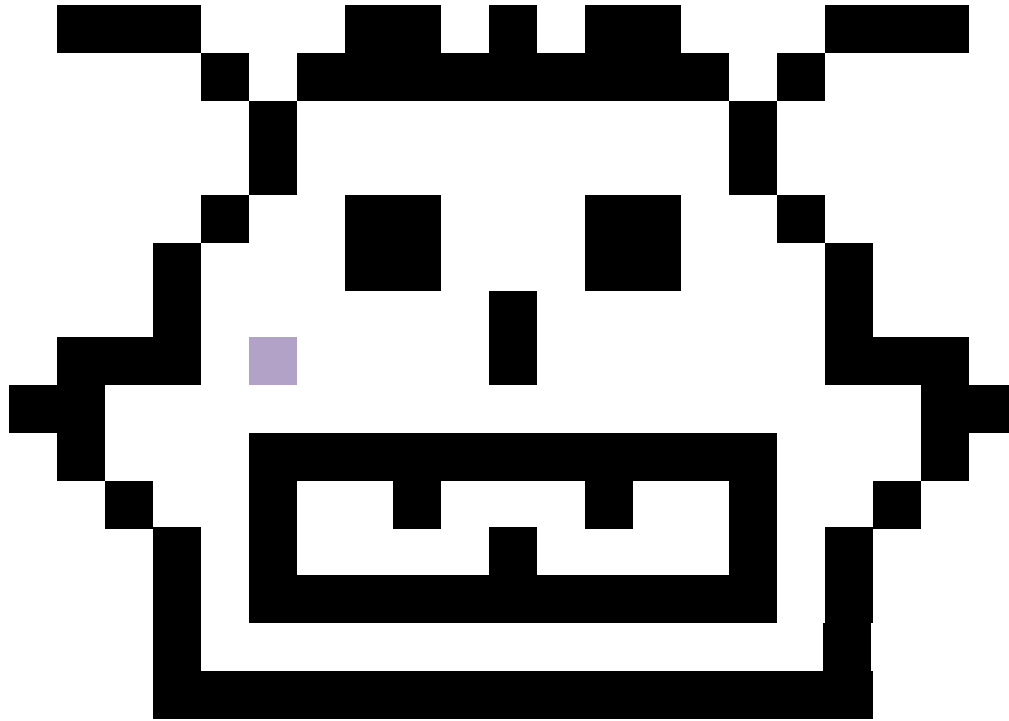


spot (7,7)

c 



# Paint spot



spot (7,7)



# Create to-do list



spot (7,7)

c 

to-do list

•

# Add spot to to-do list



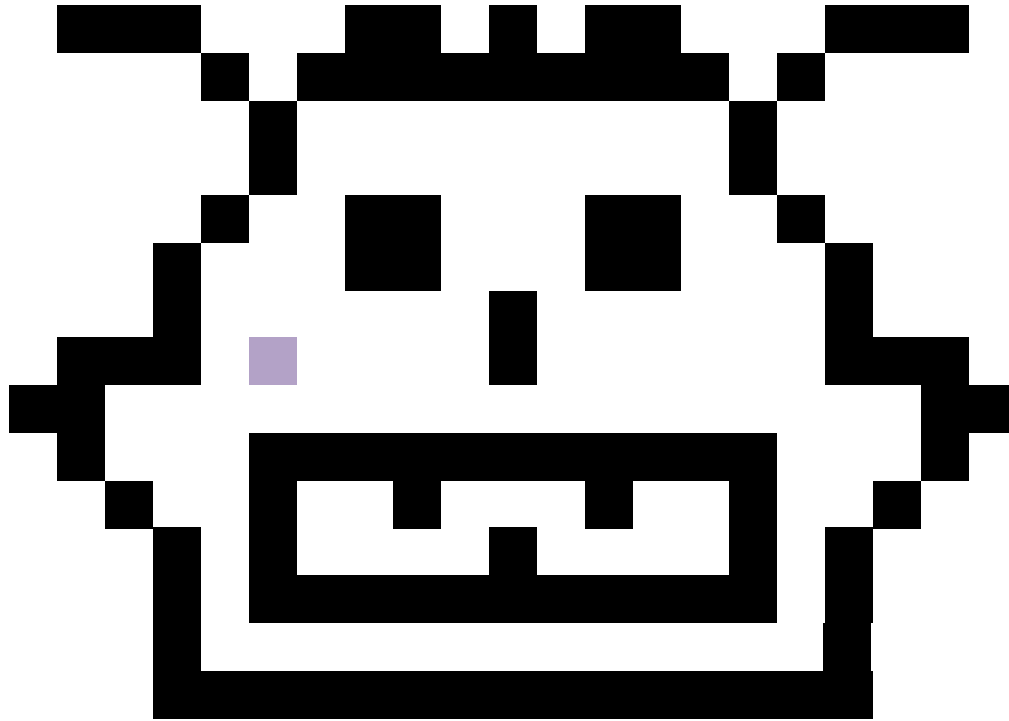
spot (7,7)

c 

to-do list

- (7,7)

# Loop while to-do list is not empty



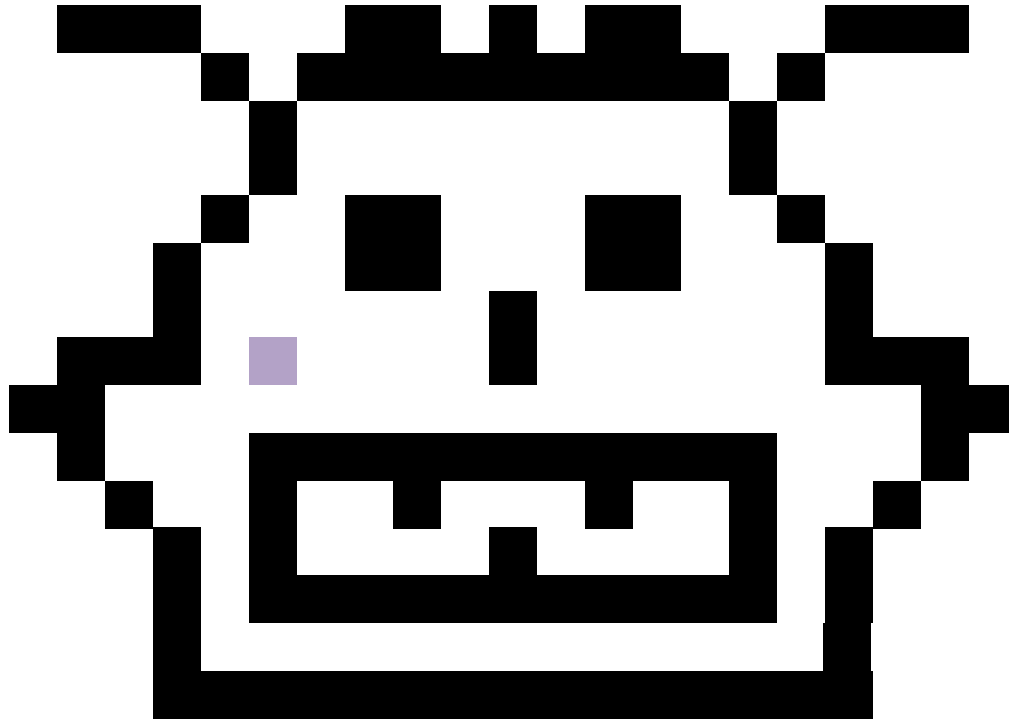
spot (7,7)

c 

to-do list

- (7,7)

# Loop while to-do list is not empty



spot (7,7)

c 

to-do list

- (7,7)

Pop an element from the to-do list and assign it to  $v$

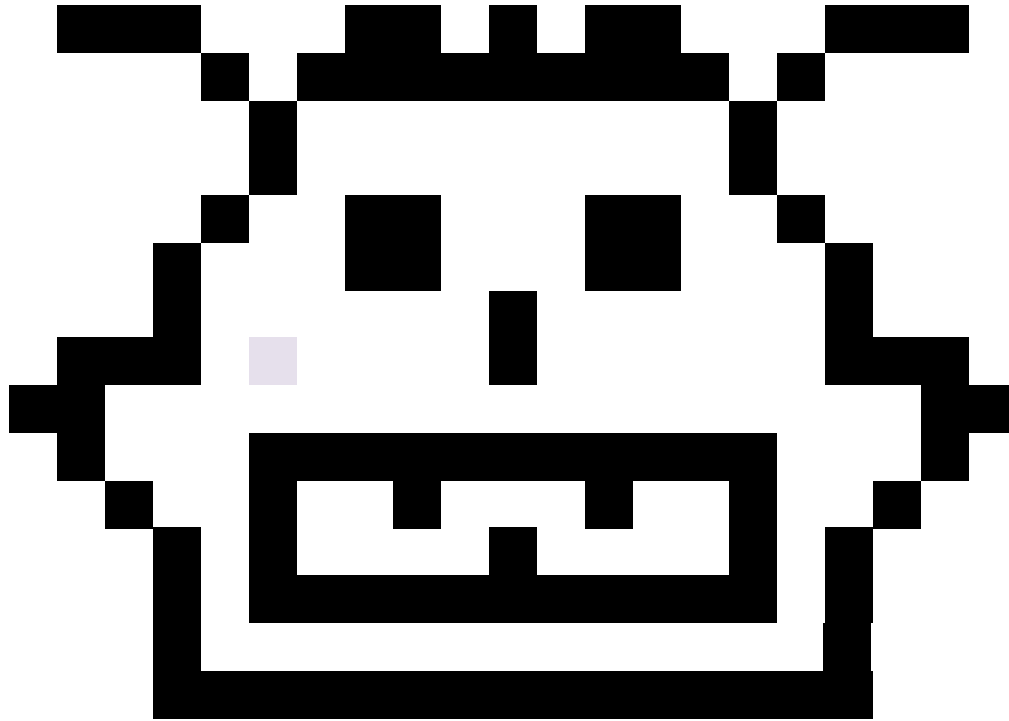
If  $v$ 's left is empty, paint it and add to to-do list

If  $v$ 's right is empty, paint it and add to to-do list

If  $v$ 's above is empty, paint it and add to to-do list

If  $v$ 's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,7)

to-do list

•

Pop an element from the to-do list and assign it to v

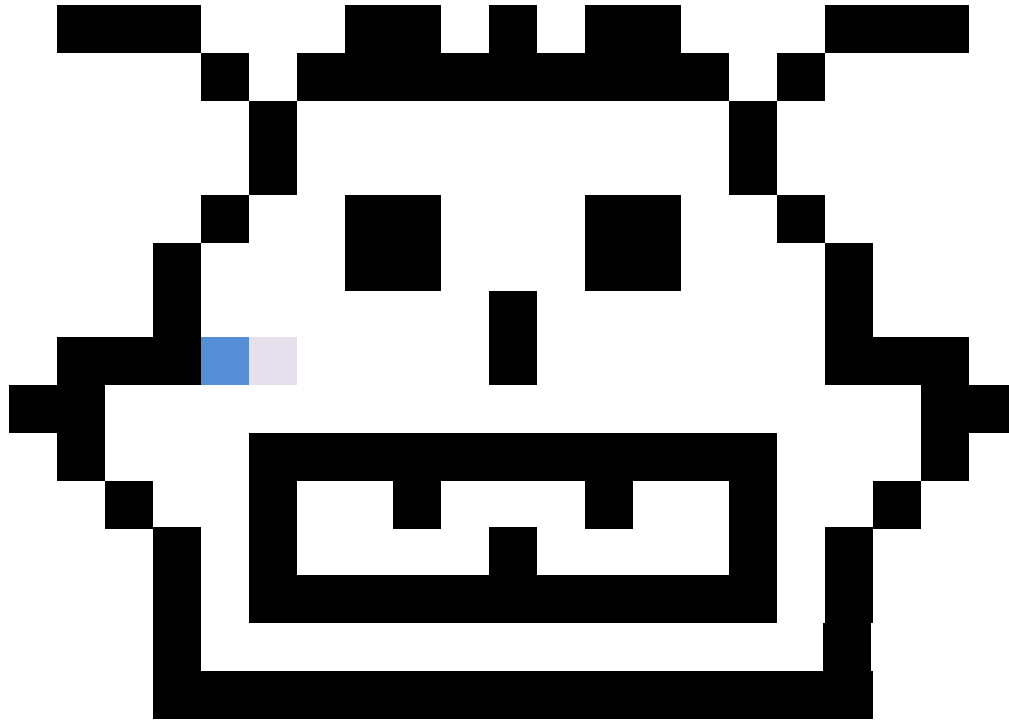
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,7)

to-do list

•

Pop an element from the to-do list and assign it to v

If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,7)

to-do list

- (6,7)

Pop an element from the to-do list and assign it to v

If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list



# Loop while to-do list is not empty



spot (7,7)

c 

v (7,7)

to-do list

- (6,7)

Pop an element from the to-do list and assign it to v

If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,7)

to-do list

- (6,7)
- (8,7)

Pop an element from the to-do list and assign it to v

If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,7)

to-do list

- (6,7)
- (8,7)

Pop an element from the to-do list and assign it to v

If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,7)

to-do list

- (6,7)
- (8,7)
- (7,6)

Pop an element from the to-do list and assign it to v

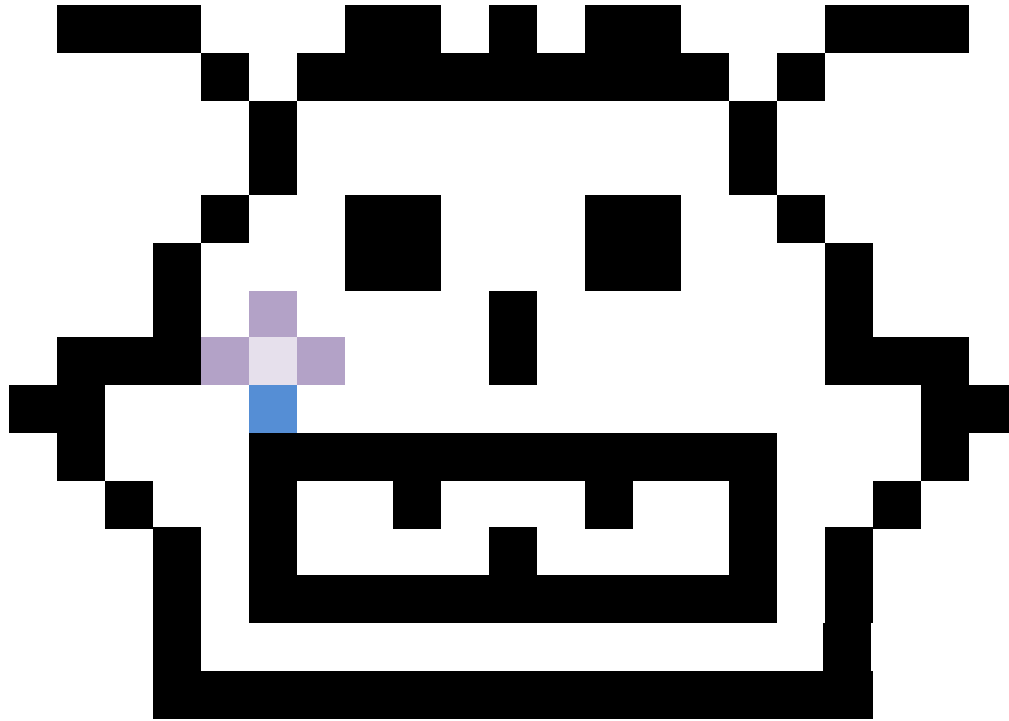
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,7)

to-do list

- (6,7)
- (8,7)
- (7,6)

Pop an element from the to-do list and assign it to v

If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,7)

to-do list

- (6,7)
- (8,7)
- (7,6)
- (7,8)

Pop an element from the to-do list and assign it to v

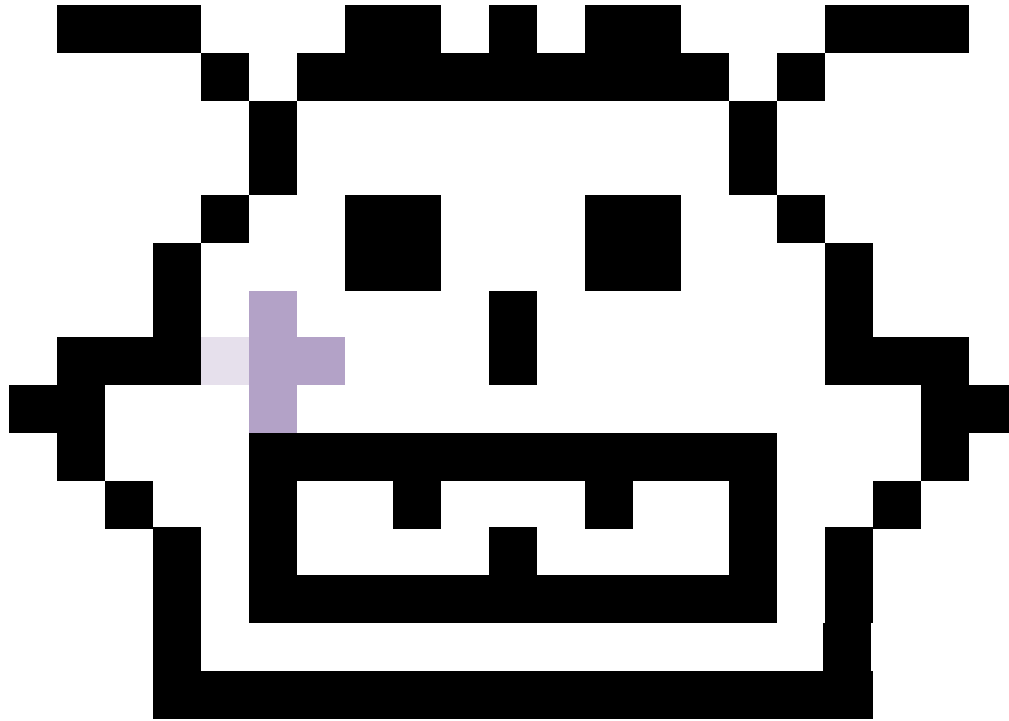
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (6,7)

to-do list

- (8,7)
- (7,6)
- (7,8)

Pop an element from the to-do list and assign it to v

If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (6,7)

to-do list

- (8,7)
- (7,6)
- (7,8)

Pop an element from the to-do list and assign it to v

If v's left is empty, paint it and add to to-do list

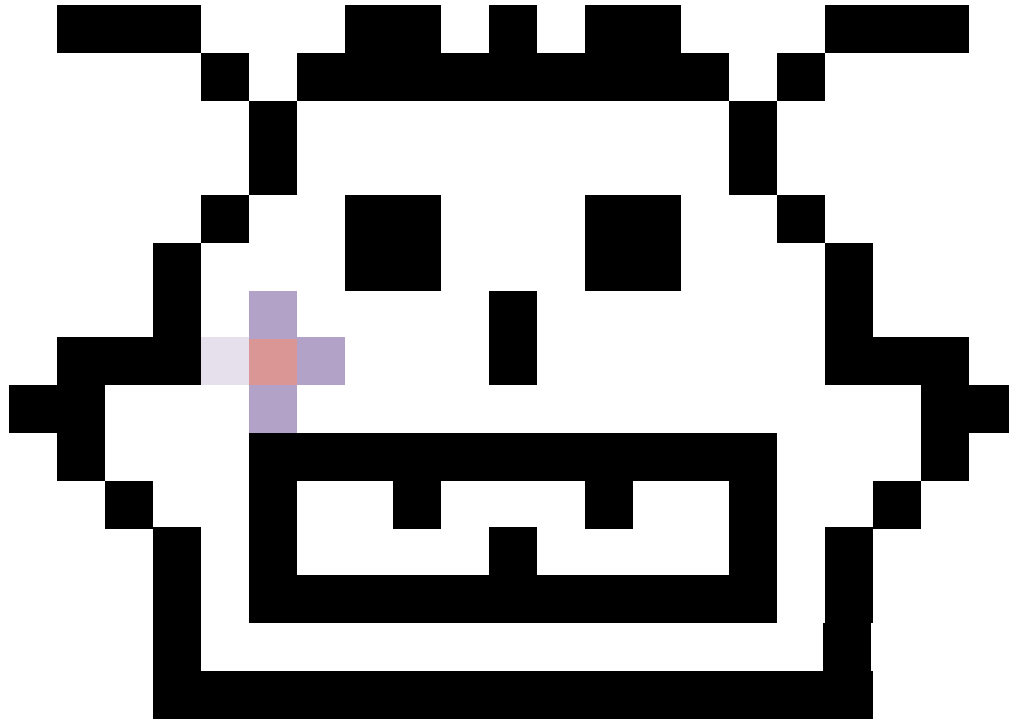
If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list



# Loop while to-do list is not empty



spot (7,7)

c 

v (6,7)

to-do list

- (8,7)
- (7,6)
- (7,8)

Pop an element from the to-do list and assign it to v

If v's left is empty, paint it and add to to-do list

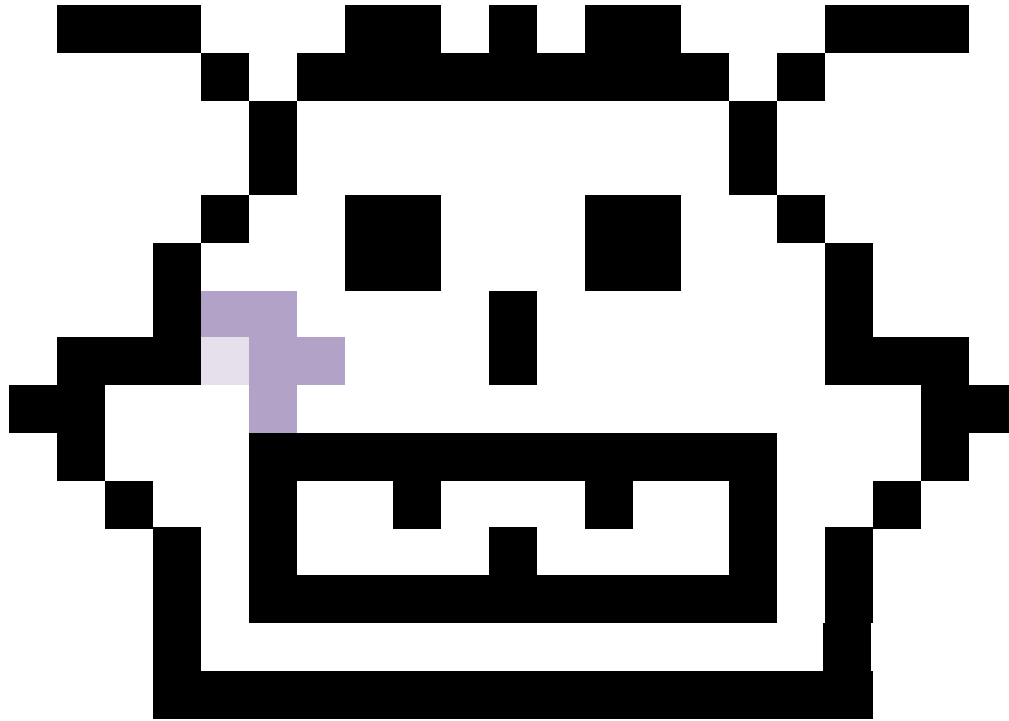
If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list



# Loop while to-do list is not empty



spot (7,7)

c 

v (6,7)

to-do list

- (8,7)
- (7,6)
- (7,8)
- (6,6)

Pop an element from the to-do list and assign it to v

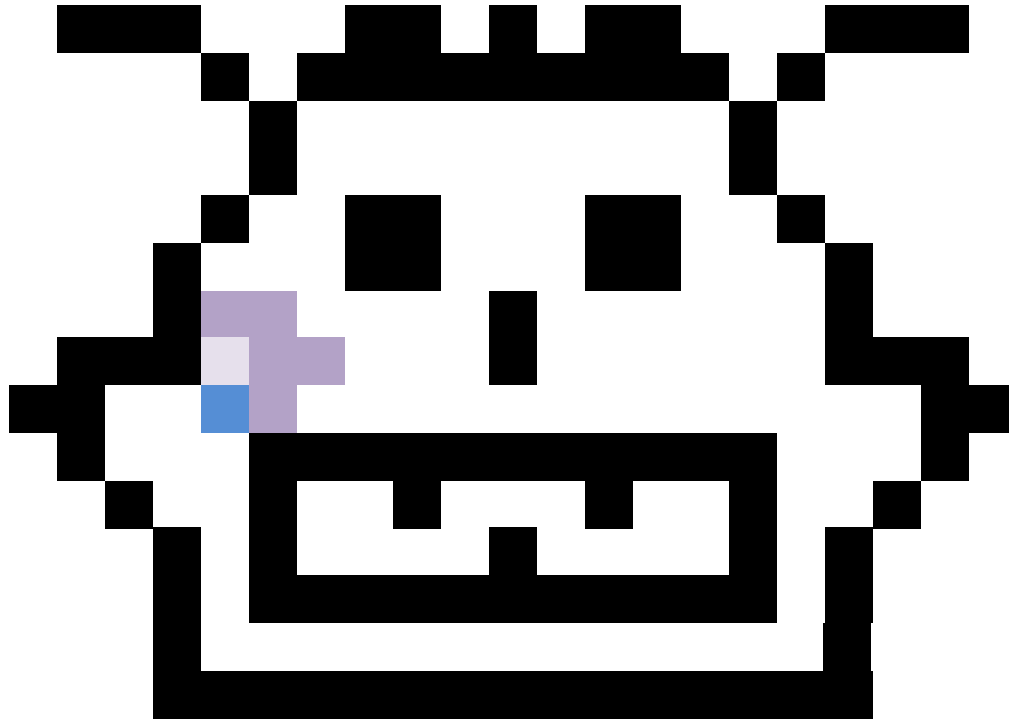
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (6,7)

to-do list

- (8,7)
- (7,6)
- (7,8)
- (6,6)

Pop an element from the to-do list and assign it to v

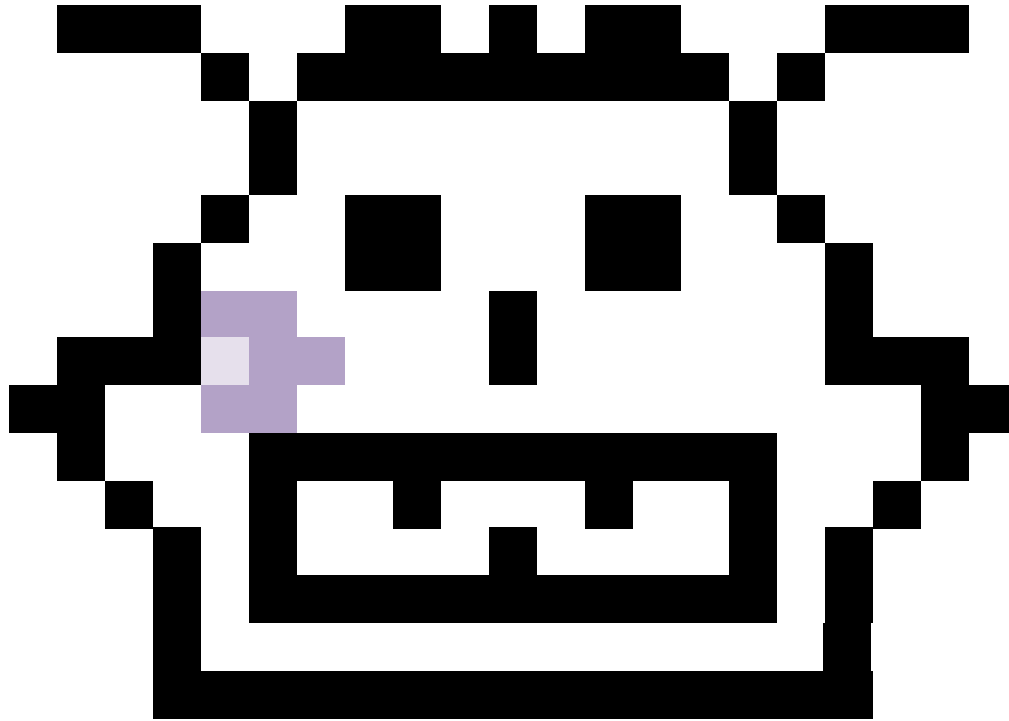
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (6,7)

to-do list

- (8,7)
- (7,6)
- (7,8)
- (6,6)
- (6,8)

Pop an element from the to-do list and assign it to v

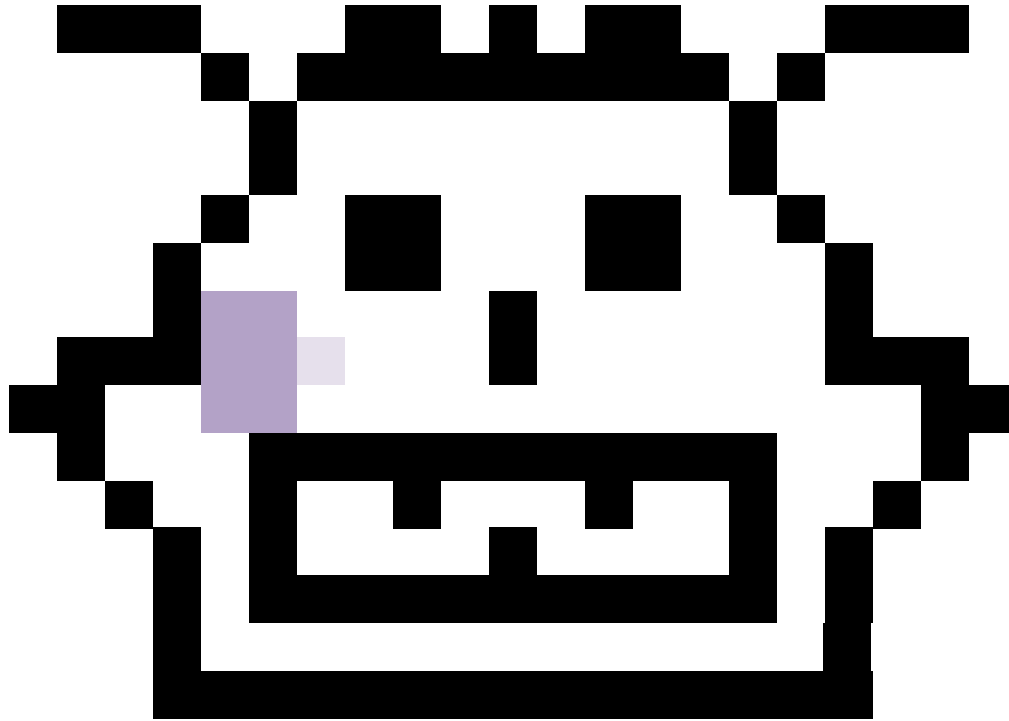
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (8,7)

to-do list

- (7,6)
- (7,8)
- (6,6)
- (6,8)

Pop an element from the to-do list and assign it to v

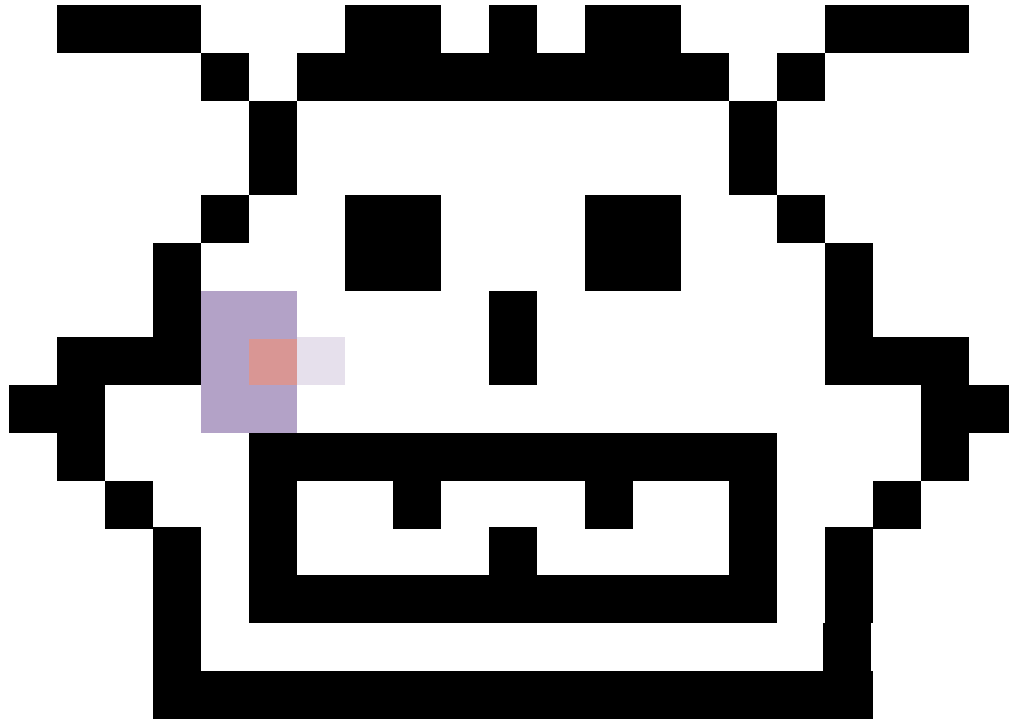
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (8,7)

to-do list

- (7,6)
- (7,8)
- (6,6)
- (6,8)

Pop an element from the to-do list and assign it to v

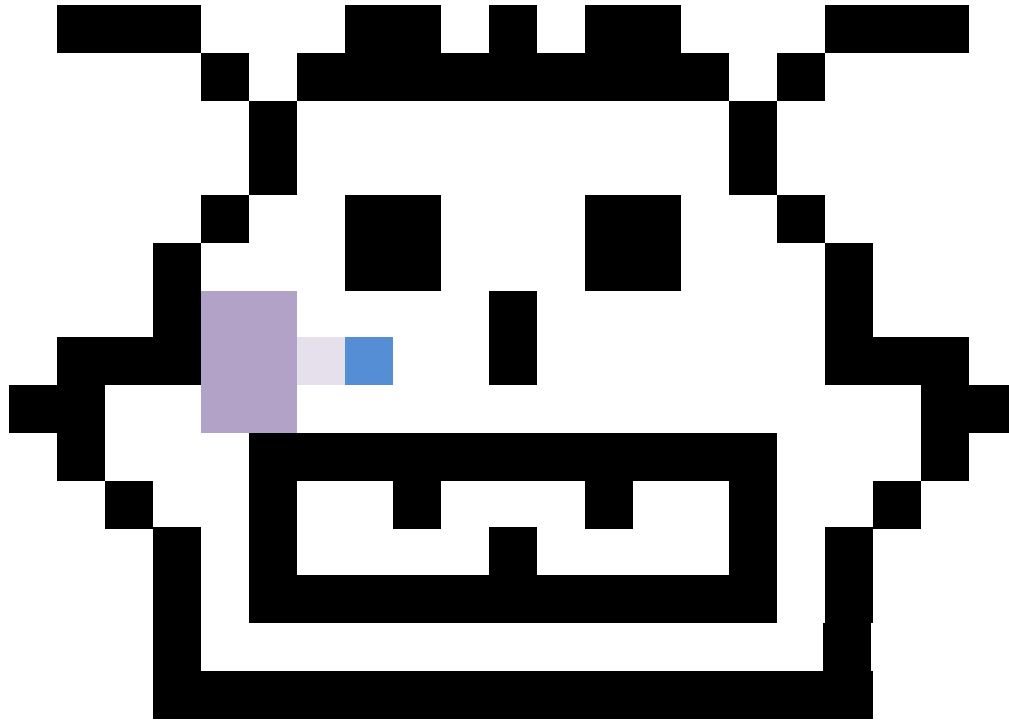
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (8,7)

to-do list

- (7,6)
- (7,8)
- (6,6)
- (6,8)

Pop an element from the to-do list and assign it to v

If v's left is empty, paint it and add to to-do list

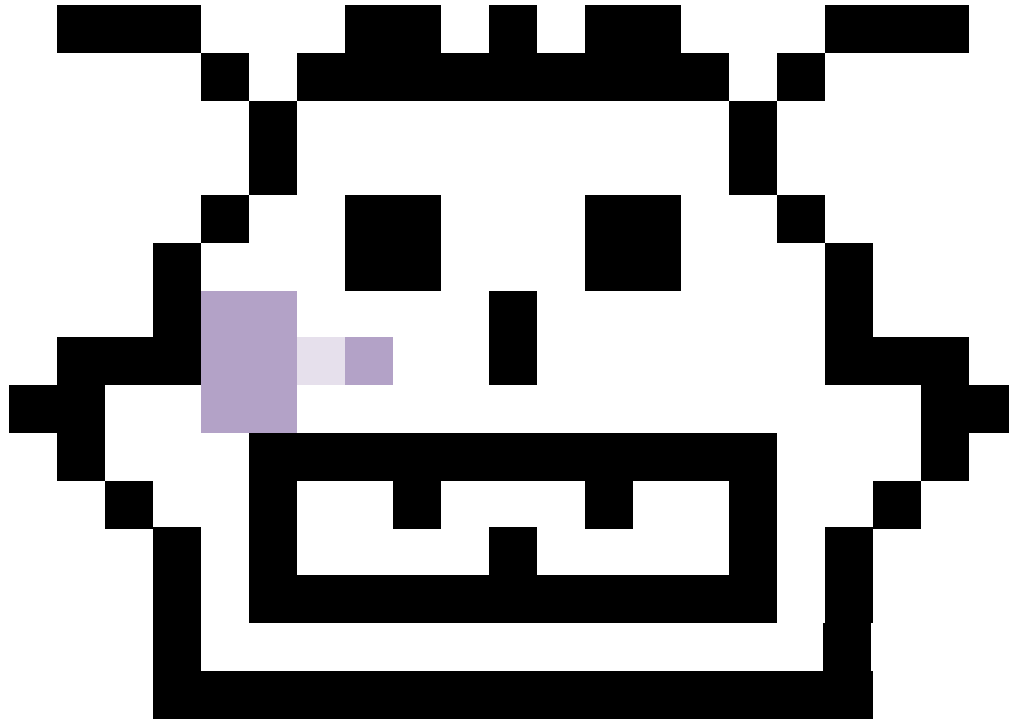
If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list



# Loop while to-do list is not empty



spot (7,7)

c 

v (8,7)

to-do list

- (7,6)
- (7,8)
- (6,6)
- (6,8)
- (9,7)

Pop an element from the to-do list and assign it to v

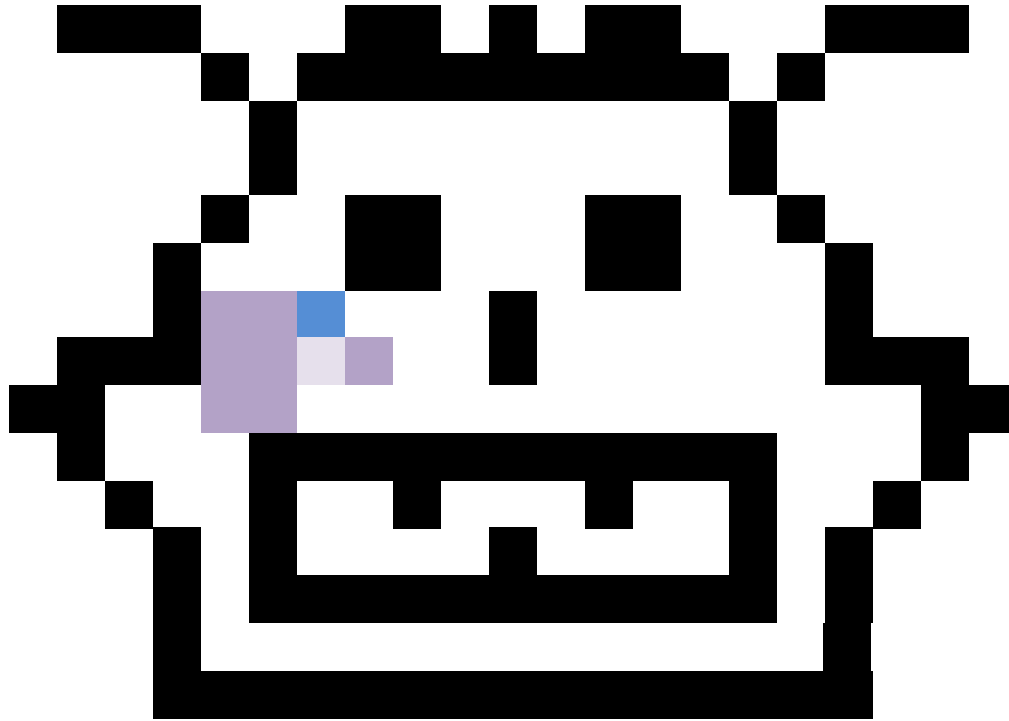
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (8,7)

to-do list

- (7,6)
- (7,8)
- (6,6)
- (6,8)
- (9,7)

Pop an element from the to-do list and assign it to v

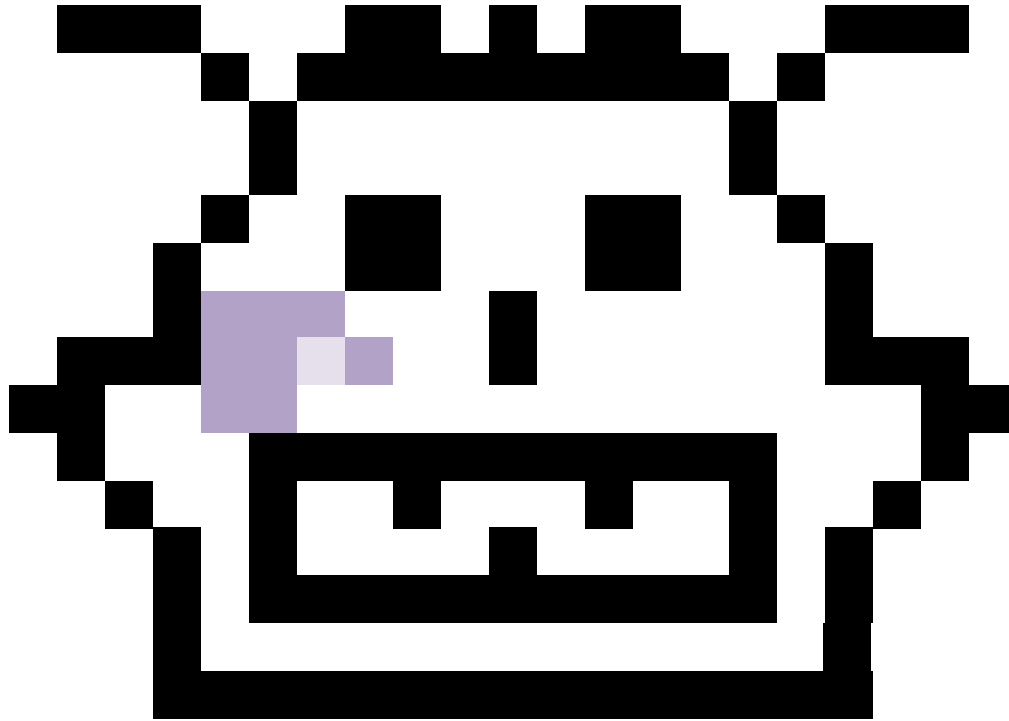
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (8,7)

to-do list

- (7,6)
- (7,8)
- (6,6)
- (6,8)
- (9,7)
- (8,6)

Pop an element from the to-do list and assign it to v

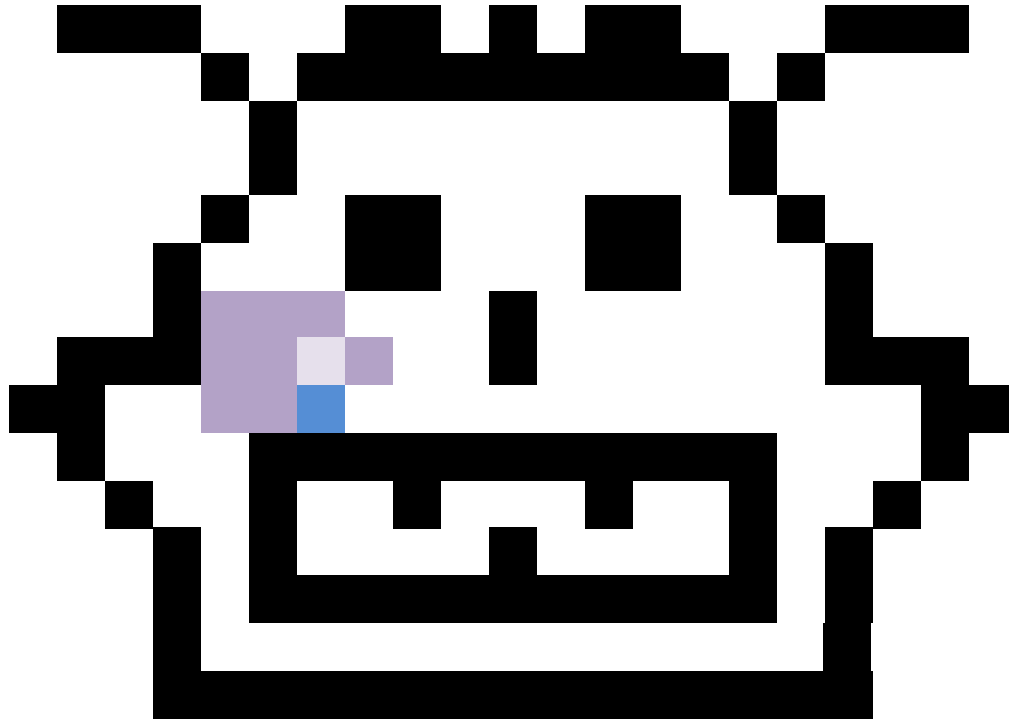
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (8,7)

to-do list

- (7,6)
- (7,8)
- (6,6)
- (6,8)
- (9,7)
- (8,6)

Pop an element from the to-do list and assign it to v

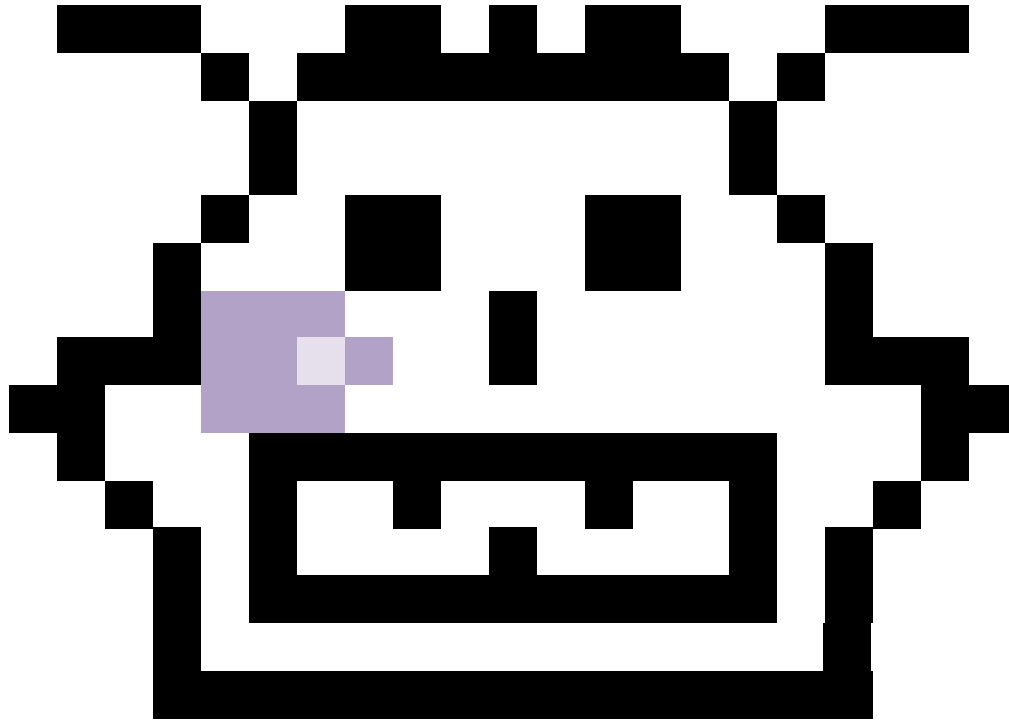
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c  v

v (8,7)

to-do list

- (7,6)
- (7,8)
- (6,6)
- (6,8)
- (9,7)
- (8,6)
- (8,8)

Pop an element from the to-do list and assign it to v

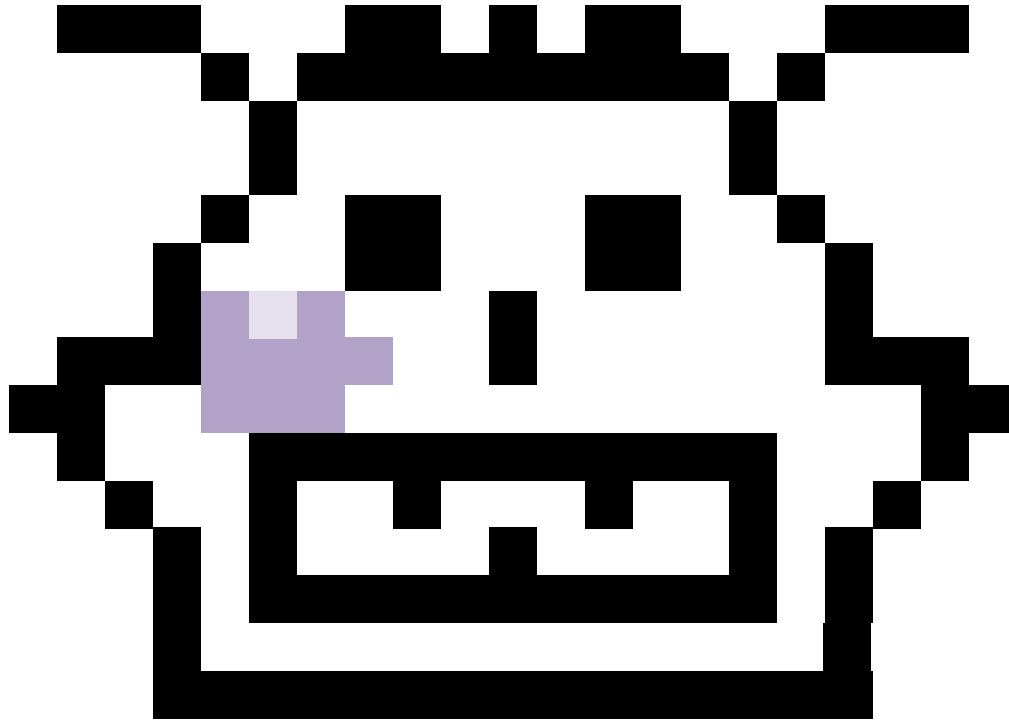
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,6)

to-do list

- (7,8)
- (6,6)
- (6,8)
- (9,7)
- (8,6)
- (8,8)

Pop an element from the to-do list and assign it to v

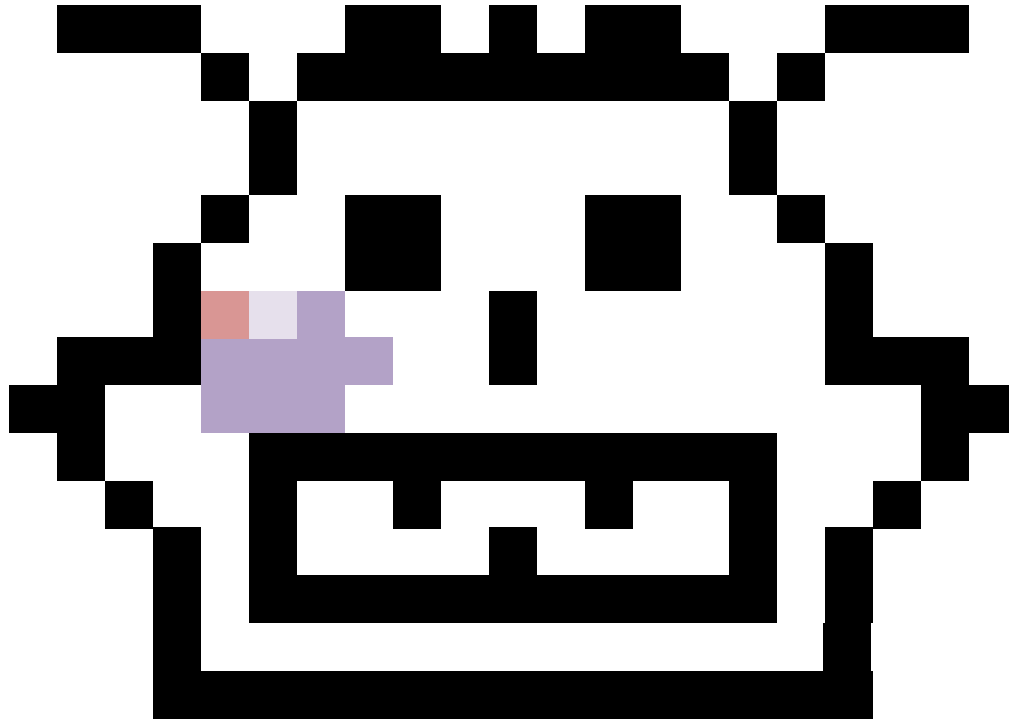
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,6)

to-do list

- (7,8)
- (6,6)
- (6,8)
- (9,7)
- (8,6)
- (8,8)

Pop an element from the to-do list and assign it to v

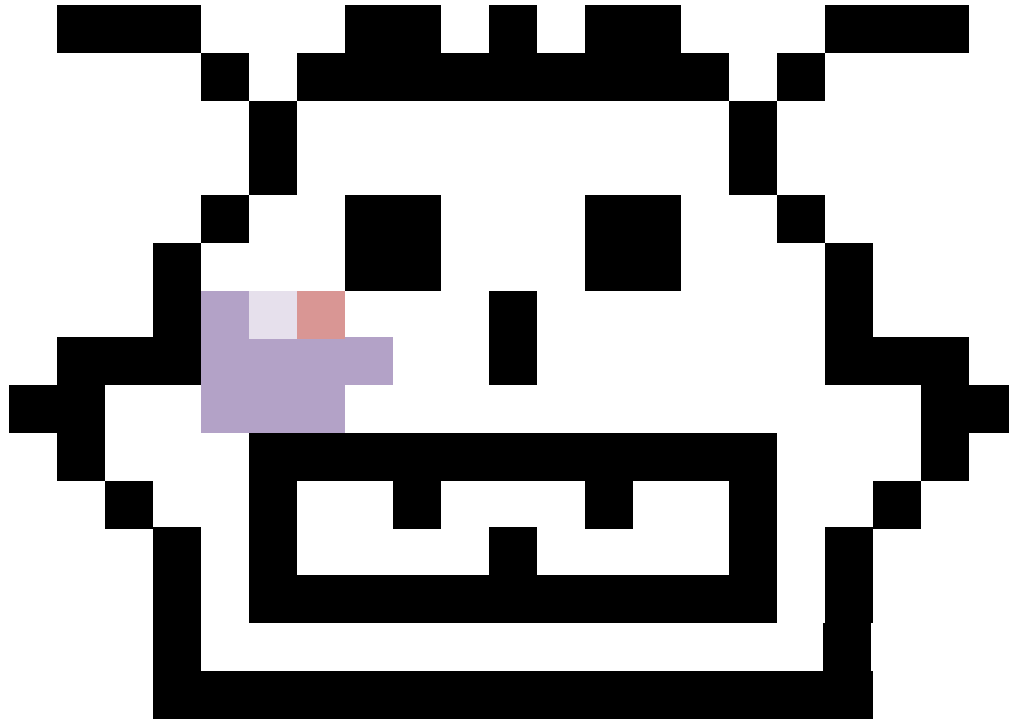
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,6)

to-do list

- (7,8)
- (6,6)
- (6,8)
- (9,7)
- (8,6)
- (8,8)

Pop an element from the to-do list and assign it to v

If v's left is empty, paint it and add to to-do list

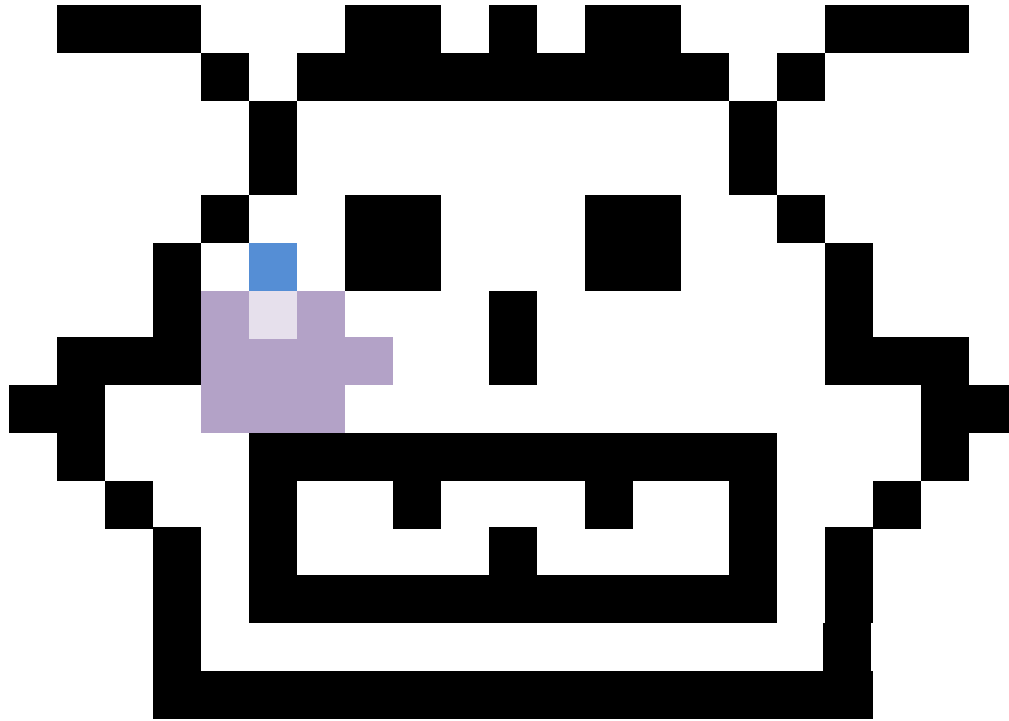
If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list



# Loop while to-do list is not empty



spot (7,7)

c 

v (7,6)

to-do list

- (7,8)
- (6,6)
- (6,8)
- (9,7)
- (8,6)
- (8,8)

Pop an element from the to-do list and assign it to v

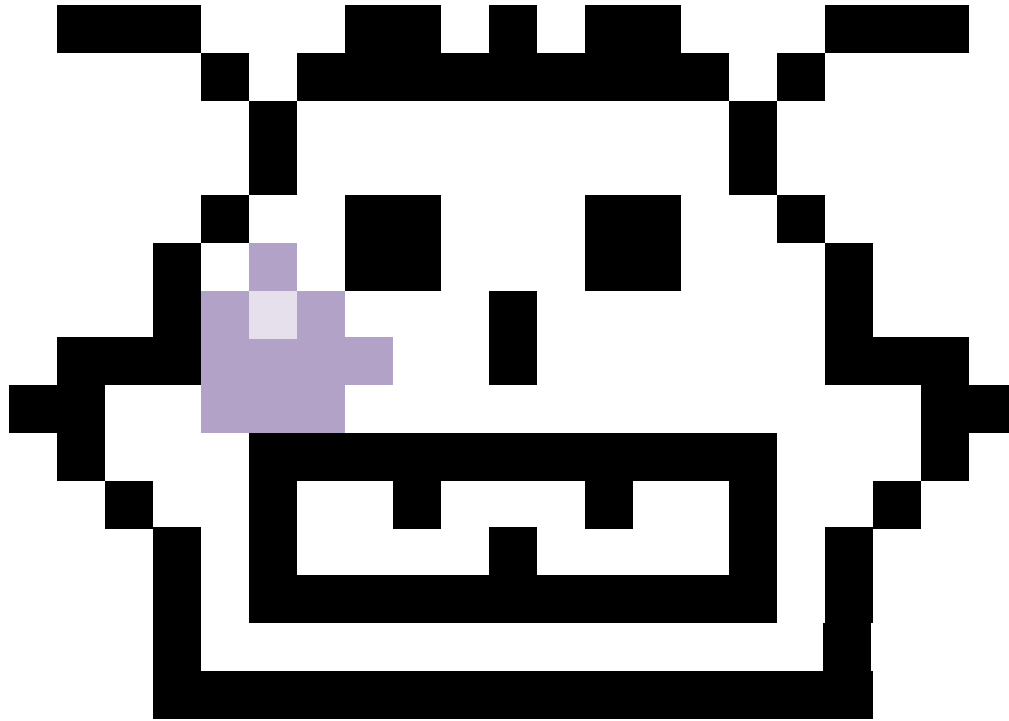
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,6)

to-do list

- (7,8)
- (6,6)
- (6,8)
- (9,7)
- (8,6)
- (8,8)
- (7,5)

Pop an element from the to-do list and assign it to v

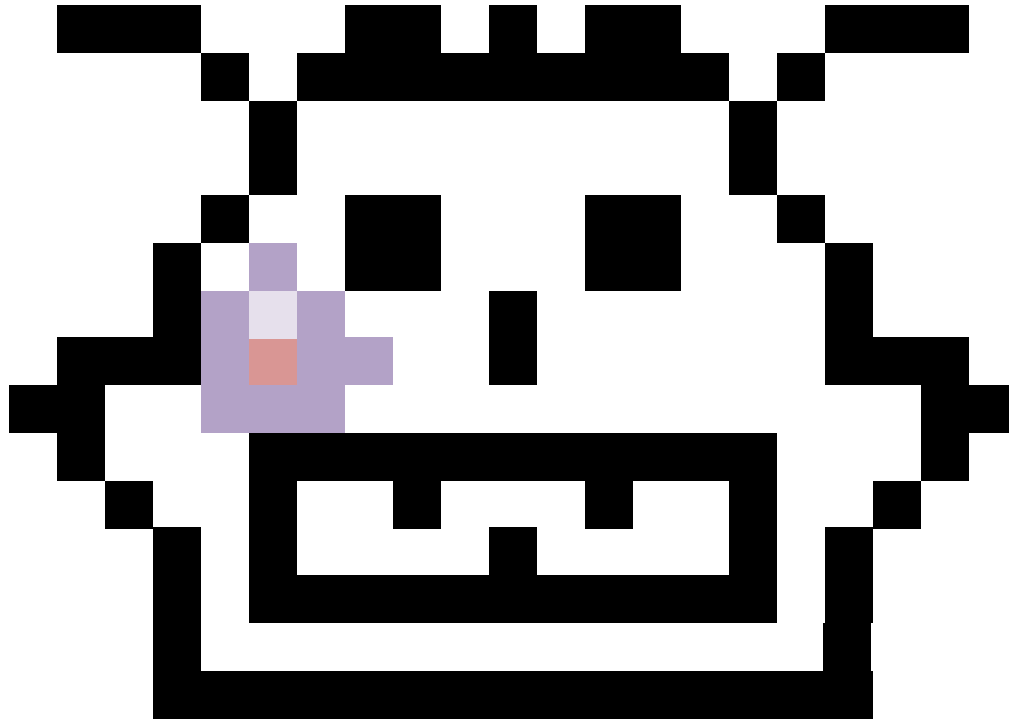
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,6)

to-do list

- (7,8)
- (6,6)
- (6,8)
- (9,7)
- (8,6)
- (8,8)
- (7,5)

Pop an element from the to-do list and assign it to v

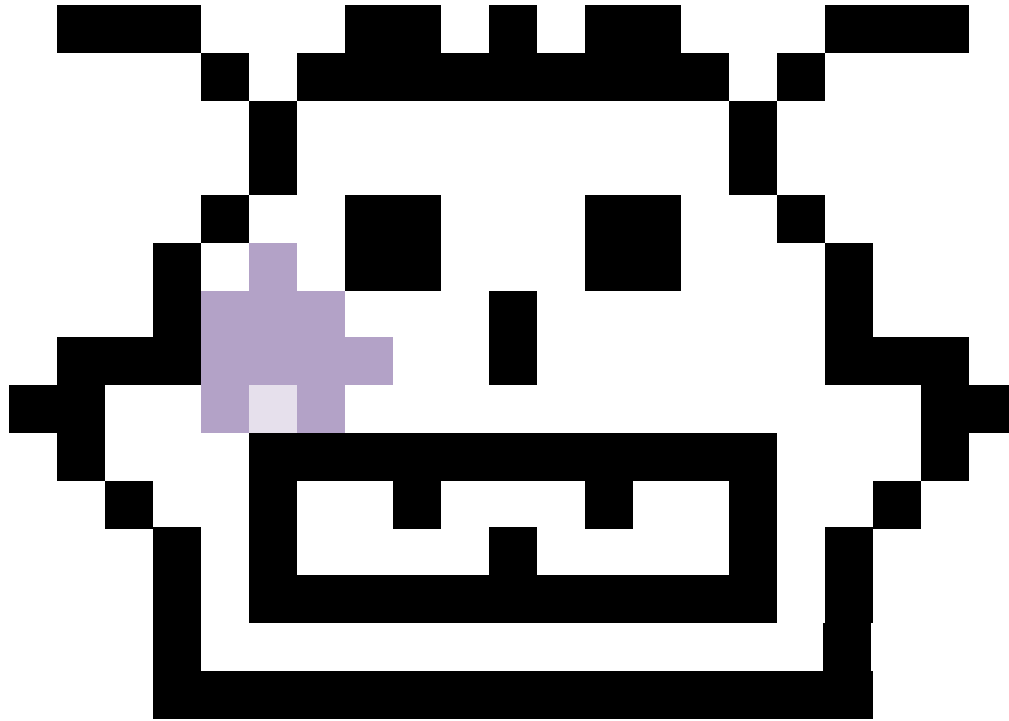
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,8)

to-do list

- (6,6)
- (6,8)
- (9,7)
- (8,6)
- (8,8)
- (7,5)

Pop an element from the to-do list and assign it to v

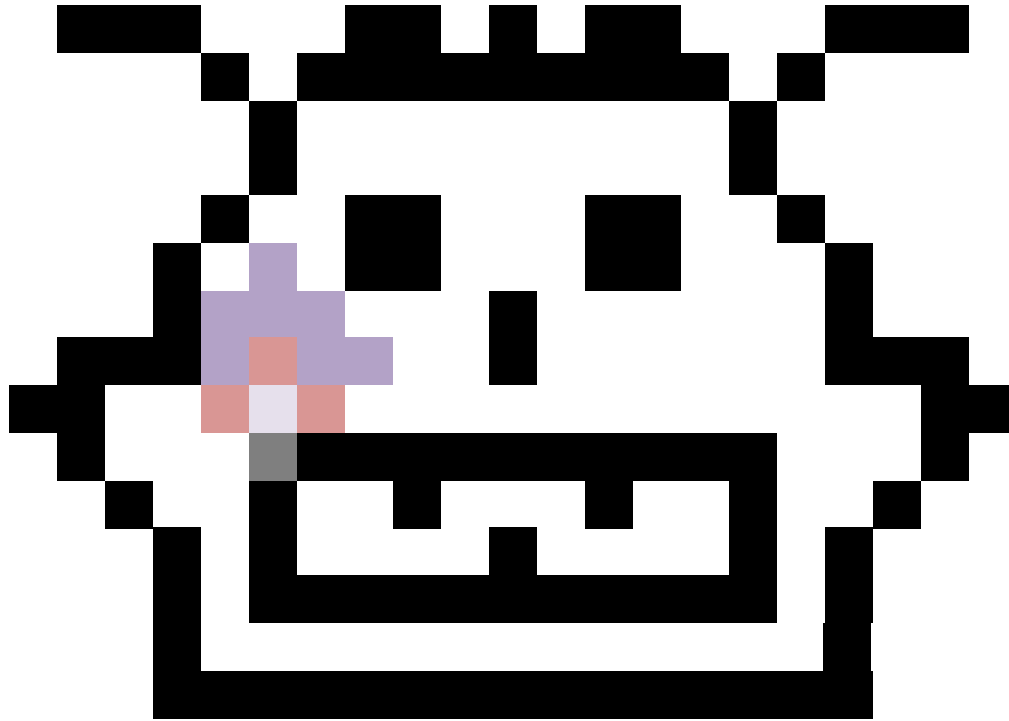
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,8)

to-do list

- (6,6)
- (6,8)
- (9,7)
- (8,6)
- (8,8)
- (7,5)

Pop an element from the to-do list and assign it to v

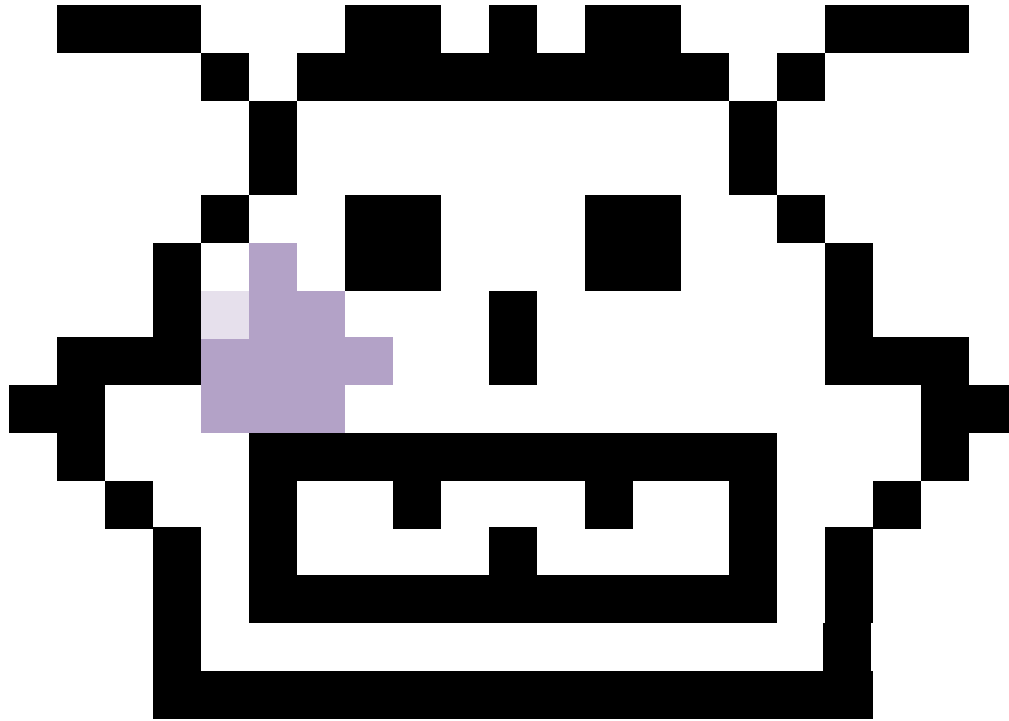
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (6,6)

to-do list

- (6,8)
- (9,7)
- (8,6)
- (8,8)
- (7,5)

Pop an element from the to-do list and assign it to v

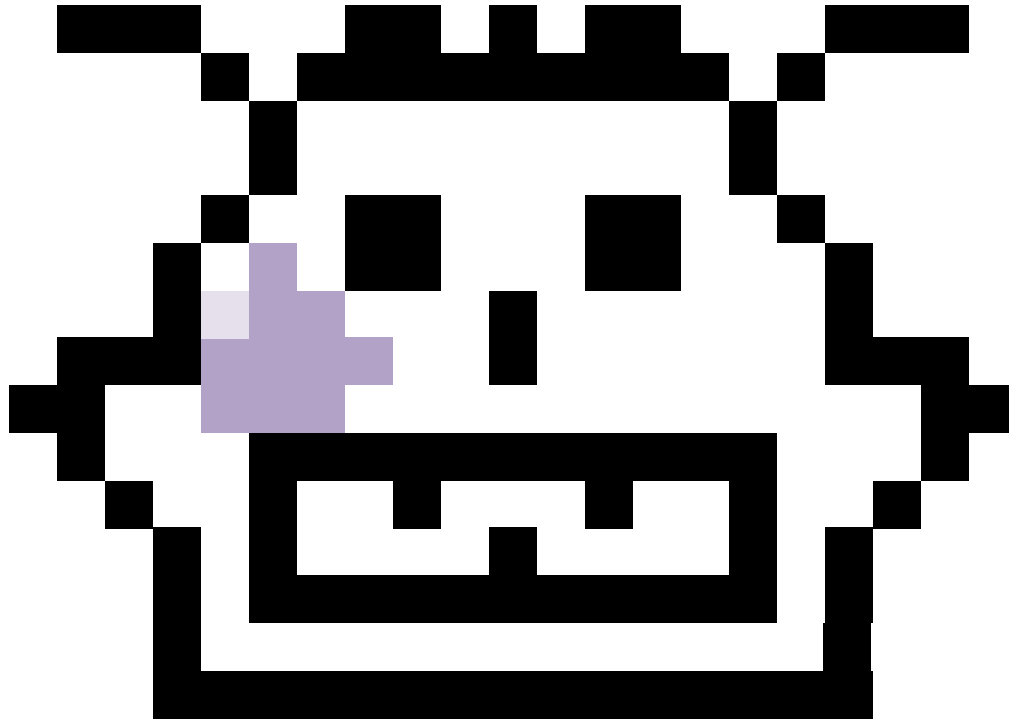
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (6,6)

to-do list

- (6,8)
- (9,7)
- (8,6)
- (8,8)
- (7,5)

Pop an element from the to-do list and assign it to v

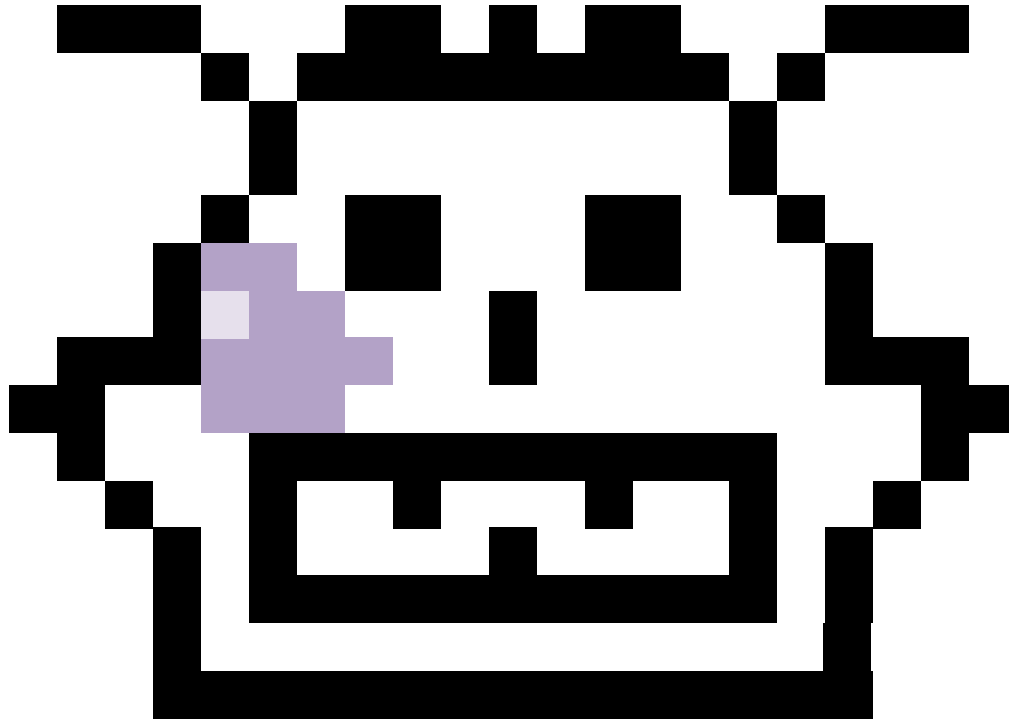
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (6,6)

to-do list

- (6,8)
- (9,7)
- (8,6)
- (8,8)
- (7,5)
- (6,5)

Pop an element from the to-do list and assign it to v

If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

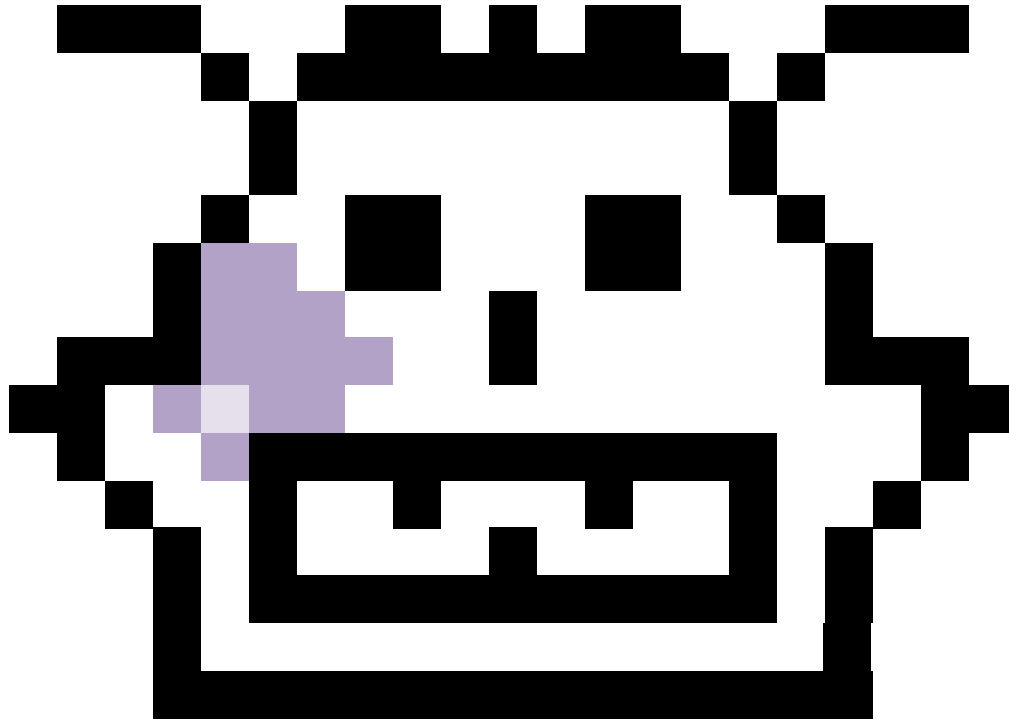
If v's below is empty, paint it and add to to-do list







# Loop while to-do list is not empty



spot (7,7)

c 

v (6,8)

to-do list

- (9,7)
- (8,6)
- (8,8)
- (7,5)
- (6,5)
- (5,8)
- (6,9)

Pop an element from the to-do list and assign it to v

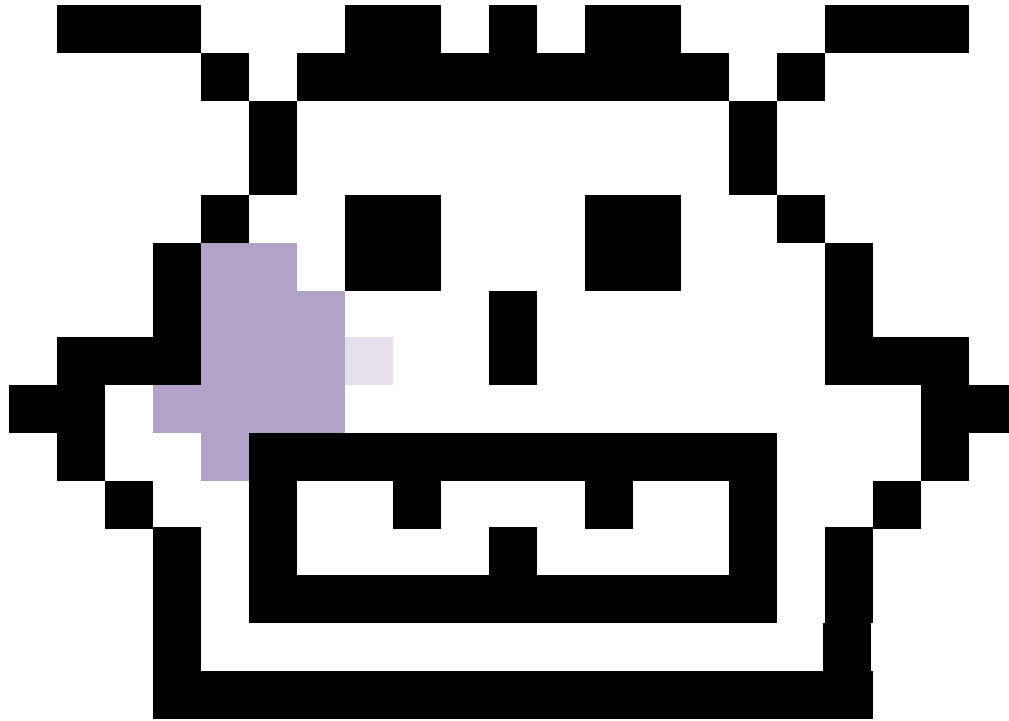
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (9,7)

to-do list

- (8,6)
- (8,8)
- (7,5)
- (6,5)
- (5,8)
- (6,9)

Pop an element from the to-do list and assign it to v

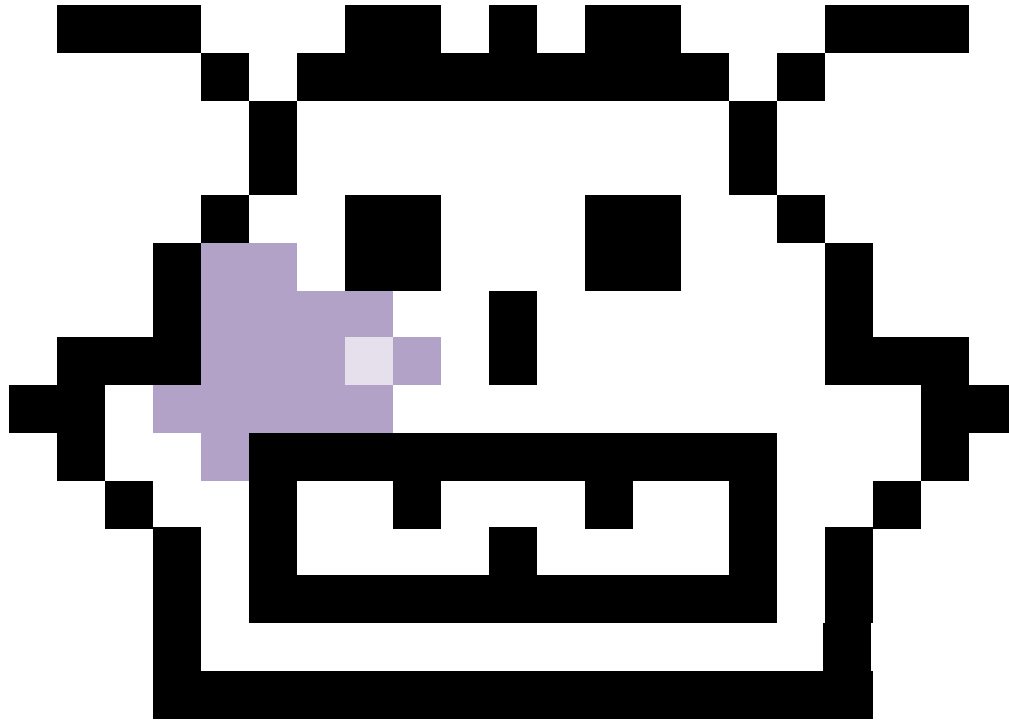
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (9,7)

to-do list

- (8,6)
- (8,8)
- (7,5)
- (6,5)
- (5,8)
- (6,9)
- (10,7)
- (9,6)
- (9,8)

Pop an element from the to-do list and assign it to v

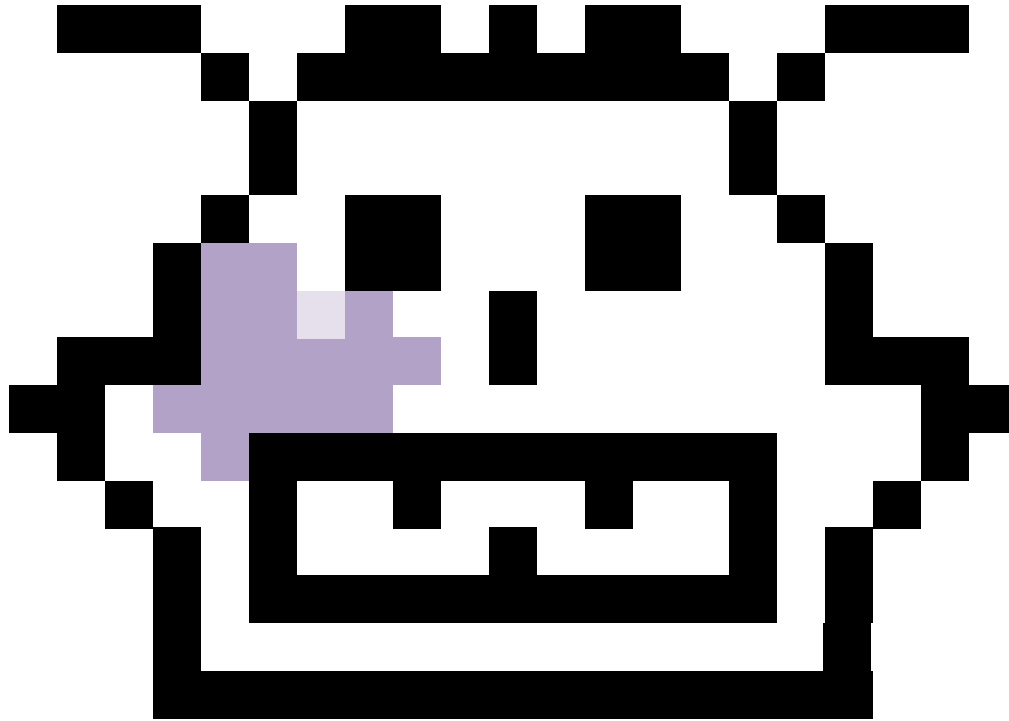
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (8,6)

to-do list

- (8,8)
- (7,5)
- (6,5)
- (5,8)
- (6,9)
- (10,7)
- (9,6)
- (9,8)

Pop an element from the to-do list and assign it to v

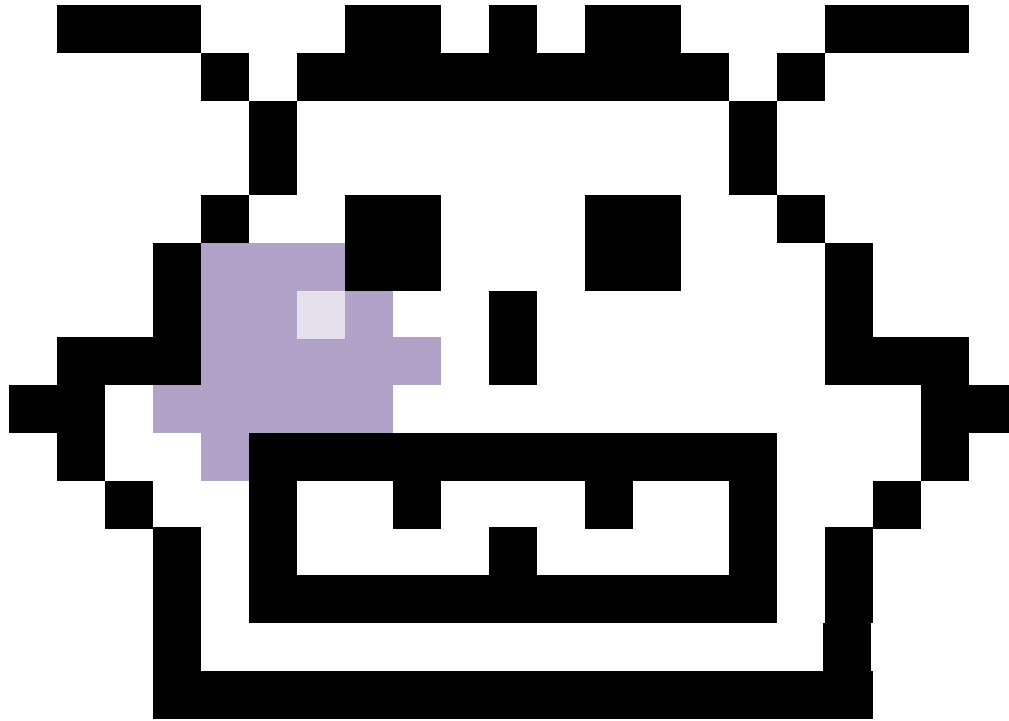
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (8,6)

to-do list

- (8,8)
- (7,5)
- (6,5)
- (5,8)
- (6,9)
- (10,7)
- (9,6)
- (9,8)
- (8,5)

Pop an element from the to-do list and assign it to v

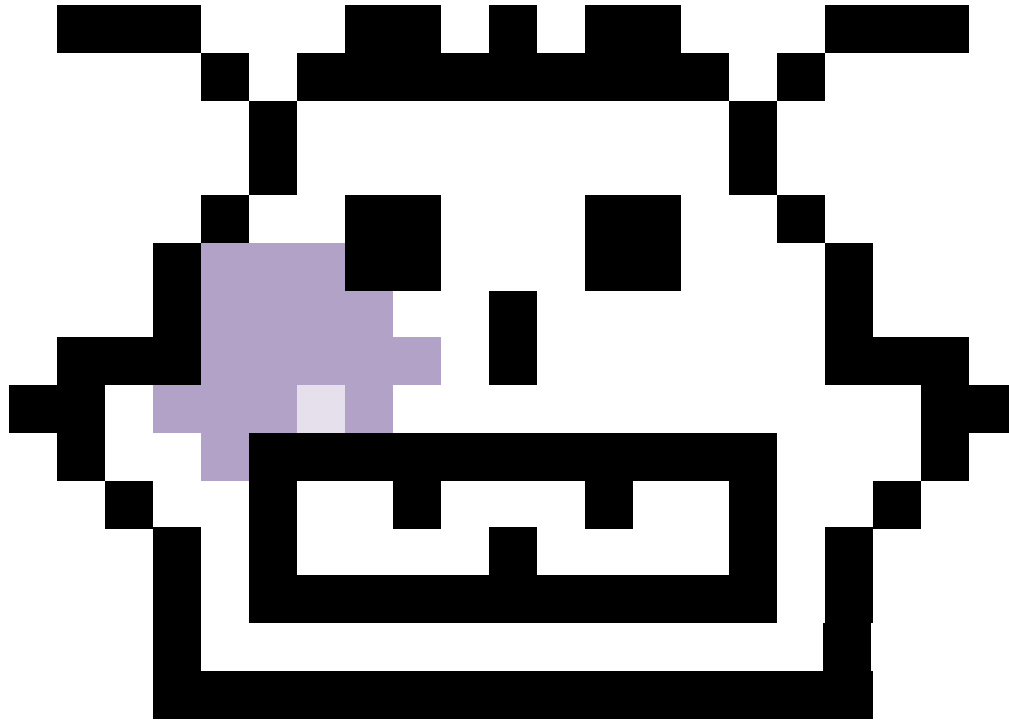
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (8,8)

to-do list

- (7,5)
- (6,5)
- (5,8)
- (6,9)
- (10,7)
- (9,6)
- (9,8)
- (8,5)

Pop an element from the to-do list and assign it to v

If v's left is empty, paint it and add to to-do list

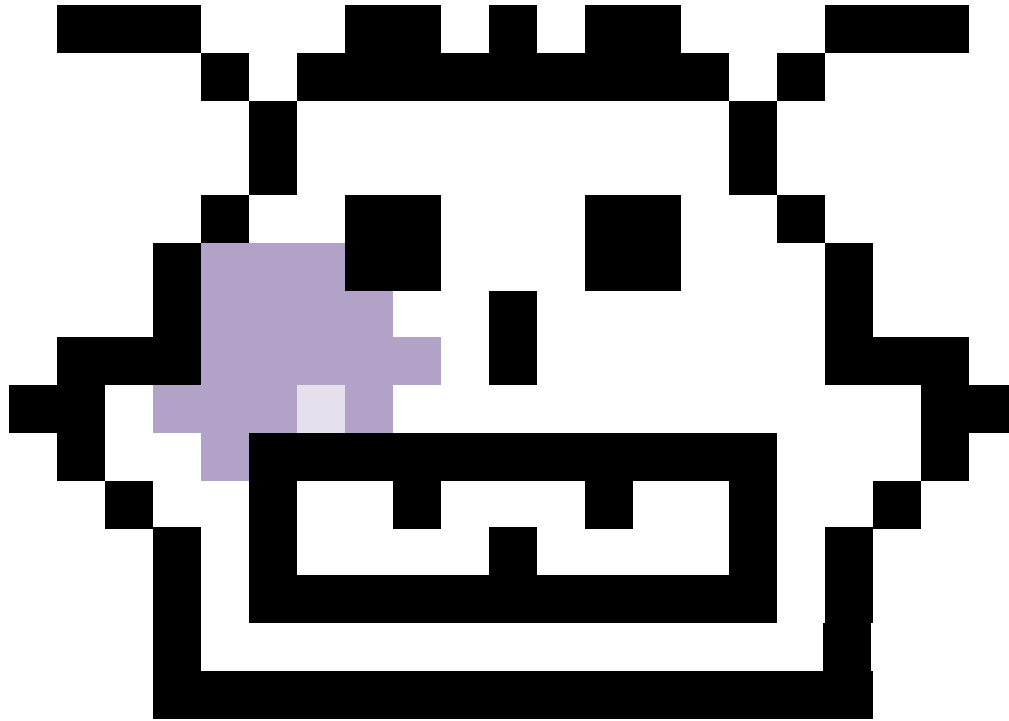
If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list



# Loop while to-do list is not empty



spot (7,7)

c 

v (8,8)

to-do list

- (7,5)
- (6,5)
- (5,8)
- (6,9)
- (10,7)
- (9,6)
- (9,8)
- (8,5)

Pop an element from the to-do list and assign it to v

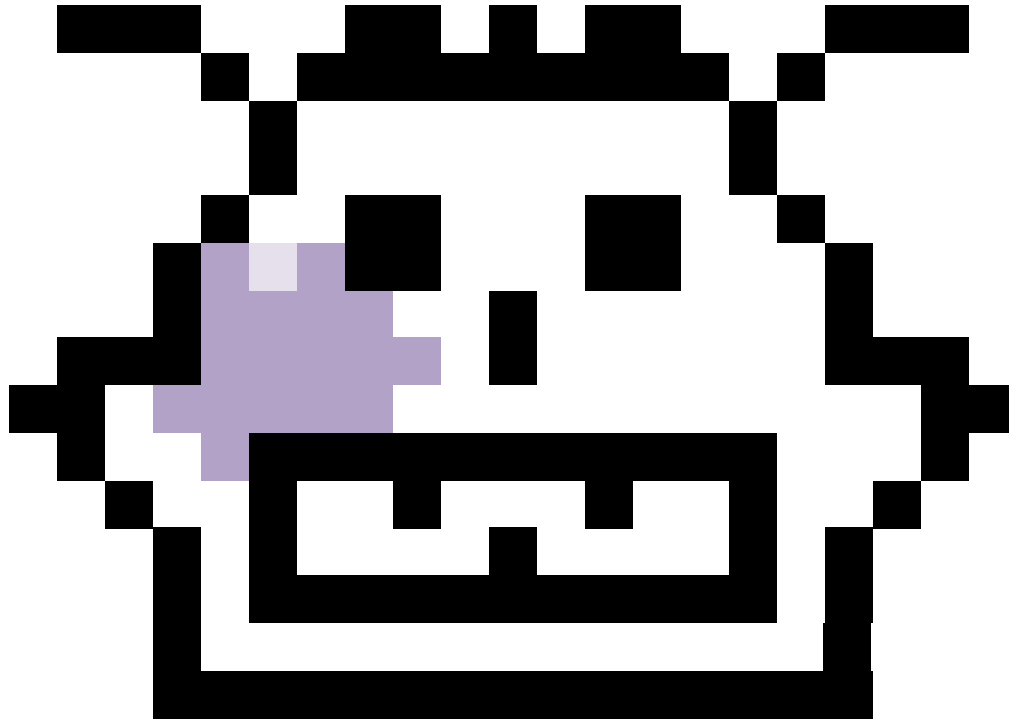
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,5)

to-do list

- (6,5)
- (5,8)
- (6,9)
- (10,7)
- (9,6)
- (9,8)
- (8,5)

Pop an element from the to-do list and assign it to v

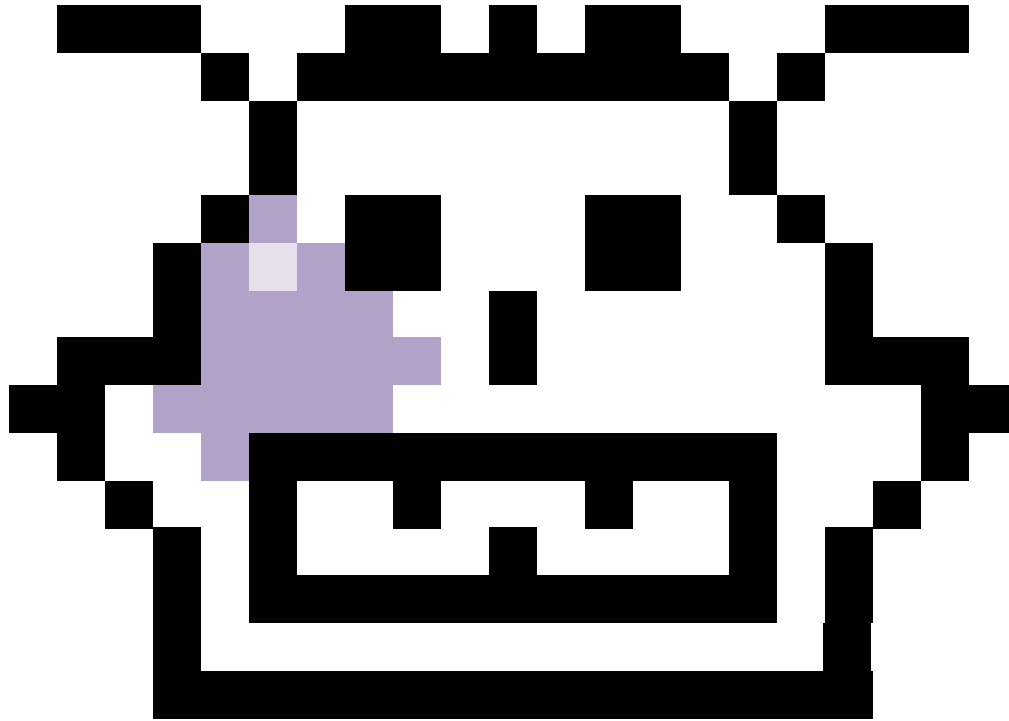
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (7,5)

to-do list

- (6,5)
- (5,8)
- (6,9)
- (10,7)
- (9,6)
- (9,8)
- (8,5)
- (7,4)

Pop an element from the to-do list and assign it to v

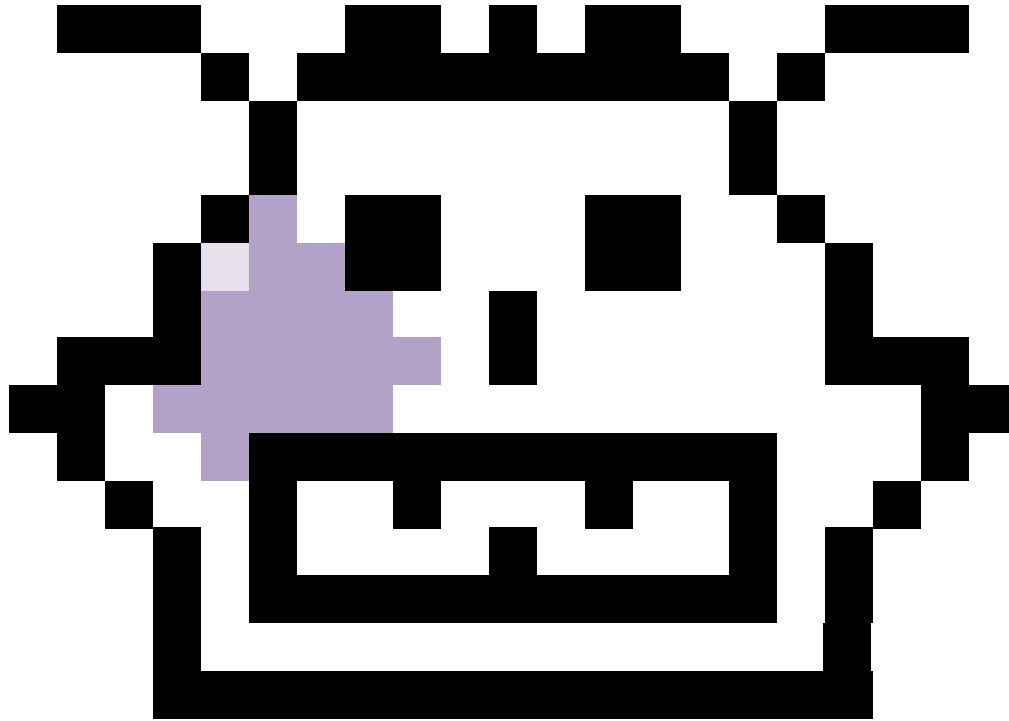
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (6,5)

to-do list

- (5,8)
- (6,9)
- (10,7)
- (9,6)
- (9,8)
- (8,5)
- (7,4)

Pop an element from the to-do list and assign it to v

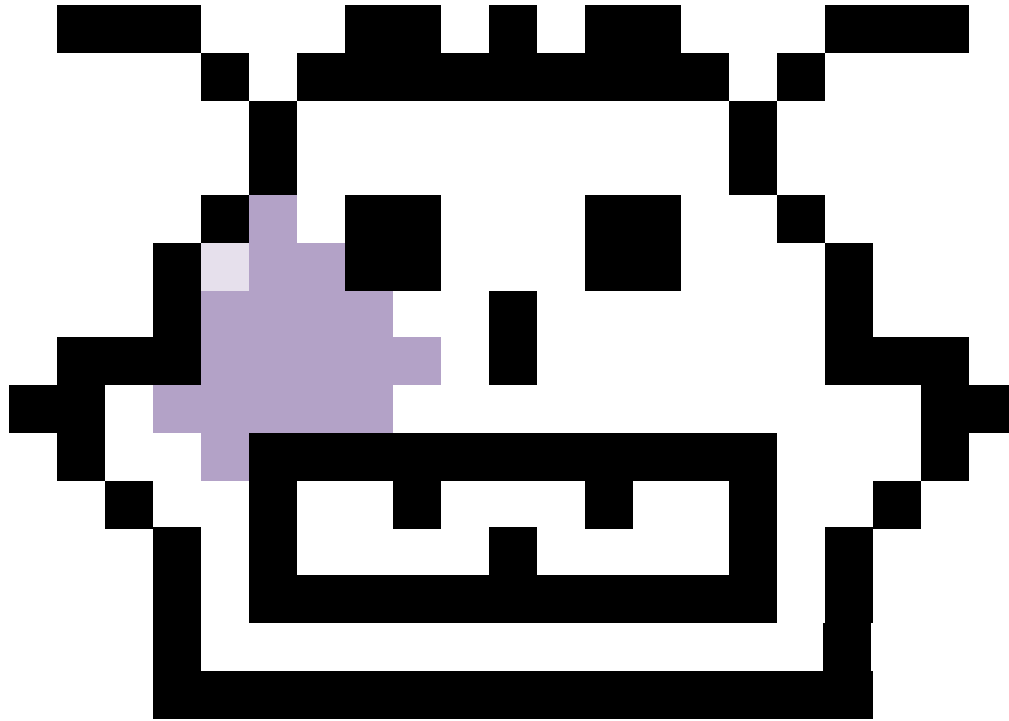
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (6,5)

to-do list

- (5,8)
- (6,9)
- (10,7)
- (9,6)
- (9,8)
- (8,5)
- (7,4)

Pop an element from the to-do list and assign it to v

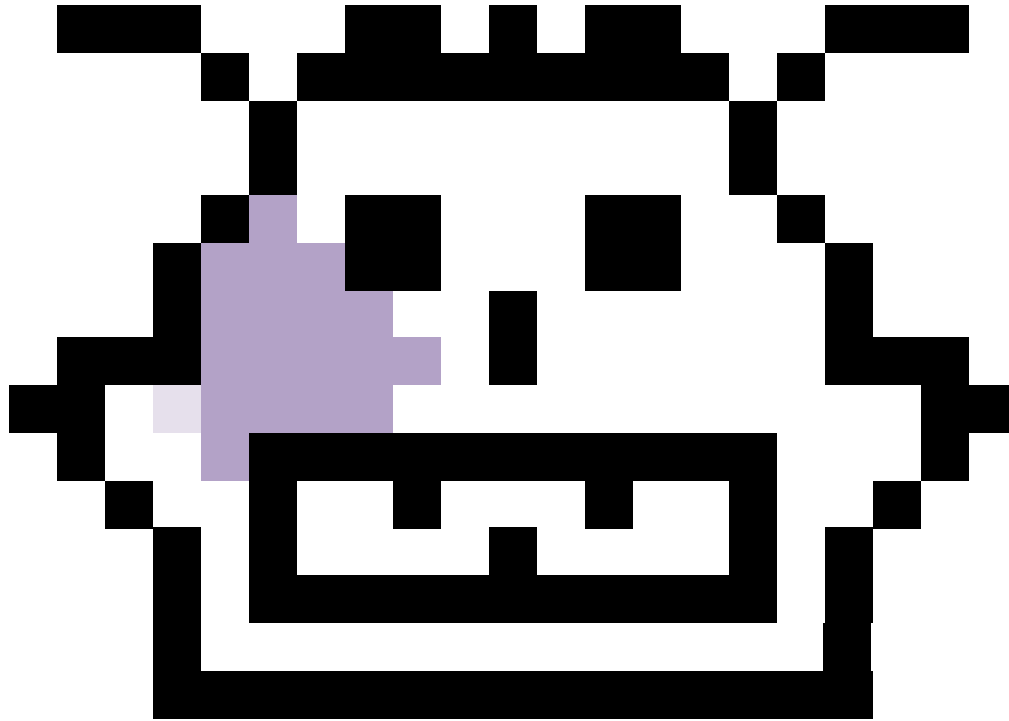
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (5,8)

to-do list

- (6,9)
- (10,7)
- (9,6)
- (9,8)
- (8,5)
- (7,4)

Pop an element from the to-do list and assign it to v

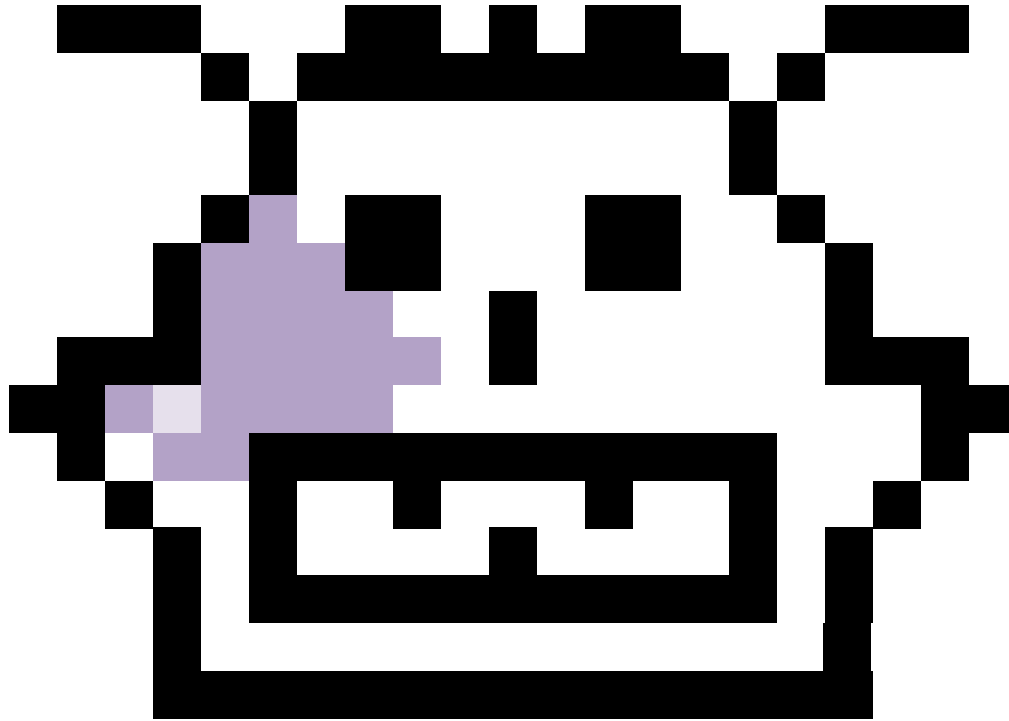
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (5,8)

to-do list

- (6,9)
- (10,7)
- (9,6)
- (9,8)
- (8,5)
- (7,4)
- (4,8)
- (5,9)

Pop an element from the to-do list and assign it to v

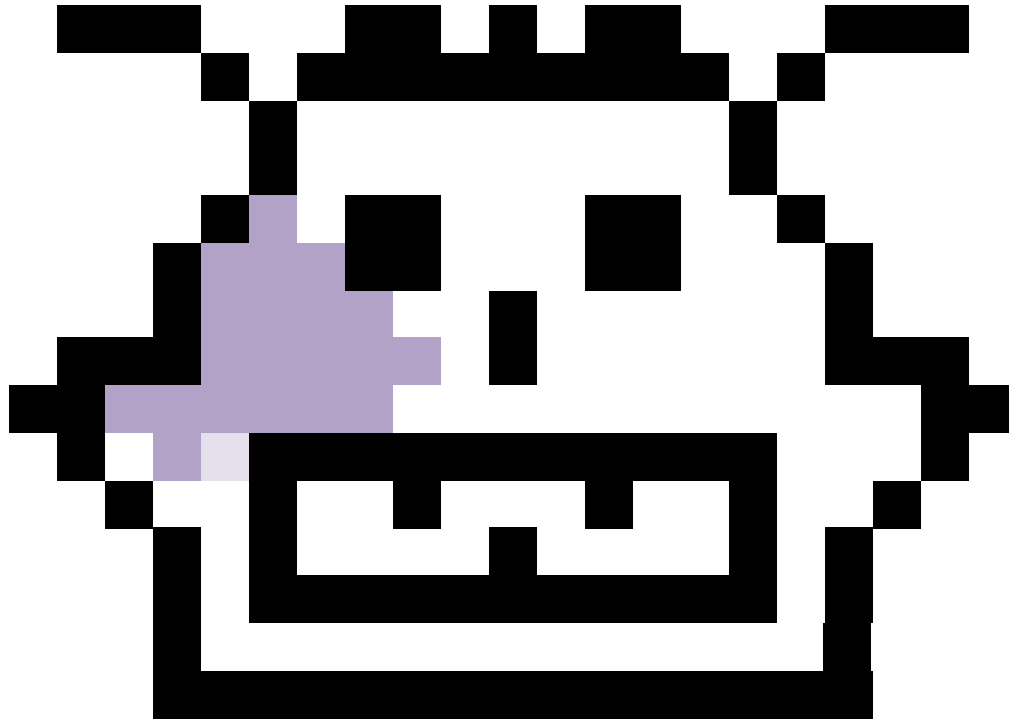
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (6,9)

to-do list

- (10,7)
- (9,6)
- (9,8)
- (8,5)
- (7,4)
- (4,8)
- (5,9)

Pop an element from the to-do list and assign it to v

If v's left is empty, paint it and add to to-do list

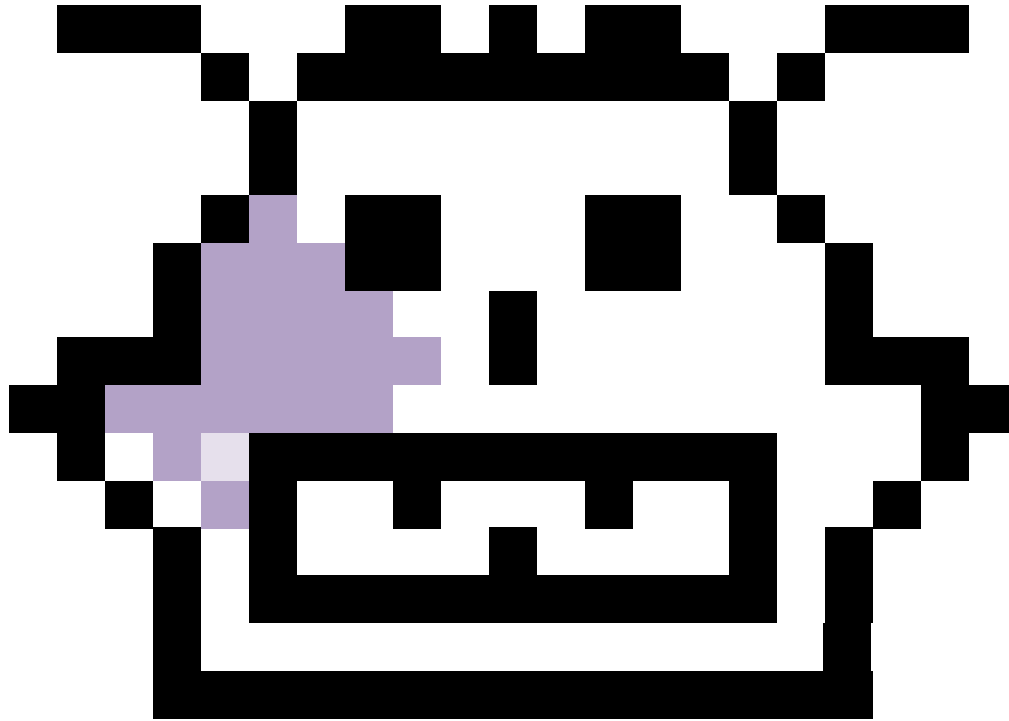
If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list



# Loop while to-do list is not empty



spot (7,7)

c 

v (6,9)

to-do list

- (10,7)
- (9,6)
- (9,8)
- (8,5)
- (7,4)
- (4,8)
- (5,9)
- (6,10)

Pop an element from the to-do list and assign it to v

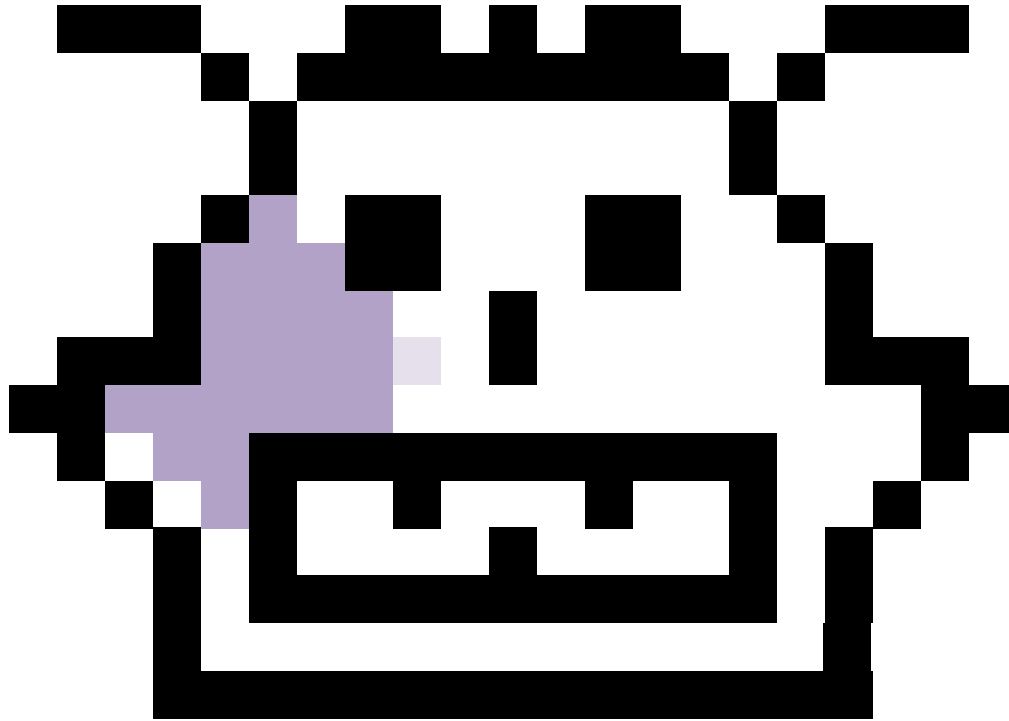
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (10,7)

to-do list

- (9,6)
- (9,8)
- (8,5)
- (7,4)
- (4,8)
- (5,9)
- (6,10)

Pop an element from the to-do list and assign it to v

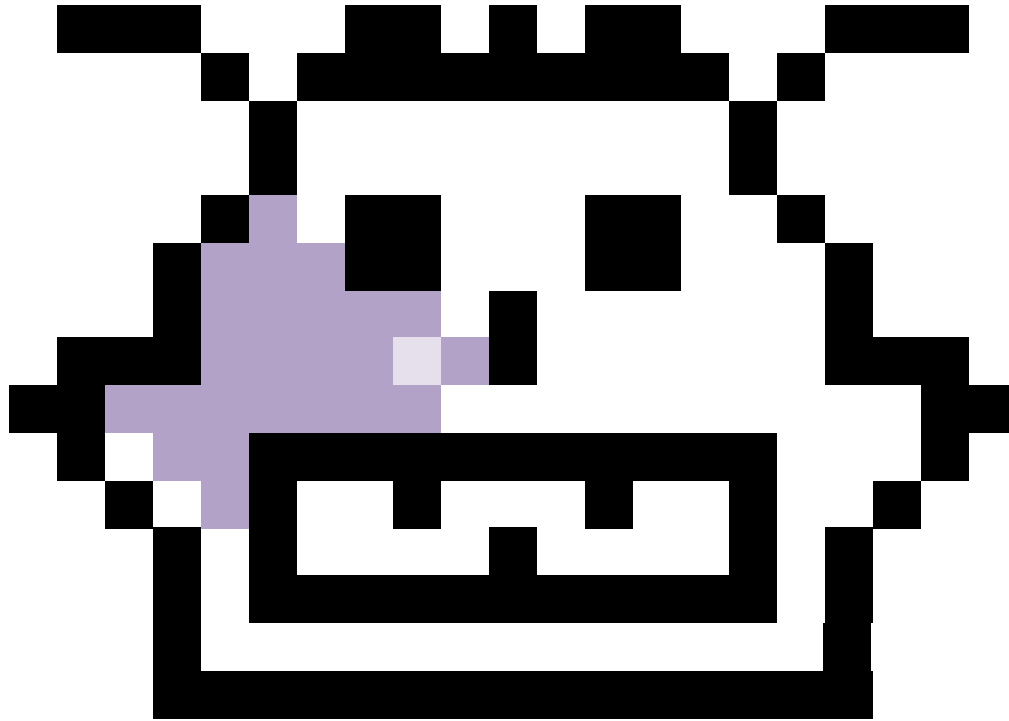
If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list

# Loop while to-do list is not empty



spot (7,7)

c 

v (10,7)

to-do list

- (9,6)
- (9,8)
- (8,5)
- (7,4)
- (4,8)
- (5,9)
- (6,10)
- (11,7)
- (10,6)
- (10,8)

Pop an element from the to-do list and assign it to v

If v's left is empty, paint it and add to to-do list

If v's right is empty, paint it and add to to-do list

If v's above is empty, paint it and add to to-do list

If v's below is empty, paint it and add to to-do list